



*International Civil Aviation Organization*

**Fourth Meeting of the South Asia/Indian Ocean ATM Coordination Group (SAIOACG/4) and the Twenty-First South East Asia ATM Coordination Group (SEACG/21)**

Hong Kong, China, 24 – 28 February 2014

---

**Agenda Item 4: Implementation of CNS/ATM Systems**

**SEAMLESS ATM IMPLEMENTATION AND REPORTING**

(Presented by the Secretariat)

**SUMMARY**

This paper presents an overview of the Seamless ATM planning and reporting required by States, and provides an update on the progress towards the performance-based monitoring regime being implemented during 2014.

This paper relates to –

**Strategic Objectives:**

A: *Safety – Enhance global civil aviation safety*

**Global Plan Initiatives:**

- GPI-1 Flexible use of airspace
- GPI-2 Reduced vertical separation minima
- GPI-3 Harmonization of level systems
- GPI-4 Alignment of upper airspace classifications
- GPI-5 RNAV and RNP (Performance-based navigation)
- GPI-6 Air traffic flow management
- GPI-7 Dynamic and flexible ATS route management
- GPI-8 Collaborative airspace design and management
- GPI-9 Situational awareness
- GPI-10 Terminal area design and management
- GPI-11 RNP and RNAV SIDs and STARs
- GPI-12 Functional integration of ground systems with airborne systems
- GPI-13 Aerodrome design and management
- GPI-14 Runway operations
- GPI-15 Match IMC and VMC operating capacity
- GPI-16 Decision support systems and alerting systems
- GPI-17 Data link applications
- GPI-18 Aeronautical information
- GPI-19 Meteorological Systems
- GPI-20 WGS-84
- GPI-21 Navigation systems
- GPI-22 Communication infrastructure
- GPI-23 Aeronautical radio spectrum

## 1. INTRODUCTION

1.1 The Asia/Pacific Seamless ATM Plan had been a key outcome from the Asia/Pacific Seamless ATM Planning Group (APSAPG). The Asia/Pacific Seamless ATM Plan incorporated the Block Zero ('0') Aviation System Block Upgrade (ASBU) elements that are now part of the Global Air Navigation Plan (Doc 9750).

1.2 APANPIRG/24 (June 2014) adopted the following Conclusions and a Decision on Seamless ATM:

***Conclusion 24/2 — Establishing Regional Priorities and Targets***

*That, following the PIRG - RASG Global Coordination meeting held in March 2013 APANPIRG/24 invited the Chairpersons of ATM, RASMAG, CNS, and MET sub groups to establish regional priorities and targets for the APAC Region in alignment with the GANP and APAC Seamless ATM Plan by December 2013 in order to facilitate submission to ICAO by May 2014.*

***Conclusion 24/54: Asia/Pacific Seamless ATM Plan***

*That, the Asia/Pacific Seamless ATM Plan Version 1.0 attached as **Appendix B to the Report on Agenda Item 3.6** be endorsed, and made available on the ICAO Asia/Pacific Regional Office web site.*

***Conclusion 24/55: State Seamless ATM Planning***

*That, given the urgency and priority of Seamless ATM planning for the Asia/Pacific as acknowledged by the 46<sup>th</sup> Conference of Directors General of Civil Aviation (DGCA, Osaka, Japan, 12-16 October 2009) and APANPIRG/22 (05-09 September 2011), States should be urged to:*

- a) review Version 1.0 of the Asia/Pacific Seamless ATM Plan and utilise the Plan to develop planning for State implementation of applicable Seamless ATM elements;*
- b) ensure relevant decision-makers are briefed on the Seamless ATM Plan;*
- c) submit the first Regional Seamless ATM Reporting Form to the ICAO Regional Office by 01 March 2014; and*
- d) where possible, participate and contribute to Seamless ATM system collaborative training and research initiatives.*

***Decision 24/56: Seamless ATM Seminars/Workshops***

*That, ICAO be urged to facilitate Asia/Pacific Seamless ATM Planning and Implementation Seminars/ Workshops for Asia/Pacific and trans-regional States.*

1.3 The Seamless ATM Plan and associated implementation guidance material is available on the ICAO Asia/Pacific web site at: <http://www.icao.int/APAC/Pages/edocs.aspx>.

## 2. DISCUSSION

### State Seamless ATM Plans and Reporting

2.1 A key to any effective implementation is to reduce complexity to ensure the maximum understanding and involvement by all concerned parties. In the case of the ASBU/Seamless ATM planning, a number of States and Administrations had expressed concern about the need to minimise the burden of data gathering and reporting. This was a concern not just for administrations and States, but also for the Regional Office to manage, especially with a Regional Dashboard creating another layer of results to consider on top of the regional targets/metrics.

2.2 The State Seamless ATM Plans were intended to be high-level and concise, so that each of the Seamless ATM elements that were applicable to the State could be elucidated in a brief paragraph, explaining the basic benefits and costs, barriers and steps to implementation, and an outline of the expected result. A template of a State Seamless ATM Plan is available on the same web page that the Seamless ATM Plan is located. It was not necessary to submit the State Seamless SATM Plan to the Regional Office at this juncture, although this may become necessary in the future.

2.3 The reporting of implementation progress of the Seamless ATM Plan elements in accordance with APANPIRG Conclusion 24/55 c) was crucial for:

- airspace users (for planning of equipage and fleets);
- neighbouring Flight Information Regions (FIRs, for harmonisation of progress);
- Regional Office (to update the Seamless ATM Plan and for APANPIRG); and
- ICAO HQ (to update the GANP in response to regional implementation feedback).

2.4 Seamless ATM reporting was expected to be as uncomplicated as possible, with the initial manual excel spreadsheet requiring only basic responses, such as whether the Seamless ATM element was applicable or not, and if so, when it would be implemented. The form also had space for feedback on barriers to implementation so ICAO and other States could learn from this experience. As ASBU were incorporated into the Seamless ATM process, the single report from a State was considered all that was necessary for both ASBU and Seamless ATM updates.

2.5 The Regional Office was hoping to develop an electronic (internet) means of reporting in the near future, with automated capability to present charts and maps of regional progress in respect of each element or State. This feature, if developed, would provide APANPIRG and its Sub-Groups, and States with powerful tools for monitoring and planning.

2.6 It was important for States to understand that the implementation of the Seamless ATM elements would fulfill the GANP expectation of ASBU implementation, because ASBU was incorporated already. However, the Seamless ATM process was more comprehensive, covering areas such as human performance and civil/military cooperation that were not recognised in ASBU to the extent required by the Asia/Pacific. Thus, in many ways the Seamless ATM Plan could be considered to be 'ASBU+'.

### Seminars

2.7 In accordance with APANPIRG Decision 24/56, the Asia/Pacific Regional Office had conducted a number of Seminars or presentations to States and organisations on Seamless ATM:

- 10 September 2013: Bangkok, Thailand (ASEAN Air Transport Working Group - (ATWG));
- 23 – 25 September 2013, Beijing, China (Europe – Asia Trans-regional Special Coordination Meeting);
- 21 October 2013: Hyderabad, India (Bay of Bengal, Arabian Sea and Indian Ocean Region - BOBASIO);
- 26 November 2013, Bangkok, Thailand (Collaborative Development of Operational Safety and Continuing Airworthiness Programme-Southeast Asia - COSCAP-SEA);
- 27 November 2013, Bangkok, Thailand Meteorological Requirements Task Force (MET-R/TF); and
- 28 November 2013: Bangkok, Thailand (Civil Air Navigation Services Organisation - CANSO).

---

## Regional Dashboard

2.8 An Asia/Pacific Regional Dashboard on safety (based on the Global Aviation Safety Plan-GASP) and air navigation (based on the GANP) will become active on the ICAO HQ's web site during mid-2014. At first, the Dashboard will be relatively simple, with data being driven from within ICAO databases (Datamart) or drawn from global databases that do not require a separate State input to update.

2.9 The operation of the dashboard and the regional Seamless ATM reporting and monitoring process should not be confused by States. The dashboard had a linkage with the regional Seamless ATM reporting and monitoring process but as the dashboard was a very high-level 'window' on Asia/Pacific performance, it was expected to be used by the public and high-level decision-makers. On the other hand, the regional process is much more comprehensive, uses State inputs (through the Reporting Form), and was expected to be used by technical and operational managers. In the future, it was possible that the Dashboard and the regional system will become one system that is managed by the Regional Office.

2.10 Internal coordination meetings and training sessions on the regional dashboards were held at ICAO HQ, Montreal, from 04 to 15 November 2013, where inputs from the regional offices were presented and discussed. The Asia/Pacific representatives made presentations on the Seamless ATM planning and implementation process, and well as the results of the Chair's draft priorities for the Asia/Pacific. After recognizing the proposed metrics and targets that were common to most regions, the go-ahead was given for the pilot regional dashboards. The group of core global indicators was as follows:

- PBN Approach: percentage of runways at international aerodromes (as defined in DOC7910/AIP) with APV (Approach with Vertical Guidance);
- ATFM: percentage of FIRs within which all ACCs utilize ATFM measures;
- AIM: Status of implementation of Phase 1 and 2;
- Ground-Ground Digital Coordination/Transfer: percentage of FIRs within which all applicable Area Control Centres (ACCs) have implemented at least one interface to use ATS Inter-facility Data-link Communications/On-Line Data Interchange AIDC/OLDI with neighboring ACCs; and
- Environmental Benefit: percentage fuel burn reduction using IFSET (ICAO Fuel Savings Estimation Tool).

2.11 The indicator Environmental Benefit would measure the sum of the other improvements. This would be calculated by ICAO HQ and there will be no need at this stage for States to directly provide data for this element.

2.12 There were many possible future region-specific indicators that could be incorporated on the dashboard once some provision for customization was made available by ICAO HQ. Obviously, these would include the three metrics that were part of the Asia/Pacific list of seven which were not incorporated in the first iteration of the dashboard:

- B0-FRTO (Flexible Use of Airspace-FUA);
- B0-ASUR (Automatic Dependent Surveillance-Broadcast or Secondary Surveillance Radar or Multilateration-ADS-B or SSR or MLAT); and
- B0-TBO (Controller Pilot Data-link Communications and Automatic Dependent Surveillance-Contract-CPDLC and ADS-C).

2.13 After a training session and discussions on the dashboards, a subsequent meeting in ANB incorporated the indicators in the dashboards, reviewed and refined by ANB focal points. The indicators were then presented to the eANP working group, in charge of building the new eANP. The result of this iterative consultation process is a stabilizing group of core global indicators to be included in the first version of the regional dashboards, available on the web in March 2014, and a group of possible future region-specific indicators.

2.14 The 2014 Dashboards would be an early iteration and therefore will not embark the region-specific indicators as subsequent years. It was agreed that five of the seven indicators suggested by APAC, and shared by some other regions, should form the core that will be used for 2014. The three that were not globally agreed by other regions were ASUR (surveillance), TBO (ADS-C and CPDLC), and FRTO-FUA so these will progress as regional 'customizations' in 2015. ATFM is still in discussion. PBN Terminal was renamed to PBN approach.

2.15 Once endorsed at the regional level, the regional priorities and targets would be incorporated into the regional dashboards. In the Asia/Pacific region, the target date was September 2014, following APANPIRG/25.

#### Air Navigation Report Forms

2.16 The Air Navigation Report Forms (ANRFs) have replaced the earlier Performance Framework Forms (PFF). The ANRF were intended to be a means of setting milestones and targets, and monitoring progress with metrics for each of the key Seamless ATM elements (at first, the seven priority elements). The ANRF also identified the implementation challenges, and more efficient tools which could be used for monitoring. The ANRF would be presented to APANPIRG and its Sub-Groups as appropriate to update – and were expected to be where the agreed metrics and targets would ultimately be maintained. It should be noted that States were not expected to complete ANRF.

#### Asia/Pacific Regional Priorities and Targets

2.17 In accordance with APANPIRG Conclusion 24/2, the Chairpersons of Sub-Groups and the APSAPG were invited to consider the further development of Asia/Pacific Regional Priorities and Targets. It was noted that the Seamless ATM Plan contained priorities (paragraph 5.7, Table 1 refers) intended to generally guide States for all 18 ASBU elements.

2.18 The 42 elements in the Seamless ATM Plan were arguably already targets in themselves. They expressed an expectation of a future state, and the Phase dates detail the time by which there is an expected outcome. In addition, the seven draft ANRF that were chosen as for initial priority contained a number of extra milestones which can also be considered as targets.

2.19 ICAO HQ had proposed seven metrics, which the Chairpersons compared with the six priorities that had been assigned as top regional priorities within the Seamless ATM Plan. It was determined that three of the HQ priorities were not suitable for Asia/Pacific because the means to measure successful operation were difficult to quantify (Continuous Climb Operations-CCO, Continuous Descent Operations-CDO, Performance-based Navigation (PBN) En-route and environmental savings using the IFSET tool).

2.20 Two other metrics proposed by ICAO HQ were similar to those already recognised within the Seamless ATM Plan. A seventh proposed HQ metric regarding PBN terminal was considered suitable, so was added to the six from the Seamless ATM Plan to make a total of seven.

2.21 The Chairpersons agreed on the ten regional targets to be shown on the Regional Dashboard, which were based on the highest priority elements (**Appendix A**). In addition, all 42 Seamless ATM elements were assigned priorities (**Appendix B**).

### Handbook

2.22 The ICAO Asia/Pacific Office has developed a Handbook that contains the priority ASBU elements and their associated ANRF, information on ASBU, the Seamless ATM Plan, Implementation Guidance material, and the Seamless ATM Reporting Form. It was expected that the Handbook would be presented later in 2014 to APANPIRG/25.

### Performance-based Navigation

2.23 PBN was a key enabler for a number of ASBU modules, and in the case of the Seamless ATM Plan also supports regional elements 140 (PBN) Routes and 150 (PBN) Airspace).

2.24 There appears to be confusion in some States about the intent of PBN designations, which can be used for two entirely different functions. Some States were applying PBN specifications on ATS routes, and not the airspace. The purpose of the PBN designation within category S (Surveillance) airspace was to confirm the navigation aids and aircraft capability required to support navigation on that route, and to ensure protection for obstacles.

2.25 Within Category S airspace ATC separation should not be based on the PBN navigation specification, but be based on ATS surveillance. Notwithstanding this, it was recognized that a PBN navigation specification could also reduce ATC workload by supporting the monitoring of an ATS surveillance-based separation (such as the Republic of Korea which used 8NM spaced RNAV2/RNAV5 routes using 5NM radar separation as the basis of the separation).

2.26 Within Category R (Remote) airspace, the situation was different, and this may be the genesis of the confusion. In this case, the PBN specification also supported the use of 50 x 50NM and 30 x 30NM ATC separation standards.

2.27 In implementing Seamless ATM elements 140 and 150, States should ensure the appropriate PBN designation of ATS routes and airspace. Thus the latter should be considered as an airspace capability, applicable to all capable aircraft on and off-route (unless a more efficient standard such as ATS surveillance separation can be applied).

2.28 In addition, it had been noted that some States were applying RNAV5 on ATS routes that extended beyond VHF range or for use by large passenger jets. This was not consistent with the expectations of the PBN Manual (Doc 9613). RNAV5 was designed as a low-end navigation specification that could accommodate a basic Instrument Flight Rules Global Positioning System (IFR GPS) equipped aircraft, had no navigation database and also no requirement for waypoint sequencing. Thus States were urged to utilize RNAV2 and RNP2 navigation specifications at the earliest opportunity for regional routes, consistent with the Seamless ATM Plan.

### **3. ACTION BY THE MEETING**

3.1 The meeting is invited to:

- a) note the information contained in this paper; and
- b) discuss any relevant matters as appropriate.

.....

**Agreed Highest Priority Regional Targets  
(for the Regional Performance Dashboard)**

<b>Regional Priorities agreed 30-10-13 by Chairpersons of APANPIRG SGs and ICAO Secretariat</b>	<b>Highest Priority Regional Targets As agreed 16-01-14 by Chairpersons of APANPIRG SGs and ICAO Secretariat</b>	<b>Respective B0 module</b>	<b>Regional Reporting Form Item #</b>
<b>APV (B0-APTA)</b>	1. <u>Approach</u> : Where practicable, all high density aerodromes with instrument runways serving aeroplanes should have precision approaches or APV or LNAV.	B0-APTA	110
<b>ATFM/A-CDM (B0-NOPS)</b>	2. <u>Network Operations</u> : All High Density FIRs supporting the busiest Asia/Pacific traffic flows and high density aerodromes should implement ATFM incorporating CDM using operational ATFM platform/s.	B0-NOPS	80
<b>AIM (B0-DATM)</b>	3. <u>Aeronautical Information Management</u> : ATM systems should be supported by digitally-based AIM systems through implementation of Phase 1 and 2 of the AIS-AIM Roadmap	B0-DATM	300
<b>AIDC (B0-FICE)</b>	4. <u>System Wide Information Management</u> : All States between ATC units where transfers of control are conducted have implemented the messages ABI, EST, ACP, TOC, AOC as far as practicable.	B0-FICE	220
<b>FUA (B0-FRTO)</b>	5. <u>Civil/Military</u> - Enhanced En-Route Trajectories: All States should ensure that SUA are regularly reviewed by the appropriate Airspace Authority to assess the effect on civil air traffic and the activities affecting the airspace.	B0-FRTO	360
	6. <u>Civil/Military</u> - Enhanced En-Route Trajectories: All States should ensure that a national civil/military body coordinating strategic civil-military activities is established.	Regional	370
	7. <u>Civil/Military</u> - Enhanced En-Route Trajectories: All States should ensure that formal civil military liaison for tactical response is established.	Regional	380
<b>Surveillance (B0-ASUR)</b>	8. <u>Ground Surveillance</u> : All Category S upper controlled airspace and Category T airspace supporting high density aerodromes should be designated as non-exclusive or exclusive as appropriate ADS-B airspace requiring operation of ADS-B.	B0-ASUR	180
	9. <u>Ground Surveillance</u> : ADS-B or MLAT or radar surveillance systems should be used to provide coverage of all Category S-capable airspace as far as practicable, with data integrated into operational ATC aircraft situation displays.	B0-ASUR	270
<b>Data-link ADS-C and CPDLC (B0-TBO)</b>	10. <u>Trajectory-Based Operations-Data Link En-Route</u> : Within Category R airspace, ADS-C surveillance and CPDLC should be enabled to support PBN-based separations.	B0-TBO	280

## Agreed Priorities

### Chairperson’s Sub Group on 17 January 2014

Reference	Specification title	Module	ASBU - Module title	Priority Seamless plan v1.0	Priority Chairperson's meeting 30 Oct. 2013	Priority agreed by Chairperson's SG 17 Jan.2014
10	Apron Management	-	-	-	-	3
20	ATM-Aerodrome Coordination	-	-	-	-	3
30	Aerodrome capacity	-	-	-	-	3
40	Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)	B0-SURF	Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)	3	-	3
50	Arrival Manager/Departure Management (AMAN/DMAN)	B0-RSEQ	Improve Traffic flow through Sequencing (AMAN/DMAN)	2	-	2
60	ATC Sector Capacity	-	-	-	-	2
70	Airport Collaborative Decision-Making (ACDM)	B0-ACDM	Improved Airport Operations through Airport-CDM	2	-	2
-	-	B0-WAKE	Increased Runway Throughput through Optimized Wake Turbulence Separation	3	-	3
80	Air Traffic Flow Management/Collaborative Decision-Making (ATFM/CDM)	B0-NOPS	Improved Flow Performance through Planning based on a Network-Wide view	1	1	1
90	Continuous Descent Operations (CDO)	B0-CDO	Improved Flexibility and Efficiency in Descent Profiles using Continuous Descent Operations (CDOs)	2	-	2
100	Continuous Climb Operations (CCO)	B0-CCO	Improved Flexibility and Efficiency Departure Profiles – Continuous Climb Operations (CCO)	2	-	2
110	Performance-based Navigation (PBN) Approach	B0-APTA	Optimization of Approach Procedures including vertical guidance	2	1	1



120	Standard Instrument Departures/Standard Terminal Arrivals (SID/STAR)	B0-CCO B0-CDO	-	2	1	2
130	Performance-based Navigation (PBN) Visual Departure and Arrival Procedures	-	-	-	-	3
140	Performance-based Navigation (PBN) Routes	B0-FRTO	Improved Operations through Enhanced En-Route Trajectories	1	-	2
150	Performance-based Navigation (PBN) Airspace	-	-	-	-	2
160	Safety Nets	B0-SNET	Increased effectiveness of ground-based safety nets	2	-	2
170	Airborne Safety Systems	B0-ACAS	Airborne Collision Avoidance Systems (ACAS) Improvements	2	-	2
-	-	B0-OPFL	Improved Access to Optimum Flight Levels through Climb/Descent Procedures using ADS-B	3	-	3
180	Ground-based surveillance	B0-ASUR	Initial Capability for Ground Surveillance	1	1	1
-	-	B0-ASEP	Air Traffic Situational Awareness (ATSA)	2	-	2
190	Airspace classification	-	-	-	-	2
200	Flight Level Orientation Scheme (FLOS)	-	-	-	-	2
210	Flight Level Allocation Schemes (FLAS)	-	-	-	-	2
220	ATS Inter-facility Data-link Communications (AIDC)	B0-FICE	Increased Interoperability Efficiency & Capacity through Ground-Ground Integration	1	1	1
230	Automated Transfer of Control	-	-	-	-	2
240	ATS Surveillance data sharing	-	-	-	-	2
250	ATM systems enabling optimal PBN/ATC operations	B0-APTA	Optimization of Approach Procedures including vertical guidance	2	-	2
260	ATC Horizontal separation	-	-	-	-	2

270	Situation display integrating surveillance data	B0-ASUR	Initial Capability for Ground Surveillance	1	1	1
280	ADS-C, CPDLC	B0-TBO	Improved Safety and Efficiency through the initial application of Data Link En-Route	1	1	1
290	UPR and DARP	B0-FRTO	Improved Operations through Enhanced En-Route Trajectories	1		3
300	Aeronautical Information Management	B0-DATM	Service Improvement through Digital Aeronautical Information Management	1	1	1
310	Meteorological Information	B0-AMET	Meteorological information supporting enhanced operational efficiency and safety	2		2
320	ATM Managers' Performance	-	-			2
330	ATC simulators performance	-	-			2
340	Safety assessment of changes	-	-			2
350	ATM Operators' performance	-	-			2
360	Civil Military use of SUA	B0-FRTO	Improved Operations through Enhanced En-Route Trajectories	1	1	1
370	Strategic Civil Military coordination	-	-		1	1
380	Tactical Civil Military coordination	-	-		1	1
390	Civil Military system integration	-	-			2
400	Civil Military Nav aids joint provision	-	-			2
410	Civil Military common training	-	-			2
420	Civil Military common procedures	-	-			2

The allocation of priority was based on factors including its importance in promoting Seamless ATM (Priority 1 = critical upgrade, Priority 2 = recommended upgrade, Priority 3 = may not be universally implemented). Source: Asia/Pacific Seamless ATM Plan V1.0.