



International Civil Aviation Organization

**The First Meeting of the APANPIRG ATM Sub-Group
(ATM /SG/1)**

Bangkok, Thailand, 20 – 24 May 2013

Agenda Item 4: ATM Systems (Modernisation, Seamless ATM, CNS, ATFM)

PROPOSALS AND COMMENTS FOR THE DRAFT SEAMLESS ATM PLAN

(Presented by Singapore)

SUMMARY

This paper presents the good progress the Asia Pacific region has made in the development of the Asia Pacific Seamless ATM Plan under the ambit of the Asia Pacific Seamless ATM Planning Group (APSAPG). The collaboration among States to provide inputs and comments is critical to ensuring the robust development of the Plan. Singapore's contribution in the collaboration process proposed that further enhancement to Plan to put focus on module beyond Block 0. Five key areas are recommended which aims to ensure that the plan will be robust and future oriented.

This paper relates to –

Strategic Objectives:

- A: *Safety – Enhance global civil aviation safety*
- 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*

Global Plan Initiatives:

- GPI-1 Flexible use of airspace
- 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-11 RNP and RNAV SIDs and STARs
- GPI-12 Functional integration of ground systems with airborne systems
- GPI-16 Decision support systems and alerting systems
- GPI-19 Meteorological Systems

1. INTRODUCTION

1.1 Members of the Asia Pacific Seamless ATM Planning Group (APSAPG) have met three times over the last few months and made significant progress in the development of the Asia Pacific Seamless ATM Plan (“Plan”). Notwithstanding the limited number of meetings, the APSAPG is largely an open forum and has provided States the opportunity to collaborate and provide valuable inputs, and to set the direction towards achieving seamless ATM in this region and inter-regionally. Such openness has contributed to the Plan development thus far and should be continued to ensure widespread buy-in.

1.2 Singapore participates actively in the APSAPG and has provided comments and inputs to the development of the Plan. Singapore has also reviewed the latest draft version of Plan (Version 0.8b) and provided our latest proposals and comments to the ICAO Regional Office. The Plan is expected to be further discussed at the upcoming fourth and final meeting of the APSAPG in Hong Kong, China from 3-7 June 2013, and shortly after to be finalised before submission for APANPIRG's endorsement. Nonetheless, it is imperative that the necessary elements critical to the success of seamless ATM should not be left out in the first version without due consideration.

1.3 Following the endorsement of the Plan, it can be expected that APANPIRG and its main contributory bodies will follow through its implementation. Barring any major re-organisation, the Air Traffic Management Sub Group of APANPIRG will be one of the main work groups to carry out Seamless ATM implementation. As such, we see the value in highlighting some of our inputs deemed to be important and should be incorporated in the Plan.

2. DISCUSSION

2.1 APANPIRG/23 had discussed and agreed on the need for the region to take a long term view to plan and carry out any work necessary to support the modules beyond Block 0. This includes major efforts to define concepts and discover new knowledge, and invent solution that are unique to the Asia Pacific Region. The Plan development has thus far been future oriented and for good reasons – setting a direction for the region involves establishing a vision of what future ATM applications would be desirable that would uplift the current capability level and enhance ATM efficiency region-wide. As a good start, several references have also been made to some of the ASBU 1, 2 and 3 modules. Singapore is of the view that there is potential for such ASBU Modules' inclusion to be further reinforced to enhance the robustness of the Plan.

2.2 One of the key sections of the Plan to support future ASBU modules is the Research and Future Development Possibilities (Section 8). This is an important aspect of the Plan that will ensure that development of technologies and operational solutions will be relevant and applicable in our Region. Singapore has proposed for the Plan to elaborate further on Section 8. **Please see Annex A.** Holding a longer term view towards seamless ATM, Singapore has also identified five key areas which we view are the critical building blocks not only for the region but also inter-regionally:

- i. Performance Based Navigation (PBN);
- ii. Air Traffic Flow Management (ATFM);
- iii. Widespread Surveillance through Automatic Dependent Surveillance – Broadcast (ADS-B);
- iv. System-Wide Information Management / Information Management (SWIM/IM);
and
- v. Integration of MET into ATM.

2.3 These key areas can serve as tracks on which future developments should be based on to ensure continual pursuance of Seamless ATM beyond ASBU Block 0 and ultimately, global interoperability. The five key areas proposed are also consistent with the Seamless ATM Principles, as agreed at APANPIRG/23. The followings shall elaborate the essence of each of the five areas and its relevance to Seamless ATM:

- i. Performance Based Navigation (PBN)

New navigation specifications, especially Advanced RNP, will be significantly valuable for future planning in the Asia Pacific Region, where benefits could accrue. There is a need to focus on the range of navigation specification that will determine the scope of the future PBN implementing rules. We see that the

potential benefits are significant, given the MTF routes in this region. We also see the potential for Research and Development in this area to introduce future navigation capability improvements in an optimal and coherent way, through defined navigation performance requirements and functionalities to ensure regional interoperability

ii. Air Traffic Flow Management (ATFM)

Air traffic flow and capacity management has become a vital part of air traffic management to be considered in a wider perspective. The ATFM system will aid ATM services in exploiting the full capacity of air transport system, without infringing upon safety caused by overload situations. There is a need for a potential research to develop an ATFM concept, based on CDM, that could be implemented at a regional or sub-regional level in Asia Pacific region. Recognizing this need, Hong Kong, China, Singapore and Thailand have collaborated to develop an ATFM concept to manage air traffic demand efficiently at times where capacity reducing events occur

iii. Widespread Surveillance through Automatic Dependent Surveillance – Broadcast (ADS-B)

Surveillance continues to be an essential enabler to Seamless ATM Surveillance techniques, such as ADS-B provides a robust foundation for future capability, while delivering tangible benefits today. ADS-B will be used as a key enabling technology for the future ATM system which is based on the Trajectory Concept and Collaborative ATM. The future air traffic environment will require increased use of aircraft-derived surveillance information for the implementation of a seamless automated ATFM system. There is a need for research and development to embrace the future mode of aircraft operations with emerging new surveillance techniques

iv. System-Wide Information Management / Information Management (SWIM/IM)

An increasingly important factor that should be considered is the provision and management of relevant, sufficient, timely, accurate and quality assured information to support ATM. As air traffic operation get increasingly more complex, the need for ATM enabling data support and integration will be more evident. The shift toward collaborative ATM requires useful, timely ATM-related information to all relevant stakeholders, riding on the advances in information communication technologies and concepts. It will improve shared situational awareness, information exchange and coordination amongst all ATM stakeholders. At the moment, there is no agreed ways and means to exchange information among stakeholders, including ANSPs. Also there is no standard technology prescribed for the task. As such, there is possibility for research to develop a data sharing concept to enhance the overall ATM efficiency.

v. Integration of MET into ATM.

As the future ATM system evolves, accurate and timely MET information that is fully integrated in the system is seen as key for ATM management. MET must be considered to be an integral element in the development of a new strategy for ATM. Having accurate and extensive weather information for ATM operation is vital to support future operation concepts as well as to provide better situational awareness for the airspace users. Research and development in this area can look

into how MET information can be exchanged between all stakeholders to enhance operations and safety, and also how to integrate the information into the ATM system

2.4 It should be noted that the proposed changes to Section 8 of the Plan looks beyond ASBU Block 0 and call for the necessary next steps towards seamless ATM in this region. Rather than introducing changes incrementally over reviews, it will be beneficial that such systemic improvements should be looked at right the onset to help establish a roadmap (**Figure 6**) that will embrace future ATM concepts necessary to support seamless ATM.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) consider incorporating the proposed changes to the Section 8 of the Seamless ATM Plan if not already done so;
- b) provide comments on **Attachment A** as necessary; and
- c) discuss any relevant matters as appropriate.

.....

Attachment A

RESEARCH AND FUTURE DEVELOPMENT POSSIBILITIES

Need for Research and Development

8.1 To develop the tools required to meet foreseeable long-term needs, there is an imperative need for States to undertake and co-operate on ATM Research and Development (R&D). This include major efforts to define concepts and discover new knowledge and invent new solutions to future ATM challenges that are unique to our Region and ensuring that these new concepts that come forward are selected and applied in a timely manner. Such efforts could be forged through collaborative partnership between, States, ANSPs, International Organizations, institute of higher learning and specialised technical agencies to develop ATM solutions. This concept is consistent with Seamless ATM Principle 36 (Inter-regional cooperation ('clustering') for the research, development and implementation of ATM projects).

8.2 Such need had been reinforced at APANPIRG/23 which had discussed and agreed on the need for the region to take a long term view to plan and carry out any work necessary to support the modules beyond Block 0. The advent of new navigational technologies has brought about advances in aircraft navigation. With the end goal of a globally interoperable ATM system in mind, the region will have to consider planning for a long term supporting concept and infrastructure. States must not overlook the need to include the development of future ATM concepts that will ensure the safety and fluidity of air transportation over the next few decades. The following areas are possible tracks on which the region should consider for future developments in order to continue pursuance of seamless ATM beyond ASBU Block 0 implementations and global interoperability.

Possible Areas for Research and Development

8.3 The following five areas are key enablers to transform regional ATM systems into higher capability levels and that require regional cooperation. They could also serve as references for ATM upgrade tracks that can be readily associated with appropriate ASBU tracks and modules 1 to 3:

- a) **Optimal use of appropriate PBN specification (PBN).** The future ATM will rely on PBN for its proven ability to maximize satellite navigation with modern aircraft capabilities. The result will be enhanced safety, increased capacity and maximized fuel efficiency. The optimal use of appropriate PBN specification is a key enabler to progress Seamless ATM in this region. PBN lays the foundation for the airspace system for years to come as future navigation developments such as four-dimensional (4D) user prefer trajectories evolve. This is consistent with Seamless ATM Principle 29 (*The encouragement of appropriate technologies that support Trajectory-Based Operations*)
- b) **Information Management to enable advanced ATM management (SWIM).** As discussed in AN-Conf/12, an increasingly important factor that should be considered is the provision and management of relevant, sufficient, timely, accurate and quality assured information to support ATM. As a start, States agreed that there should be a global system wide management (SWIM) concept to be developed to enable future ATM applications. A general trend has been observed in traffic coordination amongst States/ANSPs, that is the shift towards collaborative air traffic

management. In this regard, SWIM provides a means to increase the availability of useful, timely ATM related information to all relevant stakeholders, riding on the advances in information communication technologies and concepts. SWIM is central to building the future ATM system that the region requires to tackle the challenges of the rising air traffic movements. This concept is consistent with Seamless ATM Principle 30 (*Early implementation of AIM, including cooperative development of aeronautical databases and SWIM to support interoperable operations*). Possible research areas included looking into a regional SWIM architecture to support ATM information sharing and management.

- c) **Air Traffic Flow Management.** Amidst the strong air traffic growth in the Asia Pacific Region, there is an urgent need for airports operators and ANSPs to manage the demand against the capacity of airports and ATM systems. ATFM is one of the solutions to ensure a sustainable air traffic growth for the future. Inter-linked and networked ATFM nodes between ANSPs should be developed to serve various sub-regions. This concept is consistent with Seamless ATM Principle 8 (*Sub-regional ATFM based on system-wide CDM serving the busiest terminal airspace and MTF*). Such ATFM nodes could exist and a virtual entity, composed of a number of operational positions and automated systems located in several different physical locations, including different States. While virtual entities could be a solution to overcome political barriers in terms of all involved States having a role, the concept would need to be supported by robust communications and contingency arrangements.
- d) **Surveillance coverage through collaborative information sharing for safety and efficiency (ADS-B).** The ability of ATM system to support safe and efficient operations is critically dependent upon implementing a high performance, reliable and cost-effective surveillance infrastructure. To improve safety, capacity and efficiency, there is a need to implement new ATM techniques which will require support from an improved surveillance system. ADS-B technology is an initial step in creating a more flexible air transportation system that will create seamless surveillance and shared situational awareness picture for both ground and air operations. Analysis is continuing as to whether space-based ATS surveillance systems would be technologically and economically possible. If these space-based ATS surveillance systems came to fruition, then they could represent a game-changing technology in terms of eliminating the need for ADS-C, as long as the commensurate capability for VHF was provided. The 12th Air Navigation Conference endorsed Recommendation 1/9 regarding space-based ADS-B systems being included in the GANP (**Appendix 2**).
- e) **Integration of MET into ATM to enable advanced ATM applications.** Having accurate and extensive weather information for ATM operation is vital to support future operation concepts as well as to provide better situational awareness for the airspace users. Nevertheless, there is a gap in consolidating and translating current weather information into useful tools to support ATM operations. Research could potentially look into high fidelity weather models to provide meaningful data to ATM operations and decision support tools. It is also important to ensure the compatibility of such models with the aircraft to provide common situation awareness between the air and the ground.

Possible Asia/Pacific ATM Research concept

8.4 **Figure 6** presents a possible Asia/Pacific ATM research concept. This scenario is one of many possible permutations, and was entirely dependent on agreement by parties concerned, given the changing circumstances and drivers in the future. Thus the concept should not be taken as an agreed plan or vision until that time.

