

INTERNATIONAL CIVIL AVIATION ORGANIZATION



**REPORT OF THE COMBINED SEVENTH MEETING OF THE ATM SUB-GROUP
OF APANPIRG (ATM/SG/7) AND
THE FOURTH MEETING OF THE ADVANCED INTER-REGIONAL ATS ROUTE
DEVELOPMENT TASK FORCE (AIRARD TF/4)**

BANGKOK, THAILAND, 05 – 09 AUGUST 2019

The views expressed in this Report should be taken as those of the Meeting and not the Organization.

Approved by the Meeting
and published by the ICAO Asia and Pacific Office, Bangkok

ATM/SG/7
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INTRODUCTION

Meeting

1.1 The Seventh Meeting of the Air Traffic Management Sub-Group (ATM/SG/7) of the Asia Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) was held from 05 – 09 August 2019 at the Kotiate Wing of the ICAO Asia and Pacific Regional Office, Bangkok, Thailand.

1.2 The Fourth Meeting of the Advanced Inter-Regional Air Traffic Services Route Development Task Force (AIRARD/TF/4) was held as part of the combined meeting with the ATM/SG/7 from 05 – 07 August 2019 at the Kotiate Wing of the ICAO Asia and Pacific Regional Office, Bangkok, Thailand.

Attendance

2.1 The combined meetings were attended by 135 participants from 34 States, two Special Administrative Regions of China and eight International and ATM-related organizations, including Afghanistan, Armenia, Australia, Bangladesh, Bhutan, Cambodia, China, Hong Kong China, Macao China, Fiji, France (New Caledonia), India, Indonesia, Islamic Republic of Iran (I.R. Iran), Japan, Kiribati, Lao People's Democratic Republic (PDR), Malaysia, Mongolia, Myanmar, Nepal, New Zealand, Pakistan, Papua New Guinea, Philippines, Qatar, Republic of Korea (ROK), Singapore, Sri Lanka, Tajikistan, Thailand, Tonga, Ukraine, United Arab Emirates (UAE), United States of America (USA), Viet Nam, CANSO, EUROCONTROL, IATA, ICCAIA, IFALPA, Jeppesen, MID Regional Monitoring Agency (RMA), SITA, and ICAO.

2.2 A list of participants is provided at **Appendix A** to this Report.

Officer and Secretariat

3.1 Mr. Kuah Kong Beng, Director (Special Project) Singapore Air Navigation Services Group, Civil Aviation Authority of Singapore presided over the ATM/SG portions of the meeting throughout its duration as Sub-Group Chairman.

3.2 Mr. Ahmad Kaveh Firouz, Deputy Director of Tehran Area Control Centre (ACC), I. R. Iran, presided over the AIRARD/TF portions of the meeting as the AIRARD/TF Co-Chair.

3.3 Mr. Len Wicks, Regional Officer Air Traffic Management (ATM)/Search and Rescue (SAR), ICAO Asia and Pacific Office, was the Secretary for the combined meetings. He was assisted by Mr. Shane Sumner, Regional Officer, ATM/Aeronautical Information Management (AIM), Mr. Chew Han Chee, Associate ATM Officer, Mr. Erdenebaatar Davaasuren, Associate ATM/AIM Officer, and Ms. Zhou Ying, Associate ATM/AIM Officer, Mr. Hiroyuki Takata, Mr. Mior Addli Bin Mior Sallehhuddin and Mr. Mr. Yan Yonggang, Regional Officers, ATM ICAO Asia and Pacific Regional Sub-Office and Ms. Prakayphet Chalayonnawin, Programme Analysis Associate, ATM.

Language and Documentation

4.1 The ATM Sub-Group met as a plenary throughout the meeting. The working language of the meeting was English for all documentation and this Report. A total of 42 Working Papers (WPs), 15 Information Papers (IPs), six flimsies and 11 presentations were considered by the meeting. The list of working and information papers is attached at **Appendix B** to this report (IP01).

Opening of the Meeting

Chairman of the ATM Subgroup

5.1 Mr. Kuah Kong Beng welcomed participants to the meeting.

ICAO Regional Office

5.2 Mr. Arun Mishra, Regional Director of the ICAO Asia and Pacific Office, welcomed all the participants to the meeting.

Draft Conclusions, Draft Decisions and Decisions of ATM/SG – Definition

6.1 The ATM Sub-Group recorded its actions in the form of Draft Conclusions, Draft Decisions and Decisions within the following definitions:

- a) **Draft Conclusions** of the ATM/SG relate to matters that are not just of a purely technical or operational nature, which need to be considered by APANPIRG;
- b) **Conclusions** of the ATM/SG relate to matters of a purely technical or operational nature, which APANPIRG had delegated authority to ATM/SG to act upon;
- c) **Draft Decisions** relate solely to matters dealing with the internal working arrangements of the ATM/SG, which need to be considered by APANPIRG; and
- d) **Decisions** of the ATM/SG that relate solely to matters dealing with the internal working arrangements of the ATM/SG, which APANPIRG had delegated authority to ATM/SG to act upon.

List of Draft Conclusions and Decisions

7.1 List of ATM/SG/7 Draft Conclusions

Draft Conclusion ATM/SG/7-1: Asia/Pacific Seamless ANS Plan		
What:	That, given the urgency and priority of Air Navigation Service (ANS) planning and modernization, and the lack of progress in implementing the Aviation System Block Upgrade (ASBU) Block 0, Asia/Pacific States are urged to: (1) review Version 3.0 of the Asia/Pacific Seamless ANS Plan appended as Appendix C to the Report ; and (2) consider utilising the Asia/Pacific Seamless ANS Plan to develop a National Air Navigation Plan (NANP) after considering the NANP Template at Appendix D to the Report , to enable timely implementation of applicable Seamless ANS elements.	Expected impact: ☒ Political / Global ☐ Inter-regional ☒ Economic ☒ Environmental ☒ Ops/Technical
Why:	To incorporate changes from the GANP and regional requirements, and to ensure more effective use of NANPs.	Follow-up: ☒ Required from States
When:	6-Nov-18	Status: Draft to be adopted by PIRG
Who:	☐ Sub groups ☒ APAC States ☐ ICAO APAC RO ☐ ICAO HQ ☐ Other:	

Draft Conclusion ATM/SG/7-2: ICAO HQ Support for Regional ANS Implementation		
What: That, ICAO HQ is invited to: (1) given the greatly increased number and complexity of Aviation System Block Upgrade (ASBU) elements in the draft 6th Edition of the Global Aviation Navigation Plan (GANP), the redefinition of ASBU Block 0 elements that were expected to be completed by 2019, and the need for more detailed and comprehensive guidance provided on the ASBU Portal for each element than is currently provided, consider: (i) the consequences for States of different capabilities to ensure that the No Country Left Behind (NCLB) policy is fully considered; and (ii) the extra resources, tools and training required to enable States to be able to understand, review, determine priorities and costs/benefits, and implement the applicable ASBU elements; and (2) ensure that the redevelopment of the Regional Air Navigation Plan Volume III templates allow the Asia/Pacific Seamless Air Navigation Service (ANS) Plan to be fully incorporated into Vol. III without amendment; and (3) ensure an urgent upgrade of the electronic regional ANS Monitoring and Reporting Scheme to: (i) allow States to electronically submit data related to the Seamless ANS Plan and its subsidiary plans; and (ii) ensure the ICAO Regional Office can amend online elements, metrics and priorities, consistent with APANPIRG endorsements.		Expected impact: ☒ Political / Global ☒ Inter-regional ☒ Economic ☐ Environmental ☒ Ops/Technical
Why: The 6th Edition of the GANP as proposed significantly increases the complexity and technological focus, even of Block 0 elements, which may widen the gap between developed and less developed States. This may require an increase in resources for ICAO HQ implementation programmes, Regional Offices, and less developed States. The redevelopment of the Vol. III template must support the regional plan already endorsed by APANPIRG. The current inflexible Seamless ATM Monitoring and Reporting Scheme is not able to manage GANP or Seamless ATM Plan changes so it will be invalidated in November 2019, and the subsidiary regional plans use a different manual reporting process that is not connected to iSTARS.	Follow-up: ☐ Required from States	
When: 6-Nov-19	Status: Draft to be adopted by PIRG	
Who: ☐ Sub groups ☐ APAC States ☐ ICAO APAC RO ☒ ICAO HQ ☐ Other:		

Draft Conclusion ATM/SG/7-3: Asia-Pacific ATM Performance Measurement Framework			
What: That, States are urged to consider: 1. analysing the Asia/Pacific ATM Performance Measurement Framework (ATM PFM) at Appendix E to the Report; 2. tailoring the ATM/PFM according to their own conditions, as appropriate; 3. promoting the ATM PFM through encouraging the stakeholders to initiate their own performance measurement practice; 4. when time and condition permit, publish a report, supporting the initiative to conduct a trial of the first phase for the initial performance measurement work; and 5. the means by which to guide the stakeholders to perform analysis and manage improvement internally, for example, develop a comprehensive information demonstration platform for performance measurement to gather data, display outcomes with computerised support tools and technology documents as appropriate.	Expected impact: ☒ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical		
Why: To facilitate ATM performance measurement work in order to achieve the Seamless ATM and regional ATFM goals in the Asia/Pacific Region, to promote improved operational performance.	Follow-up: ☒ Required from States		
When: 6-Nov-19	Status: Draft to be adopted by PIRG		
Who: ☐ Sub groups ☒ APAC States ☒ ICAO APAC RO ☐ ICAO HQ ☐ Other:			

Draft Conclusion ATM/SG/7-8: Recovery of Lost Revenue due to Airspace Closure			
What: That, concerned States are urged to carefully consider enacting any ANS pricing changes aimed at recovering revenue lost during the 2019 Pakistan airspace closure. Should any States be considering such a move the meeting urges those States to enter into full and transparent consultations with airspace users and their representative bodies in accordance with ICAO Doc 9082 prior to any decisions being made.	Expected impact: ☒ Political / Global ☐ Inter-regional ☒ Economic ☐ Environmental ☐ Ops/Technical		
Why: Airlines have already incurred extra unbudgeted costs conservatively estimated to be in excess of USD400,000 per day (a cumulative amount in excess of USD55 million as of mid-July) and should not be penalized twice for the same causal event.	Follow-up: ☒ Required from States		
When: 6-Nov-19	Status: Draft to be adopted by PIRG		
Who: ☐ Sub groups ☒ APAC States ☒ ICAO APAC RO ☐ ICAO HQ ☐ Other:			

Draft Conclusion ATM/SG/7-12: Ballistic Launch and Space Re-Entry Notification and Response			
What:		That, States are urged to:	
1. Comply with Asia/Pacific Seamless ANS Plan provisions for advance notification of ballistic launch and space re-entry activities;		Expected impact:	
2. Ensure that, in addition to the coordination specified in Annex 11, and in the Asia/Pacific Seamless ANS Plan, all notifications for ballistic launch and space re-entry are addressed to:		☒ Political / Global	
a) the ATC Centres in Charge of all affected Flight Information Regions; and		☐ Inter-regional	
b) the International NOTAM Office of all affected Flight Information Regions; and		☐ Economic	
3. Ensure that NOTAMs are promulgated and tactical coordination undertaken for the management of affected airspace and traffic, immediately on receipt of notification from another State, and on receipt of any notification of changes or cancellation.		☐ Environmental	
		☒ Ops/Technical	
Why:		To ensure a fully informed and coordinated ATM operational response to rocket launch and space re-entry activities in accordance with Annex 11 and the Asia/Pacific Seamless ATM Plan.	
		Follow-up:	
		☒ Required from States	
When:		6-Nov-19	
		Status:	
		Draft to be adopted by PIRG	
Who:		☐ Sub groups ☒ APAC States ☒ ICAO APAC RO ☐ ICAO HQ ☐ Other:	

7.2 List of Conclusions

Conclusion ATM/SG/7-5: ATS Message Reception and Handling	
What: Noting that incorrect flight plan addressing requirements published by States in AIP ENR 1.11 contribute to the non-reception of flight plans and associated ATS messages, and that simple technology solutions are readily available to permit redistribution of messages to all necessary internal units and organizations, States are urged to: 1. ensure that, in accordance with PANS-ATM 11.4.2.2.2 all FPL and associated ATS messages that are addressed in accordance with PANS-ATM to the centre in charge of each FIR along the route and the destination aerodrome control tower, are correctly received and redistributed to all necessary ATS units by the receiving State; 2. note that, as specified in PANS-ATM 11.2.1.2.3.3, the correct address for the centre in charge of the FIR is [FIR location indicator] ZQZX, and other indicators shall not be used for the addressing of ATS messages; 3. remove flight plan addressing requirements that do not comply with the above PANS-ATM provisions from AIP ENR 1.11; and 4. ensure that all three letter designators used in addresses are registered in ICAO Doc 8585. Note: this does not preclude the redistribution of messages to units such as ATFM as appropriate within the State.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical

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Why: To reduce the proliferation of flight plan addressing requirements published in AIP that are not compliant with PANS-ATM, in reduce the number of FPL, DEP and associated ATS messages that are not received by all necessary ATS units.	Follow-up: ☒ Required from States
When: 9-Aug-19	Status: Adopted by Subgroup
Who: ☐ Sub groups ☒ APAC States ☒ ICAO APAC RO ☐ ICAO HQ ☐ Other:	

Conclusion ATM/SG/7-6: ATM Emergency and Contingency Response Planning

What: That, Asia/Pacific States are urged to ensure through regulatory oversight mechanisms that all operational positions at ATS units have ready access to information to respond to emergency and contingency situations.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: Noting an inconsistent approach to the material available to Asia/Pacific ATS operational personnel, to strengthen preparedness and capability for a timely response to emergency and contingency situations.	Follow-up: ☒ Required from States
When: 9-Aug-19	Status: Adopted by Subgroup
Who: ☐ Sub groups ☒ APAC States ☐ ICAO APAC RO ☐ ICAO HQ ☐ Other:	

Conclusion ATM/SG/7-7: Amendment to the Regional ATM Contingency Plan

What: That: 1. The Proposal for Amendment at Appendix G to the Report be incorporated in the Regional ATM Contingency Plan; and 2. States ensure their contingency plans include the new elements of the Plan.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: To include in the Regional ATM Contingency Plan, and State ATM contingency planning, elements arising from lessons learned in recent contingency events in the Asia/Pacific Region.	Follow-up: ☒ Required from States
When: 9-Aug-19	Status: Adopted by Subgroup
Who: ☐ Sub groups ☒ APAC States ☒ ICAO APAC RO ☐ ICAO HQ ☐ Other:	

Conclusion ATM/SG/7-9: Regional Guidance for the Regulation and Safe Operation of UAS within National Airspace		
What:	That, the <i>Asia/Pacific Regional Guidance for the Regulation and Safe Operation of UAS within National Airspace</i> at Appendix H to the Report be adopted, and uploaded to the ICAO Asia/Pacific Regional Office eDocuments web-page.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why:	To provide regulatory guidance for the integration in the National Airspace of UAS operations that are outside the scope of the ICAO RPAS Panel.	Follow-up: ☒ Required from States
When:	9-Aug-19	Status: Adopted by Subgroup
Who:	☐ Sub groups ☒ APAC States ☒ ICAO APAC RO ☐ ICAO HQ ☐ Other:	

Conclusion ATM/SG/7-11: Standardized Aeronautical Information		
What:	That, noting: 1. previous APANPIRG Conclusions 23/8, 24/19 and 28/7, and ATM/SG Conclusion 6/14; 2. lack of conformance of many States with the provisions of Annex 15 and PANS-AIM on the presentation and promulgation of aeronautical information; and 3. the safety-critical requirement for standardized presentation and content of aeronautical information; States are urged to immediately take all necessary steps to fully review all aeronautical information products and rectify errors and omissions, to ensure full compliance with the provisions of Annex 15 Chapter 5 and PANS-AIM Chapter 5.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why:	To rectify errors in content and presentation of aeronautical information.	Follow-up: ☒ Required from States
When:	9-Aug-19	Status: Adopted by Subgroup
Who:	☐ Sub groups ☒ APAC States ☐ ICAO APAC RO ☐ ICAO HQ ☐ Other:	

Conclusion ATM/SG/7-13: NOTAM Format for FUA Operations		
What:	That, 1. States are urged to use the NOTAM templates provided in Appendix I to the Report for promulgation of Flexible Use of Airspace information; and 2. The Flexible Use of Airspace NOTAM Templates be uploaded to the Asia/Pacific Regional Office eDocuments web-page, and included in the next update of the Asia/Pacific Region Operating Procedures for Aeronautical Dynamic Data.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why:	To provide a standardized format of NOTAM for FUA operations for the Asia/Pacific Region.	Follow-up: ☒ Required from States

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When:	9-Aug-19	Status:	Adopted by Subgroup
Who:	☐ Sub groups ☒ APAC States ☒ ICAO APAC RO ☐ ICAO HQ ☐ Other:		

Conclusion ATM/SG/7-14: Format for Multi-Part NOTAMs

What:	That, States are urged to ensure that all multi-part NOTAMs, including multi-part NOTAM checklist NOTAMs, conform with the format described in the ICAO Guidance Manual for AIS in the Asia/Pacific Region.		Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why:	To ensure that multi-part NOTAMS are presented in the correct format for automated NOTAM processing	Follow-up:	☒ Required from States
When:	9-Aug-19	Status:	Adopted by Subgroup
Who:	☐ Sub groups ☒ APAC States ☒ ICAO APAC RO ☐ ICAO HQ ☐ Other:		

Conclusion ATM/SG/7-15: Aeronautical Data Catalogue

What:	That, States are urged to: 1. utilize the Asia/Pacific Region AIM Information Sharing Website at http://aim-tracking.org/ to share information and experience of the use of the Aeronautical Data Catalogue; and 2. participate in a Data Catalogue workshop activity, to be conducted in conjunction with the AAITF/15 meeting in 2020.		Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why:	Develop Regional understanding and capability, and to improve coordination between data originators and AIS, by using the data catalogue	Follow-up:	☒ Required from States
When:	9-Aug-19	Status:	Adopted by Subgroup
Who:	☐ Sub groups ☒ APAC States ☒ ICAO APAC RO ☐ ICAO HQ ☐ Other:		

Conclusion ATM/SG/7-16: Amendment to the Regional Plan for Collaborative AIM			
What: That, 1. the Amendment to the Regional Plan for Collaborative AIM at Appendix J to the Report be adopted, and the amended Plan be posted on the ICAO Asia/Pacific Regional Office eDocuments web-page; 2. the revised Regional AIM Implementation Status Reporting Form (Appendix D to the Regional Plan for Collaborative AIM) be separately uploaded to the Regional Office eDocuments web-page for implementation reporting by Asia/Pacific Administrations: a) immediately on adoption of this Conclusion; and then; b) annually, by not later than 30 April each year; and 3. Asia/Pacific Regional reporting against the transition steps in the ICAO Roadmap for Transition from AIS to AIM be discontinued, and the AIM Transition Table be removed from the Regional Office eDocuments web-page. <i>Note: This Draft Conclusion supersedes Conclusions APANPIRG 22/2 and APANPIRG/25-15</i>	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical		
Why: To consolidate regional AIM performance expectations and implementation status reporting, and removing the need for monitoring regional performance and reporting implementation of the steps of the Roadmap for Transition from AIS to AIM.	Follow-up: ☒ Required from States		
When: 9-Aug-19	Status: Adopted by Subgroup		
Who: ☐ Sub groups ☒ APAC States ☒ ICAO APAC RO ☐ ICAO HQ ☐ Other:			

Conclusion ATM/SG/7-17: Preparation for GADSS ADT Phase			
What: That, due to the impending implementation of the Autonomous Distress Tracking (ADT) phase of the Global Aviation Distress and Safety System (GADSS) on 01 January 2021, States are urged to: 1) note the basic briefing material at Appendix K to the Report; 2) consider forming a national group of stakeholders that may be affected by ADT, including regulators, airlines, Air Navigation Service Providers (ANSPs), Search and Rescue (SAR) service providers; 3) consider the early development of procedures for ANSP and SAR operational personnel, including coordination with adjacent States; and 4) consider the requirement for briefing material and training (including simulations) for operational staff.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical		
Why: To ensure that key stakeholders are aware of, and prepared for the ADT changes.	Follow-up: ☒ Required from States		
When: 9-Aug-19	Status: Adopted by Subgroup		
Who: ☐ Sub groups ☒ APAC States ☒ ICAO APAC RO ☐ ICAO HQ ☐ Other:			

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Conclusion ATM/SG/7-18: Asia/Pacific SAR Plan Update		
What:	That, the Asia/Pacific SAR Plan be amended as Version 3.0 in accordance with Appendix L to the Report .	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why:	To incorporate changes in the Global Aeronautical Distress and Safety System (GADSS) and the Global Air Navigation Plan, as well as improvements to the SAR Plan itself.	Follow-up: ☐ Required from States
When:	9-Aug-19	Status: Adopted by Subgroup
Who:	☐ Sub groups ☐ APAC States ☒ ICAO APAC RO ☐ ICAO HQ ☐ Other:	

7.3 List of ATM/SG/7 Draft Decisions

Draft Decision ATM/SG/7-4: Amend ATFM/SG Terms of Reference		
What:	That, in the event that APANPIRG/30 dissolves the APA-CDM/TF and agrees to transfer responsibility for ongoing A-CDM activities to ATFM/SG, the amended ATFM/SG Terms of Reference at Attachment B be adopted.	Expected impact: ☒ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why:	To bring any ongoing or residual activities in the field of A-CDM, which is a component of ATFM, into the work programme of ATFM/SG	Follow-up: ☐ Required from States
When:	6-Nov-19	Status: Draft to be adopted by PIRG
Who:	☐ Sub groups ☐ APAC States ☒ ICAO APAC RO ☐ ICAO HQ ☐ Other:	

Draft Decision ATM/SG/7-10: Dissolution of the APUAS/TF		
What:	That, noting that the APUAS/TF has met its objective, and any residual tasks have been reassigned to the Secretariat, the APUAS/TF be dissolved.	Expected impact: ☒ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why:	APUAS/TF has completed the task assigned by APANPIRG, in accordance with its Terms of Reference.	Follow-up: ☐ Required from States
When:	6-Nov-19	Status: Draft to be adopted by PIRG
Who:	☐ Sub groups ☐ APAC States ☒ ICAO APAC RO ☐ ICAO HQ ☐ Other:	

7.4 List of Decisions: Nil.

REPORT ON AGENDA ITEMS

Agenda Item 1: Adoption of Provisional Agenda

1.1 The Provisional Agenda (WP01) was adopted by the meeting, which noted the Tentative Order of Discussion (OOD), and the List of Tentative Working and Information Papers (IP01).

Agenda Item 2: Review of Related High Level Meetings

APANPIRG Outcomes (WP02)

2.1 The meeting was informed of relevant outcomes from the Twenty Ninth Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/29, Bangkok, Thailand, 03 – 05 September 2018).

2.2 The meeting noted the outcomes of the Asia Pacific Ministerial Conference on Civil Aviation. The *Beijing Declaration* had committed Ministers to implement the APANPIRG-endorsed *Asia/Pacific Seamless ATM Plan* by 2022, with the following elements selected as a priority:

- Aeronautical Information Management (AIM);
- Performance-based Navigation (PBN);
- common ground/ground telecommunication infrastructure;
- civil/military cooperation;
- ATS surveillance, including Automatic Dependent Surveillance-Broadcast (ADS-B);
- Air Traffic Flow Management/Collaborative Decision Making (ATFM/CDM);
- National Air Navigation Plans;
- Aeronautical Search and Rescue (SAR); and
- Meteorological Services for International Air Navigation (MET).

2.3 In preparing for the next Ministerial Conference on Civil Aviation, tentatively scheduled for 2020, the meeting noted that each of the ANS priority areas still presented a challenge to many States, so the progress report to the ministers may not show a positive result. States were therefore urged to take note and use a whole-of-government approach in coordination with ministries in order to ensure appropriate progress may be reported in 2020.

RASG and APRAST Meeting Outcomes (WP03)

2.4 The meeting was briefed on relevant outcomes from the Eighth Meeting of the Regional Aviation Safety Group – Asia and Pacific Regions (RASG/8, Bangkok, Thailand, 06 – 07 September 2018), and the Thirteenth and Fourteenth Meetings of the Asia Pacific Regional Aviation Safety Team (APRAST/13, Bangkok, Thailand, from 03 – 07 December 2018 and APRAST/14, Bangkok, Thailand, 27 – 31 May 2019).

2.5 The meeting noted the development of a Regional Aviation Safety Plan (RASP) for the 2020-22 timeframe and the request for ATM experts to volunteer to develop a performance-based safety oversight manual to oversee Air Navigation Service Providers (ANSPs).

Conference of Directors General of Civil Aviation Outcomes (WP04)

2.6 WP04 described relevant outcomes from the Fifty-Fifth Conference of Directors General of Civil Aviation, Asia and Pacific Regions (DGCA/55, Denarau Island, Nadi, Fiji, 22 – 26 October 2018), including the adoption of the Beijing Declaration on Civil Aviation.

Pacific Islands Forum Airspace Policy (IP02)

2.7 Kiribati provided updated information from the Pacific Islands Forum (PIF, Nauru, 03 – 06 September 2018) and the associated meeting of the Small Island States concerning the forum’s policy on airspace in the Pacific. IP02 also provided information on the discussion related to the Pacific Upper Airspace that was proposed to be held during the Fortieth of the ICAO Assembly (Montreal, Canada, 24 September – 07 October 2019).

2.8 Kiribati noted that discussions on rearrangement of the Pacific Upper Airspace had been ongoing at least since 1993 and almost all reports had recommended some form of reorganisation of the airspace to both achieve greater efficiency in airspace management consistent with ICAO policies and the recognition of sovereign airspace.

Agenda Item 3: Performance Frameworks and Metrics

FIT-Asia and RASMAG Outcomes (WP05)

3.1 The ATM/SG/7 meeting reviewed relevant major outcomes from the Ninth Meeting of the Future Air Navigation Services (FANS) Interoperability Team – Asia (FIT-Asia/9, Makassar, Indonesia 01 – 05 July 2019) and the Twenty-Fourth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/24, 09 – 12 July 2019 at Bangkok, Thailand).

Central Reporting Agency Reports

3.2 The FIT-Asia Central Reporting Agency (CRA) had analysed 45 Problem Reports (PRs) raised between July 2018 and June 2019. Among recurrent problems reported were aircraft systems receiving, acknowledging then discarding messages (‘Ack’n’toss’), up-linking of UM175 message resulting in aircraft downlink error message (PANS-ATM recommended against the use of UM175), continuing poor performance of High Frequency Data Link (HFDL), and delayed or withheld authorization from aircraft operators for CRA to access data link logs.

3.3 The CRA had also presented options potentially available to aircraft operators to improve data link performance. RASMAG/24 had agreed to the following Conclusion, drafted by FIT-Asia/9:

Conclusion RASMAG/24-1: Guidance for Data Link Performance Improvement for Aircraft Operators

That, the Guidance for Data Link Performance Improvement for Aircraft Operators at RASMAG/24 WP/3 Attachment A be uploaded to the Asia/Pacific Regional Office website.

PBCS Developments and Implementation

3.4 IATA had informed FIT-Asia/9 that the majority of yet-to-be certified Performance-Based Communications and Surveillance (PBCS)-capable aircraft were expected to be certified within the next 12 to 18 months. ANSPs could seek further information on particular aircraft or airlines could contact the IATA Regional Director for Safety and Flight Operations – Asia-Pacific (cowlesb@iata.org).

3.5 Since FIT-Asia/8, only six APAC Administrations had submitted completed PBCS Implementation Survey Forms, which were expected to be submitted annually, by no later than 30 April each year (**Conclusion RASMAG/23-1: PBCS Compliance**). The Secretariat reminded the meeting of the need for emphasis on the establishment of regulatory oversight and operational approval processes for PBCS for aircraft operators. The ICAO Regional Office would continue to monitor regional implementation, and raise APANPIRG Air Navigation Deficiencies or take other action as necessary in cases where States did not comply with the relevant ICAO PBCS provisions.

3.6 The FIT-Asia/9 meeting had noted that, unchanged from FIT-Asia/8, States that may have implemented, or intended to implement, performance-based separations in high seas airspace without the necessary supporting procedural means of implementation in ICAO Doc 7030 Regional Supplementary Procedures included India, Indonesia, Maldives, Myanmar, Philippines and Sri Lanka.

Review of ADS-CPDLC Operations and Performance – Aggregated Regional Data

3.7 During the two most recent 6-months report periods: the 95% criteria were met for RSP 180 for the Asia-Pacific FIRs, and for RCP 240, except for the Ho Chi Minh FIR, for which aggregated data was reported for 12 months. The 99.9% criteria were met for RSP 180 at the level of 99.0% for the aggregate for the Asia-Pacific FIRs except for the Chennai FIR, which was marginally below the target. The Actual Surveillance Performance (ASP) for the Chennai FIR, and the Actual Communications Performance (ACP) for the Lanzhou, Urumqi and Ho Chi Minh FIRs were notably lower than the other Asia-Pacific FIRs. Further investigation may have been needed to determine the reason for the difference, which could include: differences in the interpretation and/or application of the analysis methodology in Appendix D of the PBCS Manual, differences in the coverage areas of the satellites and VHF stations, differences in the fleets operating in the airspace.

3.8 Commendable improvement in problem reporting by Australia, Indonesia, Philippines and Sri Lanka had been noted by FIT-Asia/9. Conversely, the implausibly low numbers of problems reported by some other administrations indicated that further work was required to ensure all problems were recorded and forwarded to the CRA for analysis. ICAO would undertake further examination of cases where only one PR was submitted, and consider different criteria for Air Navigation Deficiencies at future FIT-Asia meetings.

General Discussion of Performance Monitoring, Analysis and Reporting

3.9 FIT-Asia/9 noted that, while many FIT-Asia Administrations had made considerable improvements to their performance monitoring processes, few had advanced to the desired level of continuous monitoring, analysis and improvement of data link performance. In seeking clarification of the meaning of the term ‘continuous’, the meeting was informed that this was intended to mean that data link performance should be continuously monitored, and analysed each month, on a rolling three-month basis, with a view to identifying poor performance and/or problems for local rectification, and reporting to CRA and RMA for rectification action where the problem was not within the local control of the ANSP.

3.10 The meeting also noted that few FIT-Asia Administrations had been providing in their performance reports any narrative information on efforts made to determine the causes of poor performance, action taken to rectify poor performance, and the results of that action. RASMAG/24 had agreed to the following Conclusion:

Conclusion RASMAG/24-2: Continuous Data Link Performance Monitoring

That, States providing ADS-C and CPDLC services are urged to undertake the following actions, in accordance with ICAO Docs 9689 – PBCS Manual and 10037 Gold Manual and the Asia/Pacific PBCS Action List for ANSPs:

- *Continuously monitor data link performance;*

- Conduct monthly data link performance analyses on a rolling three-month basis, and report problems and significantly poor performance to the CRA and RMA in accordance with the Asia/Pacific PBCS Action List for ANSPs;
- Take steps to identify any local cause of poor performance identified in each monthly analysis;
- Compile monthly performance report data in reporting periods from January to June and July to December each year;
- Provide the compiled performance report data to the State responsible for the compilation and analysis of Regional aggregated data;
- Include narrative information on efforts made to determine the causes of poor performance, action taken to rectify poor performance, and the results of that action, in annual performance monitoring analysis reports to FIT-Asia; and
- Make airframe and fleet performance data available on request to all Administrations for regulatory oversight purposes.

3.11 The United States had provided an overview of the role of Regional Monitoring Agencies (RMAs) in the Performance-Based Communications and Surveillance (PBCS) monitoring programme. This meeting was provided with modified forms and templates developed to accommodate data collection necessary to support PBCS-related tasks and a recommended approach to documenting the role of monitoring agency support to the monitoring program and development of guidance material. The meeting noted the following Conclusion: **Conclusion RASMAG/24-5: Verification of RCP and RSP Capabilities Filed in the Flight Plan.**

Regional Safety Monitoring Assessment

3.12 ICAO provided a regional safety monitoring assessment summary. **Figure 1** illustrates the state of Asia/Pacific Reduced Vertical Separation Minimum (RVSM) TLS compliance, as reported to RASMAG/24:

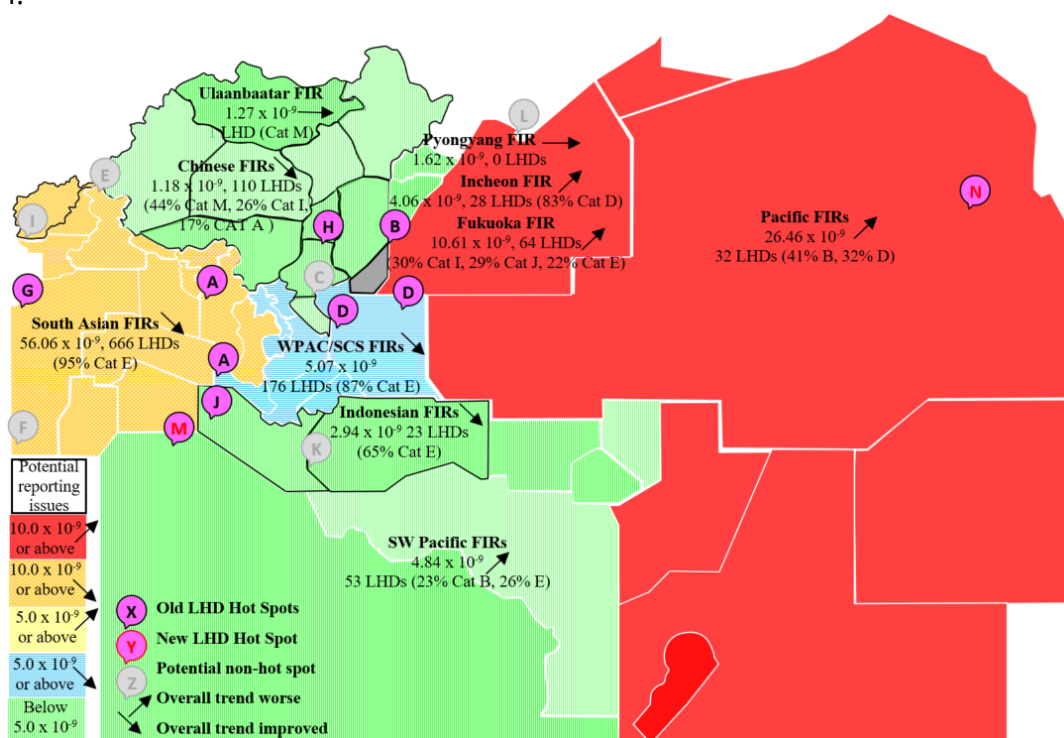


Figure 1: Asia/Pacific RVSM TLS compliance reported to RASMAG/24

ATM/SG/7
Report on Agenda Items

3.13 The meeting noted that over the past five years (2014 – 2018), the performance of Asia/Pacific in compliance with the TLS for RVSM had been poor overall, averaging 37% when measured by the grouped FIRs (18 FIRs or 37% for 2018). In addition, of the 18 FIRs that had achieved TLS, 11 FIRs had potential reporting issues (discussed later in this paper), and five were operating just under the TLS, with an upward trend. Therefore, measures taken to improve adherence to the TLS in the past five years may have yielded localised improvements, but overall had failed to produce a positive result for the Asia/Pacific Region (APAC) as a whole.

3.14 **Table 1** was noted by the meeting as a summary of the Large Height Deviation (LHD) Hot Spots that had been analysed by RASMAG/24.

Hot Spot	Involved FIRs	Identified	Remarks
A1	Kolkata/Dhaka – Yangon;	2015	LHDs increased, risk bearing
A2	Chennai – Kuala Lumpur	2015	LHDs reduced
B	Incheon	2015	AKARA Corridor
C	Hong Kong – Guangzhou	2015	Potential non-hot spot
D	Manila – all adjacent FIRs	2015	Increase of LHDs to Fukuoka
E	Lahore – Urumqi	2015	Potential non-hot spot
F	Mogadishu – Mumbai	2015	Potential non-hot spot
G	Sana’a/Muscat – Mumbai	2015	LHDs increasing (Cat. E)
H	Guangzhou – Wuhan	2015	Hong Kong/Sanya reduction
I	Karachi – Kabul	2018	Potential non-hot spot
J	Jakarta – Singapore/Kota Kinabalu	2018	Minor, Cat. E LHDs
K	Jakarta – Ujung Pandang	2018	Potential non-hot spot
L	Fukuoka – Khabarovsk	2018	Potential non-hot spot
M	Colombo - Melbourne	2019	New; Cat. A, B and E LHDs
N	Oakland USA – Hawaii CEP	2019	New; Cat. A, B and D LHDs

Table 1: Comparison Summary of LHD Hot Spots

South Asian/Indian Ocean

3.15 The meeting had noted that concerted efforts by the States concerned had reduced the number of LHDs reducing from 73 in 2016 to 52 in 2017, partially due to implementation of ATS Inter-facility Datalink Communications (AIDC) between Chennai and Kuala Lumpur Area Control Centres (ACCs). In 2018, the Monitoring Agency for the Asian Region (MAAR) observed a decreasing trend, and most risks had been mitigated to zero.

3.16 However, in the West Indian Ocean the risk at the Mogadishu/Mumbai FIR interface had significantly increased from nine LHDs reported at position ORLID in 2016 to 20 reports in 2017. In 2018 there had been 24 reports at ORLID, so there had been no improvement at the interface with the ICAO African (AFI) Region. The Regional Officer ATM, ICAO Eastern and Southern African Office stated that a Tactical Action Group would be meeting in the next two weeks to conduct a coordination meeting focused on the Horn of Africa, and these matters would be discussed then.

3.17 The meeting also noted that the Muscat/Sana’a/Mumbai FIR interface (ASPOX-RASKI) the number of LHDs identified by MAAR had increased for the second year in a row from 35 in 2016 to 103 in 2017, and 107 risk-bearing LHDs were reported by Mumbai FIR in 2018. This had resulted in 69% of the area’s total operational risk. A number of trans-regional meetings had been organised to address these issues, including a Special Coordination Meeting (SCM) with the ICAO Middle East (MID) Region during the ATM Subgroup (Hong Kong, China, 30 July – 03 August 2018) Region.

3.18 MAAR had advised that although Afghanistan used to report many LHDs at GADER several years ago, no LHD reports were received from Afghanistan during 2018.

3.19 In summary, the meeting noted that the estimated vertical risk for the South Asia/Indian Ocean area had reduced substantially from 62.4×10^{-9} to **56.06×10^{-9}** . However, this was still by far the highest risk level the Asia/Pacific Region, and additional urgent actions should be undertaken to address the risks, especially focussed on the minimisation of Category E LHDs.

Southeast Asia

3.20 The Western Pacific/South China Sea (WPAC/SCS) area overall risk estimation was described as reducing from 9.4×10^{-9} in 2017 to be just above TLS at **5.07×10^{-9}** in December 2018.

3.21 The Manila FIR interface with the Ujung Pandang, Singapore, Ho Chi Minh, Hong Kong and Fukuoka FIRs had remained problematic, with 96 LHDs reported in 2016, 62 in 2017, and more than 80 in 2018. In April 2018, MAAR, CAAP, and CAAS delegates had held a dedicated workshop in Manila in order to identify contributing factors of LHDs on the Manila FIR's interfaces. Contributing factors identified included procedures, human factors, equipment and other factors.

3.22 MAAR had observed a significant decrease in risk between the Manila-Singapore boundary and this interface was a candidate for being a non-Hot Spot. The main improvement that was expected to reduce LHDs was the new Manila ACC ATM system (TopSky-ATC). The transition to the new system took place in mid-November 2018. Therefore, an improvement was expected in 2019.

3.23 Although the Hot Spot at the interface between the Jakarta FIR and the Ujung Pandang FIRs had an increase of 34 in 2017 that was attributed to an improved reporting environment, in 2018 there had been a major reduction to only three reports. AAMA had noted that this reduction is potentially due to actions taken by the Indonesian ANSP to address safety issues, including refresher training for supervisors and the establishment of a safety awareness workshop. However, it could also be due to reporting issues that had been previously noted.

East Asia

3.24 The Ulaanbaatar and Pyongyang FIRs had reportedly met the TLS. However, in the case of Mongolia the meeting noted that there were potential reporting issues.

3.25 The Incheon FIR had also reportedly met the TLS at **4.06×10^{-9}** ; however, the portion of the Incheon FIR known as the FUKUE – AKARA Corridor had failed to meet the TLS at **55.1×10^{-9}** , due to the extreme sensitivity of this airspace to any deviation, and a number of LHDs being reported in 2018 (refer to RASMAG/24/WP11).

3.26 Recalling PARMO's FUKUE-AKARA Corridor safety assessment, China stressed that ICAO HQ had established the FUKUE-AKARA Corridor TWG to study the safety and airspace optimization. China stated that it was willing to find suitable solutions with ICAO HQ, Japan and Republic of Korea to solve the corresponding problems and concerns of all stakeholders. Japan also noted that it was participating to improve safety. IATA confirmed its view that the FUKUE – AKARA Corridor situation was unacceptable, and appreciated the efforts of RASMAG and the three TWG States to work towards resolution.

3.27 The Fukuoka FIR had indicated an increased risk from 9.2×10^{-9} in 2016 to 9.6×10^{-9} in 2017, and to **10.61×10^{-9}** in 2018, although much of this risk had originated from the Manila FIR. Of significance was the continued incidence of turbulence-related Category I LHDs southwest, south, east and northeast of Japan, which numbered 19 in total.

3.28 Chinese FIRs had reportedly experienced a major reduction in estimated risk, from 28.0×10^{-9} in 2017 to **1.18×10^{-9}** in December 2018. The number of Category M (Other) LHDs were similar to the 48 in 2018, while the number of LHDs overall had decreased from 134 to 110.

3.29 RASMAG had previously noted that China RMA had embarked on an extensive education programme to provide an improved reporting environment. However, RASMAG/24 had noted that there were still indications of reporting issues in terms of the almost complete absence of ATC error reports (only three of 110 LHD reports had been attributed to ATC errors).

Pacific

3.30 The Central and South Pacific areas reportedly did not achieve the TLS, with a major increase in estimated risk from 5.7×10^{-9} in 2017 to **26.46×10^{-9}** in December 2018. The Category B events (Flight crew climbing or descending without ATC clearance) with 13 reports in total, and Category D (ATC system loop error) with seven reports in total, especially in the Central East Pacific (CEP) area between Continental USA and Hawaii, had contributed to the increased risk.

3.31 ATC phraseology, compliance with the datalink procedures in Doc. 10037 and aircrew not complying with conditional clearances had been determined to be root causes for the reported category A and B LHDs. The meeting noted that there were also four long duration Category E LHDs of 104 minutes representing 30% of the time spent at an incorrect level, two of which occurred in the northern Auckland Oceanic FIR. One case was caused by the incorrect delivery of an ATC clearance by an HF radio operator.

Non-RVSM Approved Aircraft

3.32 **Table 2** compared the number of non-RVSM airframes reported by each RMA:

Report	AAMA	China RMA	JASMA	MAAR	PARMO	Total
RASMAG/24	5	0	3	30	0	38

Table 2: Trend of Non-RVSM Airframes Observed by Asia/Pacific RMAs

Regional Horizontal TLS Compliance

3.33 All the Asia/Pacific EMAs had reported horizontal risk assessments that met the TLS of 5.0×10^{-9} .

Safety Reporting

3.34 Analysis had indicated that both Mongolia and Indonesia had a very low rate of reported LHDs per hour, more than triple that of developed nations with high technology, which was an indication of issues with the reporting culture. Conversely, South Asia's extremely large number of LHDs had resulted in a very high level of LHDs per hour more than 25 times that of developed nations.

3.35 It was noteworthy that MAAR had reported a significant number of LHDs over continental Indian airspace – a tripling of reports from 2018, presumably as a result of India's efforts to enhance the reporting culture in India. MAAR had noted the increase in LHD reported within South Asian FIRs, mostly along FIR boundaries and that in most cases, ATCO report LHDs only when they are affected by mistakes made by ATCO in their neighbouring FIRs. However, in 2018, the MAAR started to receive LHD reports which occurred inside an FIR. India and other South Asian States are urged to continue this effort. MAAR also confirmed a lack of LHD reports during 2018 from Afghanistan, which had reported regularly during 2017.

3.36 **Figure 2** provided an overview of the proportion of Category E (ATC – ATC Transfer Errors) over the period 2016 – 2018.

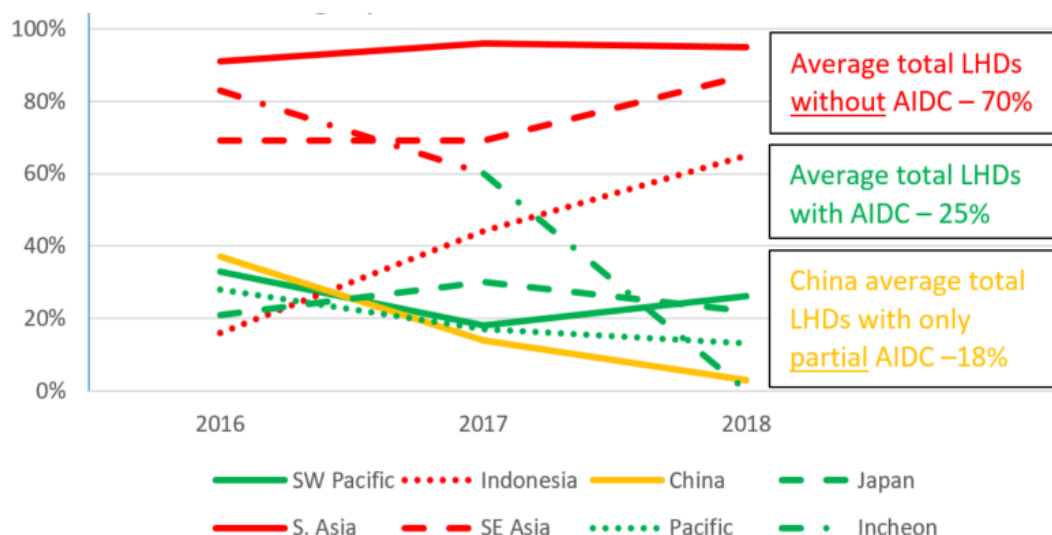


Figure 2: Comparison of Category E LHDs, 2016 - 2018

3.37 The meeting noted that **Figure 2** indicated a strong relationship between those ANSPs that had implemented AIDC, with an average of 25% of Category E LHDs. There was also a good relationship between those ANSPs that had not implemented AIDC, which averaged 70%. This data quantified the major improvement in safety that resulted from the use of AIDC to reduce human error.

3.38 The RASMAG/24 analysis also indicated a possible safety reporting issue within Chinese airspace, with a low number of Category E LHDs being reported averaging 18%, considering China had only partially implemented AIDC, and dropping to an implausibly low 3% during 2018. Noting China RMA's past work to increase improve reporting culture that resulted in a steep increase in reports, China was urged to consider steps to further strengthen its 'Just Culture' policies and effective implementation of those policies to support open reporting of safety occurrences.

3.39 China stated that it had established a very comprehensive reporting system that could collect relevant reports from both controllers and pilots, and a system of integrity has also been established by CAAC. At the same time, China stated that it had also established a non-punitive voluntary reporting system, and organized annual meetings of relevant parties to conduct research and discussion on related issues.

3.40 China emphasized that the implementation of AIDC would help to reduce ATC workload and human errors in addition to reducing LHDs, and all parties would benefit from it. China noted that AIDC needed to be implemented after collaboration with neighboring States, so it was not a unilateral decision.

3.41 RASMAG/24 had also noted the inconsistency of LHDs being reported to MAAR and those being reported by Indonesia. AAMA had reported only a few LHDs on the northern boundary of Indonesian airspace during 2018. However, in the same period MAAR had reported numerous LHDs on the same boundary (Singapore and Malaysian airspace).

3.42 The UAE apprised the ATM/SG/7 meeting of the benefits of its the special reporting system, which was the backbone of safety management. Indonesia and Mongolia both advised that they would follow up with an analysis of their safety reporting.

3.43 RASMAG/24 had noted that it was always difficult to compare reporting rates between States. However, the methods used to analyse the data had successfully highlighted poor reporting in the past, and after action by States the reporting had changed dramatically. In 2018's analysis, the data indicated that India had partly improved its reporting, while there were probable reporting issues indicated in Afghanistan, China, Indonesia and Mongolia.

Airspace Safety Side Meeting

3.44 Bangladesh, India, I. R. Iran, Myanmar, Pakistan, MAAR (by telephone), MID RMA and the Regional ATM Officers from the APAC and ESAF Offices conducted a side meeting to discuss airspace safety issues related to the South Asian/Indian Ocean airspace.

3.45 The meeting was informed that there continued to be a high level of LHDs emanating from the Muscat FIR into adjacent FIR and in particular the Mumbai FIR. India informed the meeting that they had visited Oman recently and there were technical problems with the Oman automation AIDC system (version 3.0), which was provided by Indra. India's AIDC was reportedly working well with Chennai. India stated that a bilateral agreement for AIDC was initiated between India and Oman on 18 July 2019 month to start a one month trial. In addition, there had been discussions on potential surveillance data sharing, with plans to install an ADS-B sensor on an oil rig off the coast of Oman.

3.46 The meeting discussed the need for operational measures to minimise LHDs in addition to the technical solution of AIDC. The MID RMA advised that they had issued a Safety Protocol in February 2018 to Oman but this had not yielded a solution.

3.47 The meeting suggested that the MID CNS Officer should be requested to address this with Oman. The meeting also requested a joint State Letter from the ICAO APAC and MID Offices to be sent to Oman to request that they prioritise the necessary corrective action. Pakistan was willing to connect its AIDC with Oman in the short term.

3.48 It was noted that there were still LHDs being reported on the Mogadishu – Sana'a – Mumbai interface. The Regional Officer ATM ESAF stated that there was a planned meeting in Nairobi, Kenya from 20 – 21 August 2019 that would address the safety issues in the Horn of Africa.

3.49 The meeting discussed airspace safety issues related to the traffic flow between Bangladesh – India – Myanmar. While there were no major issues between Bangladesh and its neighbours, there had been concerns between the Kolkata and Yangon FIRs. These were mainly caused by the poor performance of the communications, which also carried the AIDC data (active since February 2019), and the only backup was by public telephone lines (IDD). It was reported that the line was partly an undersea cable which was unreliable and often cut for months. This had led controllers passing up to ten aircraft estimates at the same time, whenever the communications was working.

3.50 The meeting noted that a reliable alternative communications system was necessary, and that Very Small Aperture Terminal (VSAT) should be considered, such as the AFI Nafisat system.

Development of TSD Application to Support TLS Data Collection and Assessment (IP03)

3.51 Indonesia discussed issues concerning the provision of providing Traffic Sample Data (TSD) December each year to support the safety assessment of RVSM by the RMA. Indonesia had developed a software application so that data collection could be extracted and managed more effectively and efficiently to produce more valid analysis.

Seamless ATM Reporting and Monitoring Update (WP06, PR07)

3.52 WP06 presented the status of the Seamless ATM reporting, reflecting the implementation progress of air navigation improvements in the Region against the objectives set out in the *Asia/Pacific Seamless ATM Plan V2.0*. The paper also provided information on the State reporting rate on the ICAO Seamless ATM Reporting Portal (accessible through the ICAO Secure Portal).

3.53 The meeting noted that States had been urged by APANPIRG/27 to give higher priority at CAA and Air Navigation Service Provider (ANSP) levels and to mobilize human and financial resources to complete the implementation of Phase 1 objectives by November 2019 (commencement of Phase II).

3.54 Notwithstanding this, Phase 1 was far from being implemented, and even the ten priority regional targets planned for Phase I had not yet been achieved. Moreover, the meeting noted that in 2019, States were expected to start implementing Phase II elements, which was aligned with the Global Air Navigation Plan (GANP) Aviation System Block Upgrade (ASBU) Block 1.

3.55 ICAO stressed that the significant gap noted between the expected and actual achievement (**Figure 3**) represented a major failure by most States to conduct whole-of government planning and to execute such plans (note: the IATA 2013 analysis determined that a ‘worst case’ scenario of non-implementation would represent a regional potential economic benefit loss of US\$16.63 billion per annum (based on 2012 data), which would reach an accumulated loss of US\$ 502 billion by 2030).

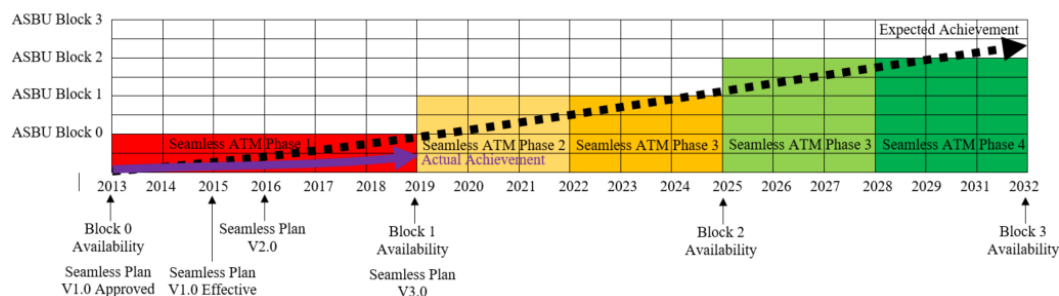


Figure 3: Gap between Planned and Actual Seamless ATM Implementation

3.56 An initial analysis of the ASBU elements, which indicated the draft priority. This matrix was analysed to include all ASBU Block 1 elements into the *Asia/Pacific Seamless Air Navigation Service Plan* (renamed from the *Asia/Pacific Seamless ATM Plan*).

3.57 The meeting reviewed Version 2.5 of the proposed *Asia/Pacific Seamless ANS Plan*, which had been developed as a result of consultation with States and International Organisations in the past year. States were requested to submit any final comments on specific edits to the ICAO Secretariat before 09 August 2019, prior to the Fifty-Sixth Conference of Asia and Pacific Directors of Civil Aviation (DGCA/56).

3.58 Given that the overall implementation progress of Seamless ATM/Block 0 elements had been poor, the *Asia/Pacific Seamless ANS Plan* V3.0 proposed to place greater emphasis on ‘robust’ status National Air Navigation Plans (NANPs) developed by a whole-of-government approach. The meeting also noted the proposed priorities for APANPIRG’s consideration incorporated within the *Asia/Pacific Seamless ANS Plan* V3.0. ICAO emphasised that States would assess whether Seamless elements were applicable or not as part of their NANP process, and clarified that the ‘robust’ status was dependent on whether the NANP – in whatever format the State determined – included the expected NANP Basic Planning Elements (BPEs).

3.59 China expressed support for the *Asia/Pacific Seamless ATM Plan* in the Asia/Pacific Region. China recommended that the Regional Office invite all Asia/Pacific States to evaluate and analyse barriers related to the implementation of ASBU and the *Seamless ATM Plan* and to make necessary adjustments according to the new version of the *Seamless ANS Plan*. China commented on paragraph 2.3 of Stakeholder Consultation from the National Air Navigation Plan Template, noting that it normally took a long time to get consensus agreements and signatures from relevant stakeholders, which would most likely prolong the process of national ANP implementation. ICAO stated that the Template was just an example, so States did not need to enact each suggested provision.

3.60 China, Hong Kong China and Thailand enquired about the possible update of the global vision after the 40th Assembly, and foresaw that the region would update with the global vision. ICAO clarified that the 6th Edition had already been approved by the Council, and the Assembly would not be amending it as had been the case in the past. Moreover, it was noted that as an organic document, States and International Organizations could make proposals to change the GANP at any time between Assemblies.

3.61 China and India requested to clarify some points related to the development of NANPs and the potential for APANPIRG Deficiencies if State planning was not of ‘robust’ status. ICAO stated that the expectation – as in the revised PfA that had been circulated – was that States that had reached 90% or more would not receive a Deficiency, but those that did not reach this requirement may be considered for such, on a case-by-case base.

3.62 An example given was that only the SAR field was being considered for Deficiencies in 2019 as this benchmark had already been agreed by States at the APSAR/WG/2 in 2016, but that other fields were not being considered in 2019. ICAO agreed to delete this reference (9.12) in version 2.6 of the draft *Asia/Pacific Seamless ANS Plan* (**Appendix C**).

3.63 ICAO also noted that the draft still needed some minor updates from certain States where this was shown in the draft, before draft version 3.0 could be completed for APANPIRG’s consideration. The United States stated that the draft was a good plan that provided guidance for the region to manage the changes from the 6th Edition.

3.64 The ATM/SG/7 discussed the draft Asia/Pacific ANS Plan. After considerable discussion during plenary, and follow-up with China, the following Draft Conclusion was agreed, for APANPIRG/30’s consideration:

Draft Conclusion ATM/SG/7-1: Asia/Pacific Seamless ANS Plan

That, given the urgency and priority of Air Navigation Service (ANS) planning and modernization, and the lack of progress in implementing the Aviation System Block Upgrade (ASBU) Block 0, Asia/Pacific States are urged to:

- (1) review Version 3.0 of the Asia/Pacific Seamless ANS Plan appended as **Appendix C to the Report**; and
- (2) consider utilising the Asia/Pacific Seamless ANS Plan to develop a National Air Navigation Plan (NANP) after considering the NANP Template at **Appendix D to the Report**, to enable timely implementation of applicable Seamless ANS elements.

3.65 The meeting noted that there were considerable challenges foreseen with the advent of the proposed 6th Edition of the GANP in terms of its increased complexity and the sheer number of ASBU elements and sub-elements. States were urged by ICAO to consider the issues related to the draft 6th Edition for consideration by their delegations to the 40th ICAO Assembly, including the need to take into account the possible increased costs of research, review and implementation, especially in terms of the No Country Left Behind (NCLB) policy.

3.66 ICAO stressed that plans to redevelop the Regional Air Navigation Plan Volume III template must not act as an impediment to the future incorporation of the *Asia/Pacific Seamless ANS Plan* into Vol. III. ICAO also urged that greater support be provided to update the current inflexible Seamless ATM reporting system, as this would be effectively invalidated by the 6th Edition and it was probable that no reporting would be possible during 2020 as a result.

3.67 Moreover, the meeting noted the need for greater visibility using user-friendly web-based portals not just for the *Asia/Pacific Seamless ANS Plan*’s elements but also the drilled-down safety-critical AIM, SAR, ATM Contingency and ATFM elements of the subsidiary regional plans.

3.68 ATM/SG/7 agreed to the following Draft Conclusion, for APANPIRG/30's consideration:

Draft Conclusion ATM/SG/7-2: ICAO HQ Support for Regional ANS Implementation

That, ICAO HQ is invited to:

(1) given the greatly increased number and complexity of Aviation System Block Upgrade (ASBU) elements in the draft 6th Edition of the Global Aviation Navigation Plan (GANP), the redefinition of ASBU Block 0 elements that were expected to be completed by 2019, and the need for more detailed and comprehensive guidance provided on the ASBU Portal for each element than is currently provided, consider:

(i) the consequences for States of different capabilities to ensure that the No Country Left Behind (NCLB) policy is fully considered; and

(ii) the extra resources, tools and training required to enable States to be able to understand, review, determine priorities and costs/benefits, and implement the applicable ASBU elements; and

(2) ensure that the redevelopment of the Regional Air Navigation Plan Volume III templates allow the Asia/Pacific Seamless Air Navigation Service (ANS) Plan to be fully incorporated into Vol. III without amendment; and

(3) ensure an urgent upgrade of the electronic regional ANS Monitoring and Reporting Scheme to:

(i) allow States to electronically submit data related to the Seamless ANS Plan and its subsidiary plans; and

(ii) ensure the ICAO Regional Office can amend online elements, metrics and priorities, consistent with APANPIRG endorsements.

RAPMFSWG Outcomes (WP07)

3.69 China presented the recent outcomes from the Regional ATM Performance Measurement and Framework Small Working Group (RAPMF/SWG). WP07 described the purpose and utilization of a demonstration ATM operation performance measurement platform and its implementation plan. A draft ATM Performance Measurement Framework (PMF) had been developed, which recommended the use of 10 Key Performance Indicators, including:

- Airport peak arrival capacity;
- Airport peak departure capacity;
- Additional taxi-in time;
- Additional taxi-out time;
- Arrival delay;
- Departure delay;
- Airport arrival throughput;
- Airport departure throughput;
- Flight arrival punctuality; and
- Flight departure punctuality.

3.70 The meeting noted that the RAPMFSWG had met its TOR deliverables, and that individual States would now have the opportunity to use the Performance Measurement Framework to develop their own performance frameworks and KPIs. The meeting was informed that USA was committed to assisting any State that needed guidance or support in this regard. It was also noted that similar efforts were being made by other States and organizations, including CANSO.

3.71 As the task of the RAPMFSWG had been completed, it was proposed that the RAPMFSWG was no longer necessary. The USA and Singapore noted that the output of the RAPMFSWG had reflected the KPIs recommended in the GANP and CANSO documents. They noted that participant-States from both groups were happy to work with individual States to develop their performance frameworks and KPI.

3.72 In response to a statement that the RAPMFSWG was a formal body which should continue to do development work on the performance measurement, the Secretariat reminded the meeting that the SWG was simply a group of participant States that had agreed to perform an ATM/SG task, and that it was not in any sense a formal group.

3.73 China indicated that the performance measurement work was still in the initial stage in the APAC Region, and the ATM/SG/6 considered that there was a need for a working group in the APAC Region to continue to support the performance measurement work of Asia/Pacific States. China also stated out that SMG's TOR had not been fully completed, and the *Asia/Pacific Seamless ATM Plan* would be updated. The Secretariat stated that the RAPMFSWG had completed the assigned task, and its participants were welcome to submit a working paper to ATM/SG/8 if they considered there may be further work for the SWG.

3.74 Noting that there would be minor format and editing by the Secretariat before submission, the meeting agreed to the following Draft Conclusion, for consideration by APANPIRG/30.

Draft Conclusion ATM/SG/7-3: Asia-Pacific ATM Performance Measurement Framework

That, States are urged to consider:

1. analysing the Asia/Pacific ATM Performance Measurement Framework (ATM PFM) at **Appendix E to the Report**;
2. tailoring the ATM/PFM according to their own conditions, as appropriate;
3. promoting the ATM PFM through encouraging the stakeholders to initiate their own performance measurement practice;
4. when time and condition permit, publish a report, supporting the initiative to conduct a trial of the first phase for the initial performance measurement work; and
5. the means by which to guide the stakeholders to perform analysis and manage improvement internally, for example, develop a comprehensive information demonstration platform for performance measurement to gather data, display outcomes with computerised support tools and technology documents as appropriate.

Performance Management in the Asia/Pacific and Beyond (WP08)

3.75 Singapore described the progress of the Performance Benchmarking Work Group (PBWG) involving EUROCONTROL, Japan, Singapore, Thailand and the United States. The PBWG cooperated with the RAPMF/SWG to select Stage 1 Key Performance Indicators (KPIs) for the Asia/Pacific Region. The PBWG had, in coordination with the RAPMF/SWG, benchmarked eight of the 19 KPIs in the draft Sixth Edition of the GANP to determine they were basic KPIs which would require little or no data processing by States to be suitable for States to commence performance measurement (**Table 3**):

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KPI	GANP Reference
Airport peak arrival capacity	KPI09
Airport peak departure capacity	KPI09
Airport arrival throughput	KPI10
Airport departure throughput	KPI10
Additional taxi-in time	KPI13
Additional taxi-out time	KPI02
Flight arrival punctuality	KPI14
Flight departure punctuality	KPI01
Arrival delay	-
Departure delay	-

Table 3: KPIs Recommended by the RAPMF/SWG

3.76 The meeting noted that the remaining two KPIs (arrival delay and departure delay) were derivatives of similar KPIs (flight arrival punctuality and flight departure punctuality) listed in the ICAO GANP, and that the derivative KPIs indicated the severity of the delay in terms of minutes. States were urged to start performance measurement on the 10 KPIs proposed by the RAPMFSWG.

ANS USOAP Update (WP09)

3.77 ICAO provided an update on the implementation status of the ICAO Universal Safety Oversight Audit Programme's (USOAP)'s provisions that assess the eight critical elements (CEs) of a State's safety oversight system. The paper discussed relevant ANS Protocol Question (PQ) status by area and CE, and also noted a Significant Safety Concern (SSC) issued in the ANS area.

3.78 In response to a request for clarification of the meaning of SSC-sensitive PQs, the meeting was informed that detailed information was available in ICAO Docs 9734 – Safety Oversight Manual and 9735 – *USOAP CMA Manual*, and through the *USOAP CMA Online Framework*.

Application of ATC Separation Standards (WP10)

3.79 ICAO presented data on surveyed ATC separation standards that were being applied within the Asia/Pacific Region as compared to the provisions in the *Asia/Pacific Seamless ATM Plan*.

3.80 When improvements to ATS surveillance (and presumably communications) are made, a core principle of the *Asia/Pacific Seamless ATM Plan* was to ensure that the operational benefits are provided to airspace users, to provide some return for the cost of the improvements. However, in many cases, no benefit is provided other than safety monitoring of procedural separations.

3.81 No State in Asia appeared to be applying the proper ATC separation standard based on the provisions of the *Seamless ATM Plan* and ICAO Document 4444 – *PANS ATM*; therefore, the Asian Region as a whole was failing to deliver the service levels new CNS systems were capable of. However, ICAO noted that China was the first State in Asia to reportedly use FIR-wide *PANS ATM* surveillance-based separation standards (equivalent to 5NM).

3.82 China asked why their airspace was portrayed as not yet achieving optimal performance, as China had reported the separation reduction plan to implement ICAO minima in 2018. ICAO acknowledged this achievement, as it was the first Asian APAC State that had reportedly managed to implement this ICAO standard. However, ICAO clarified that optimal performance also depended on China declaring its capability to receive aircraft at the Transfer of Control (TOC) points related to neighbouring countries and region at 10 – 20 NM, dependent on the ATM systems in place in the airspace concerned (noting that States were not penalised for restrictions that adjacent States imposed as this was not taken into account in the assessment).

3.83 **Figure 4** provides an indication as at April 2019 of the efficiency of ATC separations as they were theoretically being applied within Flight Information Regions (FIRs) and at TOC points.

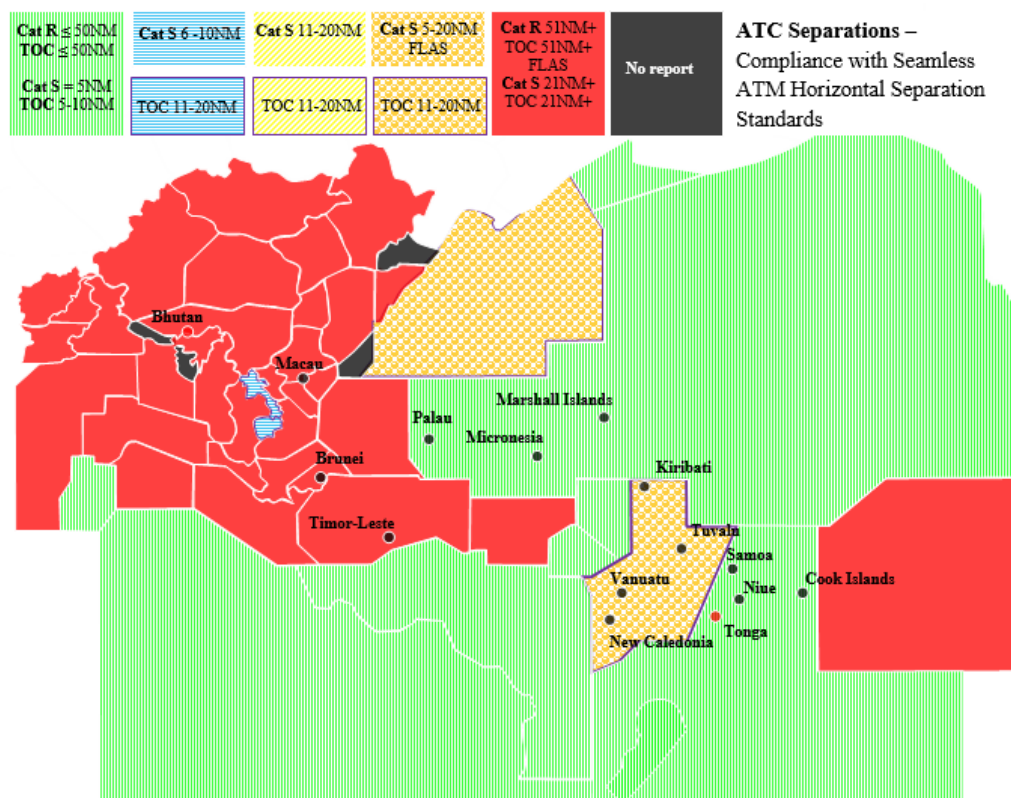


Figure 4: Compliance with Seamless ATM Horizontal Separation Standards

3.84 In particular, ICAO had noted that there were significant weaknesses in many Asian State's application of terminal separations, so this area has now been included in the survey. Very few States appear to be using the standard 3NM terminal airspace separation standard consistently in all surveillance-based ATC sectors. This, and the failure to implement proper Air Traffic Flow Management (ATFM) where necessary, sequencing mechanisms such as Arrival Manager (AMAN) and efficient Standard Terminal Arrival Routes (STARs) and use of runways for departures between arrivals, had meant that many terminal airspace operations were operating well below their actual capability. This had resulted in many gains made enroute with PBN being lost with adverse effects on ATC workload, and significant economic and environmental costs.

3.85 There appeared to be no specific technical reasons why developed States such as Australia, New Zealand and the United States were able to provide more efficient levels of service than States in Asia, using essentially the same CNS/ATM equipment. It would also be inappropriate to suggest that Asian air traffic controllers were not as capable as their counterparts providing services in the Pacific. Therefore, only human decision-making at management level could be responsible for this poor result, indicating a region-wide paradigm shift in organisational culture was necessary.

3.86 As the cost of new CNS/ATM systems were generally not providing a commensurate increase of efficiency in service, States were urged to consider the ramifications of this in terms of safety (regarding ATC workload), efficiency for airlines and environmental consequences. Given the increasing air traffic, Asian States in particular were urged to recognise the problem and establish policies, rules and procedures for ANSPs to greatly improve the benefits from modern CNS/ATM systems, including training for senior managers to recognise the gap between current practice and best practice.

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

Air Traffic Flow Management Steering Group Outcomes WP11

- 4.1 The meeting was informed of the outcomes of the Ninth Meeting of the Air Traffic Flow Management Steering Group (ATFM/SG/9, Bangkok, Thailand, 22 – 26 April 2019)
- 4.2 The ATM Operations Panel (ATMOPSP) had informed ATFM/SG/9 of the work being conducted on defining the distinction between ATFM measures and tactical mitigations of their consequence, and a proposal regarding reasonable advance notice of ATFM measures.
- 4.3 The second meeting of the Middle East Region (MID) Air Navigation Planning and Implementation Regional Group (MIDANPIRG/2, Casablanca, Morocco, 19 to 20 March 2019) had determined that the APAC Regional ATFM Concept of Operations and Framework for Collaborative ATFM would be used as the basis for development of MID Region ATFM Documentation.
- 4.4 The meeting was informed of ATFM/SG/9 discussion of operational analysis and overview of westbound flights transiting the Kabul (Afghanistan) FIR associated with the Bay of Bengal Cooperative ATFM (BOBCAT) system from January 2017 to December 2018. While 66% of flights departed within their Calculated Take-Off Time (CTOT) compliance window, only 42% of those flights entered the Kabul FIR within their Calculated Time Over (CTO) window at the entry point, indicating tactical track-shortening was being applied to BOBCAT-participating flights.
- 4.5 ATFM/SG/9 had also been informed by Thailand of the plan to deploy ATFM measures to manage traffic on ATS route L301, where several traffic flows merged into a 10-minute longitudinal separation and only two flight levels were available due to a Flight Level Allocation Scheme (FLAS). Thailand had stressed that it was not intended that ATFM measures be applied in perpetuity in the absence of action to improve the capacity of L301 for westbound traffic.
- 4.6 Singapore had informed ATFM/SG/9 of ongoing ATFM initiative to mitigate the impact of flow restrictions from downstream Area Control Centres (ACCs) on ATS route M771, to improve predictability and efficiency for flights bound for Shanghai/Pudong that were affected by Minutes-in-Trail (MINIT) ranging from 25 to 240 minutes, regardless of level.
- 4.7 Hong Kong, China provided information to ATFM/SG/9 on the management of traffic transiting the Hong Kong FIR during the inclement weather season. It was noted that Ground Delay Programs (GDPs), while permitting better analysis and equitable distribution of delay, required accurate determination of capacity with sufficient lead time and distribution of measures within agreed timeframes. It was noted that the need for relevant meteorological information sufficiently in advance, and unreliable ATFM Unit (ATFMU) participation by other Administrations, resulted in the need for a hybrid ATFM operation, with GDP only able to serve about 25 to 35% of flights.
- 4.8 The Secretariat had expressed concern that there were other ATFMUs in the APAC Region that had not made reasonable arrangement for the continuation of necessary ATFM functions outside their hours of operation. This did not meet the APAC regional expectations conveyed in the Regional Framework for Collaborative ATFM, or the normal expectation of the aviation community that such services were available on a 24-hour basis.
- 4.9 The meeting was informed of Northeast-Asia Regional ATFM Harmonization Group (NARAHG) development of the first draft of a Concept of Operations (CONOPS), progress on the ATFM Daily Plan (ADP) trial, the paper trial of proposed MINIT for flights to Beijing, analysis of ATFM outcomes arising from restrictions on flights from Republic of Korea to Da Nang, Viet Nam, and ATFM coordination procedure improvement.

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4.10 In response to a query on why there was a different concept being developed in the same Region, the Secretariat had reminded ATFM/SG/9 that the APAC Regional ATFM Concept of Operations, approved by APANPIRG, was the Regional ATFM CONOPS, and that it formed the basis of the APANPIRG-approved Regional Framework for Collaborative ATFM, with which all APAC Administrations were expected to comply. This had been discussed at many meetings of ATFM/SG and ATFM/IR/SWG.

4.11 ATFM Implementation Status Reports, due by April 30 each year, had been received from 23 Administrations. It was noted that a number of APAC Administrations had incorrectly reported against Tier B, for Administrations that were not expected to implement and distribute cross-border ATFM measures.

4.12 In alignment with the methodology applied to assessment of reported implementation status in a number of significant ATM technical fields in the APAC Region, implementation status of each Administration was assessed as *Robust* (90 – 100% implementation), *Marginal* (70 – 89%) or *Incomplete* (0 – 69%).

4.13 Only Singapore and USA were assessed as having *Robust* implementation. China, Japan and Republic of Korea were assessed as having *Marginal* implementation, and the remainder of APAC Administrations were assessed as either – *Incomplete*, *Did Not Report*, or *Incorrect Report*.

4.14 The meeting was informed of the development of the Flight Information Exchange Model (FIXM) Extension that was developed to support cross-border ATFM information exchange and ATFM/Airport Collaborative Decision-Making (A-CDM) integration in the APAC Region. **Table 4** summarized the data attributes currently included in the FIXM version 4.1 Extension.

Estimated	Calculated	Target	Actual
		Target Off Blocks Time (TOBT)	Actual Off Blocks Time (AOBT)
		Target Start Approval Time (TSAT)	
	Calculated Take-Off Time (CTOT)	Target Take-Off Time (TTOT)	
Estimated Time Over (ETO)	Calculated Time Over (CTO)		Actual Time Over (ATO)
Estimated Landing Time (ELDT)	Calculated Landing Time (CLDT)		
Other			
Trajectory		Aircraft Track	
• ETO • CTO • ATO • Flight level or Altitude • Waypoint		• Ground speed • Bearing • Flight level or Altitude • Position (Designator or Latitude/Longitude or Relative Point) • Time over position	

Table 4: FIXM version 4.1 Extension Data Attributes

4.15 The meeting was informed that the Asia/Pacific FIXM 4.1 Extension, initiated by ATFM/SG and developed by the Asia/Pacific System-Wide Information Management Task Force (SWIM/TF), had been reviewed by the FIXM Change Control Board (CCB), and was now posted on the FIXM website at <https://fixm.aero/>.

4.16 The meeting was informed of work completed by the Asia/Pacific A-CDM Task Force (APA-CDM/TF), noting that AOP/SG/3 had endorsed a Draft Decision proposing extension of the Task Force, and that APANPIRG/30 would ultimately decide on the dissolution or continuance of the Task Force. The meeting agreed to the following Draft Decision for consideration by APANPIRG, should it determine that the APA-CDM/TF be dissolved and ongoing A-CDM work conducted by ATFM/SG:

Draft Decision ATM/SG/7-4: Amend ATFM/SG Terms of Reference

That, in the event that APANPIRG/30 dissolves the APA-CDM/TF and agrees to transfer responsibility for ongoing A-CDM activities to ATFM/SG, the amended ATFM/SG Terms of Reference at **Attachment B** be adopted.

4.17 The meeting noted the following ATFM/SG Conclusion, relating to the uploading of working draft guidance material to the ICAO APAC Regional Office eDocuments web-page:

Conclusion ATFM/SG/9-4: Working Draft ATFM Guidance Material

That, the following documents in working draft form be posted to the Asia/Pacific Regional Office eDocuments web-page, pending their inclusion in the 2020 update of the Regional Framework for Collaborative ATFM:

1. *Basic Phrases for Cross-Border GDP Facilitation, at **Appendix G to the Report**; and*
2. *ATFM Post-Operations Analysis Recommended Framework, at **Appendix H to the Report**.*

4.18 ATFM/SG/9 had agreed to **Draft Conclusion ATFM/SG/9-2: AFTN/AMHS-Based Interface Control Document for ATFM**, supporting an Interface Control Document (ICD), developed by the Technical Sub-Group of the Distributed Multi-Nodal ATFM Network project, for distribution of ATFM information via Aeronautical Fixed Telecommunications Network (AFTN)/Aeronautical Message Handling Systems (AMHS), for consideration by the Aeronautical Communications Services Implementation Coordination Group (ACSICG). ACSICG consideration of the Draft Conclusion was separately reported under ATM/SG/7/WP11. A System-Wide Information Management (SWIM)-based ICD, itself based on the operational scenarios used for the APAC FIXM Extension, had been presented to the SWIM TF/3 meeting, and the outcomes were also reported in ATM/SG/7/WP11.

4.19 ATFM/SG/9 had noted that there were operational/technical gaps affecting the interoperability of NARAHG ATFM operations with other ATFM operations that were conducted in accordance with the Regional ATFM Framework, most notably the Distributed Multi-Nodal Network Project. The operational gaps had been discussed by the ATFM/IR/SWG, which had been requested to develop and report on solutions to close the interoperability gap.

4.20 The ATFM/SG meeting briefly discussed the difference in ATFM terminology and related ATFM measures between NARAHG and those provided in the Regional ATFM Framework. It was noted that the 'Boundary Time Over' (BTO) was not an agreed term in either the Regional ATFM Framework or ICAO Doc 9971 *Manual on Collaborative ATFM*, and that it appeared to be CTO re-named.

4.21 ATFM/SG/9, considering a proposal to the Regional Framework for Collaborative ATFM, had agreed to a full review and update of the Framework for consideration by ATFM/SG/10 and ATM/SG/8 in 2020. A Proposal for Amendment (PfA) to ICAO Doc 7030 *Regional Supplementary Procedures* to include procedures necessary for cross-border ATFM would be developed.

ATFM Side Meeting

4.22 A side meeting on the development of a harmonized, trans-regional capability in the future was attended by participants from eight Administrations and three International Organizations including Australia, China, India, Japan, Singapore, Thailand, UAE, USA, EUROCONTROL, IATA, and IFALPA.

4.23 The objectives of the side meeting were, (i) to share the expectation and the vision for the transition from regional ATFM to inter-regional ATFM including data sharing, and (ii) to consider how to move forward.

4.24 The side meeting noted that when considering trans-regional ATFM, many of flights would be long haul and already airborne before ATFM measures were determined or distributed. Thus, data sharing would be one of the keys to get reasonable demand information, including ATFM Daily Plan (ADP) exchange between ATFMUs beyond sub-regional ATFM groups.

4.25 The United States and UAE shared the information how they share the related data with EUROCONTROL as their neighbouring ATFM network. The meeting also noted that India is planning to start cross-border ATFM by the end of this year, and India and UAE would be exploring the sharing of related data in 2021-22. Australia also shared their experience of long range ATFM including CDM process with New Zealand. Japan informed the side meeting that soon they were going to start working together with Hong Kong, China to study cross-border ATFM and to engage with the Distributed Multi Nodal ATFM group.

4.26 The side meeting reaffirmed that airspace capacity increase was the fundamental solution to meet traffic demand and its growth. The benefits of inviting States from the neighbouring ICAO MID and AFI to ATFM/SG and ATFM related workshops in the APAC for further discussion of the trans-regional ATFM were noted. As a conclusion, the side meeting agreed to consider advancing regional engagement in trans-regional ATFM and/or data sharing, and to develop the concept of regional ADP sharing.

PERTI: A CDM Model IP04

4.27 USA provided information on the *Plan, Execute, Review, Train, Improve* (PERTI) process, which provided greater predictability, reliability and repeatability in managing the U.S. airspace system performance and allowed for ATFM pre-planning. The USA proposed that, as regions build ATFM capability, consideration should be given to adopting a CDM model such as PERTI.

Implementation of A-CDM at Kolkata Airport IP05

4.28 India informed the meeting of the process of implementation of A-CDM at Kolkata, describing the various stages and tasks including implementation stages, main challenges, A-CDM phased operations planning, and the proposed integration of ATFM-derived CTOT and other data with A-CDM.

Capacity Enhancement Initiatives in the Hong Kong FIR IP06

4.29 Hong Kong China had developed a strategic ATM plan detailing a roadmap of capacity enhancement initiatives to accommodate projected air traffic growth up to 2025. The information provided highlighted the initiatives that had been implemented, or would be implemented in the foreseeable future, including airspace re-sectorization, implementation of AIDC, and enhancement of distance-based longitudinal spacing with neighbouring ANSPs.

Missing Departure (DEP) Messages WP12

4.30 The meeting was provided with an update on the issue of missing departure (DEP) messages, as had been reported to ATM/SG/6. The meeting was provided with examples (**ATM/SG/6 WP12 Attachment A**) of the many Asia/Pacific Administrations that had specified addressing requirements for flight plans (FPLs) in their Aeronautical Information Publication (AIP) Section ENR 1.11 that were not compliant with the procedures specified in ICAO Doc 4444 Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM). The Secretariat informed the meeting that the specification of non-compliant addressing requirements contributed to the non-receipt of FPL, DEP and other related ATS messages. It was also noted that several addresses specified in AIPs included three-letter designators that the Administrations concerned were not entitled to use.

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4.31 The Secretariat informed the meeting that the practice of coercing airspace users and States to address FPL to non-compliant addresses was entirely unacceptable, and any continuation of this behaviour would be taken up formally with the Council of ICAO.

4.32 Further action would be taken by ICAO to ensure compliance with the provisions of PANS-ATM through direct contact with the Administrations concerned, and through APANPIRG Air Navigation Deficiencies in 2020. In response to a query, the Secretariat informed the meeting that Deficiencies would be considered in cases where non-compliant addresses were published in AIP ENR 1.11 *instead of* addresses compliant with PANS-ATM, rather than the cases where non-compliant were specified in addition to compliant addresses. The meeting agreed to the following Conclusion:

Conclusion ATM/SG/7-5: ATS Message Reception and Handling

Noting that incorrect flight plan addressing requirements published by States in AIP ENR 1.11 contribute to the non-reception of flight plans and associated ATS messages, and that simple technology solutions are readily available to permit redistribution of messages to all necessary internal units and organizations, States are urged to:

1. ensure that, in accordance with PANS-ATM 11.4.2.2.2 all FPL and associated ATS messages that are addressed in accordance with PANS-ATM to the centre in charge of each FIR along the route and the destination aerodrome control tower, are correctly received and redistributed to all necessary ATS units by the receiving State;
2. note that, as specified in PANS-ATM 11.2.1.2.3.3, the correct address for the centre in charge of the FIR is [FIR location indicator] ZQZX, and other indicators shall not be used for the addressing of ATS messages;
3. remove flight plan addressing requirements that do not comply with the above PANS-ATM provisions from AIP ENR 1.11; and 4. ensure that all three letter designators used in addresses are registered in ICAO Doc 8585.

Note: this does not preclude the redistribution of messages to units such as ATFM as appropriate within the State.

4.33 The results of the analysis of a 24-hour data gathering activity conducted on 14 June 2019 by five Asia/Pacific States are provided in **Table 5**:

State	Inbound/Overflight Plans	Missing DEP Messages	%
Australia	404	5	1.2
China	165	155*	93.9
India	1280	418**	29.1
Japan	925	50	5.4
Singapore	1908	64	3.3
Thailand	1641	62	3.7
Total	6476	754	11.6
* China did not identify which FIR/s were sampled, and the data sample was substantially smaller than expected (China departure flights in the data analysis)			
** India provided data for each of its four FIRs. There were 418 cases of DEP not received in one or more of the four FIRs			

Table 5: Summary of Missing DEP Messages per reporting State

4.34 **ATM/SG/7 WP12 Attachments A and B** provided the missing DEP message data for all originating States (all ICAO Regions), and APAC Administrations, respectively, that were responsible for transmission of DEP messages that were not received. Non-APAC administrations featuring prominently in the data included *inter alia* Bahrain, France, Germany, Kuwait, Qatar, Russia, Saudi Arabia, Turkey, UAE, United Kingdom. The UAE informed the meeting that the data sample would be taken back for analysis. China clarified that the data from inbound/overflight flight plans was about 2,990 flights per day, and the proportion of missing DEP messages was about 5.18%.

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4.35 In 2018 ICAO had raised APANPIRG ANS Deficiencies against the following APAC Administrations for non-compliance with the provisions of ICAO Doc. 4444 PANS-ATM 11.4: Bangladesh, India, Indonesia, Malaysia, Myanmar, Philippines, Republic of Korea, USA. Based on the 2019 data analysis, the following deleted, new or unchanged ANS Deficiencies in this field would be proposed to APANPIRG/30:

- Deficiency to be deleted: Indonesia, Myanmar, Philippines, Republic of Korea
- New Deficiency to be proposed: Maldives, Nepal,
- Deficiency to remain in place: Bangladesh, India, Malaysia, USA

4.36 It was noted that few Administrations had achieved 100% of DEP messages correctly transmitted to all relevant FIRs of States participating in the analysis. All Administrations should examine their processes and system configuration in order to improve overall performance.

Information on Missing DEP Messages Follow-Up Action WP13

4.37 Indonesia presented information on the corrective action plan for response to the APANPIRG ANS Deficiency raised for non-compliance with PANS-ATM.

4.38 The Secretariat informed the meeting that, as discussed in ATM/SG/7/WP12, the requirements for addressing FPL promulgated in AIP China were not compliant with PANS-ATM. The meeting also noted that the 2019 analysis of missing DEP messages had resulted in the proposed deletion of the related APANPIRG ANS Deficiency recorded against Indonesia.

Corrective Actions on ANS Deficiency Related to DEP Messages WP14

4.39 The meeting was informed of corrective actions taken by Republic of Korea in relation to the APANPIRG ANS Deficiency raised against non-transmission of DEP messages. The meeting noted that, based on the 2019 data analysis, this deficiency was also proposed for deletion from the Deficiency List at APANPIRG/30.

Strategic Lateral Offset Procedures (SLOP) WP15

4.40 The Secretariat presented the principles and guidelines of the Strategic Lateral Offset Procedures (SLOP), citing Annex 2 *Rules of the Air* section 3.6.2.1.1., Circular 331 Strategic Lateral Offset Procedures, and PANS-ATM section 16.5.

4.41 ICAO Headquarters had advised that it was working on an adjustment to the guidance material that may in future allow SLOP in surveillance-based environments.

4.42 IATA informed the meeting that there was still a number of aircraft types that were not capable of setting a 0.5NM offset in their Flight Management Computer (FMC).

4.43 IFALPA also informed the meeting of concerns relating to tactical parallel offsets to the left of track which did not take into account in flight contingency procedures which required a right turn by the aircraft in the event of an emergency descent.

Ujung Pandang ACC Resectorization Program Phase III Achievements IP07

4.44 Information was provided on the achievements of Ujung Pandang ACC in managing the phase III airspace re-sectorization program, successfully distributing the workload among ATC sectors. Other factors contributing to reduced workload were the implementation of AIDC coordination between the Ujung Pandang ACC and the Bali and Surabaya Terminal Area (TMA) ATC units.

Free Route Airspace Developments IP08, PR09

4.45 EUROCONTROL presented a progress report on the implementation of Free Route Airspace (FRA) in the ICAO European (EUR) Region, as well as developments concerning additional supporting documentation and data provision. The development of FRA was being driven by a plan to operate free route capability within the ICAO EUR region, for which the European Union Member States are responsible at and above FL310 from 01 January 2022.

Long-Term Vision for Future Japanese Air Traffic Systems IP09

4.46 The meeting was provided with information on the status of the long-term vision for the future of air traffic systems in Japan, namely the Collaborative Actions for Renovation of Air Traffic Systems (CARATS). The information included the long-term ATM vision, CARATS challenge for 2020 at metropolitan airports, and measures implemented under the collaborative framework with industry, academia and government.

Indonesia ATM Facilities Update IP10

4.47 Indonesia presented an update of CNS/ATM facilities, including ATM systems and ATS units, the Indonesia Modernization of Air Navigation Services (IMANS), and communications, navigation and surveillance capability and planning.

Proposed Use of Digital Tower Technology in New Zealand (IP11)

4.48 New Zealand had been developing a digital tower concept of operations to propose the use of a digital tower as a primary or contingency aerodrome ATS facility. IP11 described the use of computer generated imagery from digital cameras, infra-red sensors and other surveillance technology to replace the ‘out the window’ view used by controllers or flight service staff to provide a range of aerodrome services. The digital tower technical solution was expected to be designed to meet the Minimum Aviation System Performance Specifications (MASPS) for Digital Tower Optical Systems as described in Eurocae document ED240A (dated October 2018 or subsequent revisions).

4.49 ICAO asked whether security aspects regarding the protection of vital links and facilities had been taken into account in the planning for digital towers. New Zealand replied that it would seek more information and report back to the ATM/SG.

SID STAR New Procedures WP16

4.50 The Secretariat re-presented information first presented to ATM/SG/6 relating to the implementation of SID/STAR procedures in the APAC Region, consequential to amendment 7-A to PANS-ATM. The information provided included an update from ICAO Headquarters on the activities of the ICAO SID STAR Implementation Support Team (ISSIST). The SID/STAR Toolkit, developed by ISSIST included information on background and benefits, ICAO provisions and associated changes, training and education, implementation support, FAQs, and a reminder of the obligations of States and aircraft operators in relation to the publication (in Annex 15) and awareness of differences between State practices and the procedures in Doc 4444. The toolkit was available on the ICAO website at:

https://www.icao.int/airnavigation/sidstar/Pages/SID_STAR-Toolkit-.aspx.

4.51 Noting that the APAC Regional SID/STAR Phraseology Implementation Strategy (**Conclusion ATM/SG/6-4**) included a Regional implementation date of not later than 07 November 2019, the meeting was informed that a survey of Asia/Pacific implementation of the new SID/STAR phraseology would be circulated in Q3 2019, in order to provide updated information to APANPIRG/30 in November, followed by a post-implementation survey in Q1 2020.

SID/STAR Phraseology Implementation Update IP12

4.52 Australia informed the meeting of progress of implementation of the ICAO SID/STAR phraseology. A post-implementation review had resulted in Australia making several minor but important amendments to drive better compliance with published restrictions while remaining compliant with PANS-ATM. Information was provided on the inconsistent use of the phrase CLIMB/DESCEND VIA SID/STAR and the resultant confusion caused to pilots, and issues with regard to the application of speed control and compliance with published speeds in terminal areas.

4.53 In general discussion, ICAO agreed that the ICAO standard phraseology from PANS-ATM must be used; unless there were circumstances that were not covered by the standards, then States should consider procedures to supplement the PANS-ATM.

Recent CNS-Related Developments WP17

4.54 The Secretariat provided detailed information on recent developments in CNS fields, including several Draft Conclusions relevant to ATM/SG that would be presented to the 23rd Meeting of the CNS Sub-Group APANPIRG (CNS SG/23) in September 2019.

4.55 The Sixth Meeting of the Aeronautical Communication Services Implementation Coordination Group (ACSICG/6, Bangkok, Thailand, 13 – 15 May 2019) had noted that purpose of the Draft Aeronautical Fixed Telecommunications Network/Aeronautical Message Handling System (AFTN/AMHS)-based ICD met part of the objectives of ATFM/SG, and supported the APANPIRG-endorsed Regional Framework for Collaborative ATFM. Accordingly, ACSICG/6 had endorsed **Draft Conclusion ACSICG/6/1: AFTN/AMHS-Based Interface Control Document**, which had initially been drafted by ATFM/SG/8, for consideration by CNS SG/23.

4.56 The Third Meeting of the System-Wide Information Management Task Force (SWIM TF/3, Bangkok, Thailand, 07 – 10 May 2019) had agreed to **Draft Conclusion SWIM TF/3/4: The Asia/Pacific Regional FIXM Extension for ATFM, adopting the FIXM version 4.1 Extension**, for consideration by CNS SG/23.

4.57 The meeting noted that the Fifth Meeting of the Asia/Pacific AIDC Task Force (APA TF/5, Bangkok, Thailand, 23 to 25 April 2019) had updated AIDC implementation priorities against hot-spots identified by RASMAG and APANPIRG.

4.58 The Sixth Meeting of the Performance-Based Navigation Implementation Coordination Group (PBNICG/6, Bali, Indonesia, 24 – 26 April 2019) had finalized a regional plan for transition of Required Navigation Performance (RNP) approach chart identification from Area Navigation (RNAV) to RNP. The meeting endorsed **Draft Conclusion PBNICG/6/1: Asia/Pacific Regional Transition Plan for RNP APCH Chart Identification from RNAV to RNP**, which would be presented to CNS SG/23 for adoption.

4.59 In response to a query on PBNICG/6 discussions on the need for a contingency plan in the event that the transition plan could not be achieved, the Secretariat informed that meeting that, after approval, the Conclusion would be forwarded to the ICAO PBN Programme Office for action on sub-paragraph c) (PBN Program Office to confirm that a global contingency plan has been developed).

4.60 The meeting was informed that the Fourth Meeting of the Surveillance Implementation Coordination Group (SURICG/4), Nanjing, China, 09 – 12 April 2019) had agreed to **Draft Conclusion SURICG/4/1: ADS-B and Flow Management**, which encouraged States to consider the application of new surveillance technologies and/or data sharing which could provide surveillance from departure to destination.

4.61 SURICG/4 had been informed of issues related to the use of (24-bit) Aircraft Addresses and frequency spectrum related to small Unmanned Aircraft Systems (UAS) equipped with a Mode S Secondary Surveillance Radar (SSR) transponder, particularly with reference to congestion of 1090 MHz and the consequent, potential blinding of any ICAO standard surveillance system. SURICG had agreed to **Draft Conclusion SURICG/4/2: UAS Cooperative Surveillance Equipage**, raising awareness of States to this matter and proposing that States monitor potential congestion on 1090 MHz and the availability of 24-bit aircraft addresses.

4.62 SURICG/4 had considered the outcomes of the APAC Regional ATM Automation System Symposium (APAC RATMS), held in Nanjing, China, from 22 – 23 November 2018, and had agreed to **Draft Decision SURICG/4/5: Establishment of ATM Automation System Working Group**, for consideration by CNS SG/23.

4.63 Information was also provided on the outcomes from other groups that were subsidiary to CNS SG.

Establishing Exclusive ADS-B Airspace (WP18)

4.64 Singapore presented information on the safety and operational benefits of ADS-B, and the intention to extend ADS-B equipage requirements to the whole of the Singapore FIR, enabling possible future collaboration among States to enhance ATM by the re-designation of ATS route navigation performance specifications. The meeting also noted the momentum that had been gained by the establishment by several States of target dates for ADS-B implementation, including ADS-B-exclusive airspace,

4.65 The meeting noted that there was no need for a separate roadmap to target implementation of region-wide exclusive ADS-B airspace, as the *Asia/Pacific Seamless ATM Plan* already contained recommendations for States to harmonise their ADS-B implementation plans. Following which, States were expected to promulgate their actual plan of implementation by Aeronautical Information Circular (AIC) and then the requirements by AIP Supplement.

Regional Air Navigation Plan Update (WP19)

4.66 ICAO presented an update on the progress of the electronic Air Navigation Plan (eANP) development for the Asia/Pacific, which was intended to replace ICAO Doc. 9673. Meeting participants were invited to review the FIR and Search and Rescue Region (SRR) data affecting their administration, and provide feedback to ICAO on the data's accuracy. By 01 October 2019, the FIR/SRR data review from States was expected to be completed and the data that had been verified for the FIR Table would be entered into the eANP, with the SRRs expected to be done in 2020.

4.67 China asked about the source of the GIS data. ICAO stated that this was provided by HQ and it was understood that the underlying geographical information were provided by a commercial company. China identified that some information in the GIS was incorrect, especially involving national borders and coastlines.

4.68 China emphasized that the FIR boundary was very complex and sensitive, and the FIRs of China should be consistent with the AIP of China. New Zealand, Papua New Guinea and the USA disagreed with this statement, as the FIRs should be designated as a result of a Council decision and Air Navigation Plan confirmation, rather than the AIP governing the FIR designation. ICAO confirmed that the AIPs must not be the primary source of FIR data, which was the Council-agreed Air Navigation Plan.

4.69 ICAO reminded the meeting that States should submit their FIR data well before the APANPIRG/30 meeting, not later than 01 October 2019.

4.70 As at July 2019, about 15 FIRs were either in the process of completing their verification by Proposal for Amendment (PfA) to the ANP, or had been verified already (**Figure 5**).

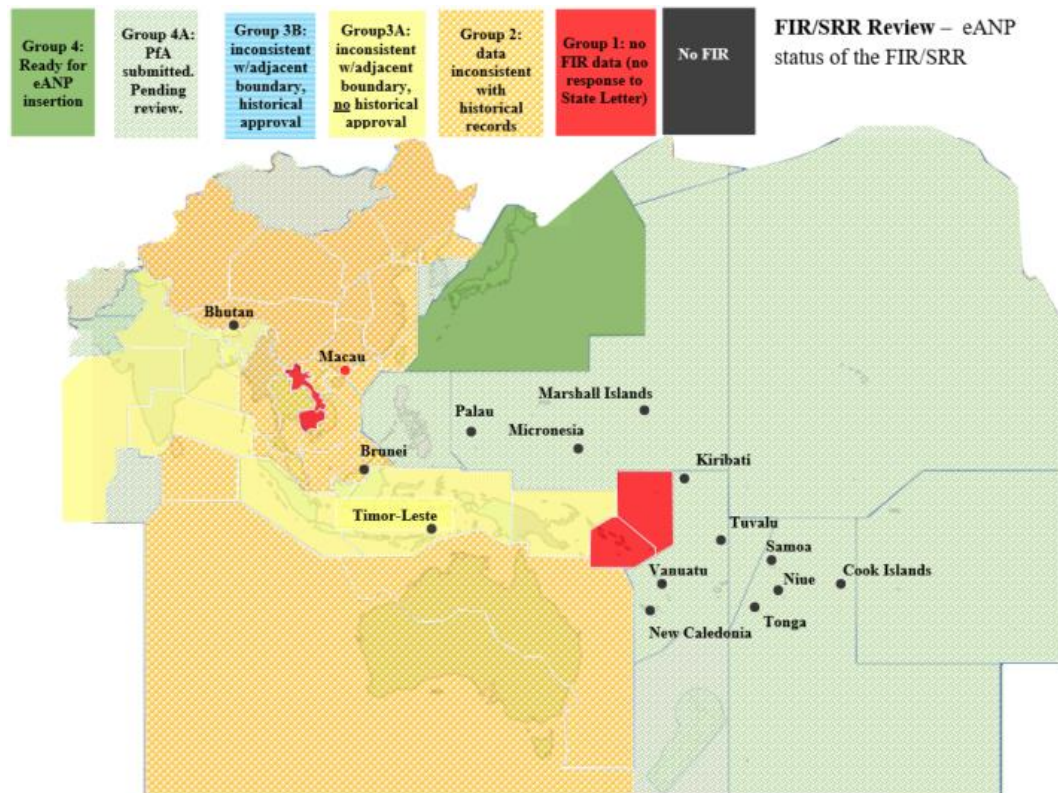


Figure 5: FIR Review Status

4.71 The meeting discussed a Draft Conclusion originating from the SAIOACG/9 and SEACG/24 to establish the new Regional ANP Vol. I Part IV Table ATM I-1 *Flight Information Regions (FIR)/Upper Information Regions (UIR) in the Asia/Pacific Region*. However, after discussions with ICAO HQ, it was confirmed that no Conclusion was necessary, as the FIR data could be entered into the Table after individual FIRs had been circulated by PfA and approved.

Lao PDR AIDC Implementation Progress Report (FL01)

4.72 The meeting was provided with information on the status of implementation and planning of AIDC in Lao PDR, and on the implementation experience with adjacent ACCs. The information provided covered the AIDC operational trial between the Vientiane (Lao PDR) and the Phnom Penh (Cambodia), Bangkok (Thailand), Ho Chi Minh (Viet Nam), Kunming (China) and Yangon (Myanmar) FIRs.

Introduction To the ‘Three-Center Project’ of ATMB CAAC (FL05)

4.73 China described its new ‘Three-Center Project’ to develop a joint Civil Aviation Operation Management Center, Meteorological Center, and AIM Project as key infrastructure construction projects in Beijing, listed in the *Thirteenth Five-Year Plan for Civil Aviation*. Flimsy noted that the ATFM system was expected to be operational at the end of 2020, so all ATFM units and stakeholders across the country would use the same set of system tools, follow the same rules, and use the same algorithm for flight sequencing so as to achieve centralized traffic flow management.

Agenda Item 5: ATM Coordination (Meetings, Route Development, Contingency Planning)

Trans-Regional ATS Coordination (WP20)

5.1 WP20 described the coordination and implementation of Trans-Regional Air Traffic Services (ATS) routes between the APAC, EUR/NAT and MID regions. Unfortunately, no progress had been possible with regard to the Russia-China interface, the Russia-Democratic People's Republic of Korea (DPRK)-Republic of Korea (ROK) interface, the Russia-Japan interface, and only a few route amendments were able to be agreed on the MID – APAC interface, due to a lack of engagement by relevant States. Moreover, despite agreed actions and timelines from a bi-lateral meeting between China and the Russian Federation (held in Moscow, Russia on July 25-26 2017) there had reportedly been no progress in the implementation of the SIMLI package.

5.2 The meeting was apprised of the progress of Afghanistan establishing full radar coverage for the purpose of providing surveillance-based ATC services for air traffic within the Kabul IFR. With implementation of the Multilateration/Wide Area Multilateration (MLAT/WAM) system, surveillance coverage would initially support the High Sector of the Kabul FIR, which mostly served overflying trans-regional traffic.

5.3 The meeting also noted the trans-regional concerns related to removal of prefix 'U' from ATS route designators, colocation designation, designation inconsistencies, ATS route designator allocation, and Five Letter Name Codes (5LNCs).

South Asia Side Meeting

5.4 Afghanistan, India, Iran, Pakistan, Thailand, EUROCONTROL, IATA, IFALPA and other Gulf States were invited to discuss surveillance in Afghanistan and planning for improved longitudinal separation between the States, especially the interface between Iran and Pakistan.

5.5 Afghanistan planned to enhance the longitudinal spacing from 50NM to 30NM, and subsequently to 20NM. ATS surveillance was reportedly implemented within the Kabul FIR on 09 May 2019. However, the new system had a number of technical problems and constraints, such as split targets, duplicated tracks, the inability to identify aircraft or pick up targets.

5.6 Moreover, Afghanistan only had direct communication with Pakistan, but not with other adjacent ACCs, and ATS LOAs had not been updated, with difficulty in obtaining responses requesting bilateral meetings. However, Afghanistan confirmed that controller resources were not an issue, including contractors and the on-going training of local controllers. Afghanistan could not provide a timeline for the systems to be fixed, but indicated that the vendors of the new system were working on the issues. ICAO suggested that Afghanistan provide an outline of its action plan to overcome the issues.

5.7 I. R. Iran proposed a more efficient spacing of 30NM for areas not affected by surveillance limitations within the Kabul FIR. Pakistan also agreed to reduce longitudinal spacing between the Karachi and Tehran FIRs and at waypoint PARTY between the Karachi and Mumbai FIRs. In response, India advised that it was not willing to implement a spacing of 30NM between Pakistan and Indian FIRs because of crossing traffic, spacing at the interface with the Dhaka FIR, and the use of PBN separations.

5.8 ICAO recalled that within Category S surveillance airspace, surveillance-based separations such as 5NM should be used (not PBN-based separations), as per the expectations in the *Asia/Pacific Seamless ATM Plan*. Moreover, ICAO stressed that States must not base TOC restrictions on constraints imposed by downstream FIRs, particularly when these were hours of flight from the airspace concerned in Category S airspace.

Indonesia-Philippines Side Meeting

5.9 A side meeting between Indonesia, Philippines and ICAO on the enhancement of longitudinal Spacing at the TOC Points between Manila and Ujung Pandang ACCs was conducted.

5.10 The Philippines informed that during a bilateral meeting was held between Indonesia and Philippines (Makassar, 13 – 14 March 2019). Manila and Ujung Pandang ACC would implement 50NM longitudinal spacing at the TOC point once the amendment of LOA had been agreed and signed between the two parties. The Philippines would provide an amended draft Letter of Agreement (LoA) to reflect this change to Indonesia as soon as possible.

5.11 In response to a query from ICAO, Philippines commented that there was a small gap in surveillance coverage on the southern portion of Manila FIR that precluded the use of surveillance-based separations at the moment. This gap was expected to be eliminated with the commissioning of new ADS-B stations. ICAO suggested that data sharing from Indonesian ADS-B sites should also be considered to supplement surveillance data from the Philippines. Furthermore, ICAO recalled that States using modern surveillance systems should be providing 5NM separation capability.

5.12 The meeting was also informed that Manila and Ujung Pandang ACCs would conduct AIDC operational trials from 10 October – April 2020.

Concept for Route Design – PBN Highways (IP13, PR01)

5.13 India provided an overview of planning for the implementation of PBN Highways through Bay of Bengal and Arabian Sea airspace. IP13 described planning to support this development such as use of RNP 4 and RNP 2, and an ADS-B mandate. An assessment of fleet mix and equipage had been undertaken to understand the traffic flow and operational needs of aircraft.

5.14 ICAO appreciated the work being undertaken by India to support the PBN Highways concept. However, it was stressed that PBN Highways were conceived as end-to-end planning from major conurbations involving multiple States (as had occurred during the development of Europe Middle East-Asia Route South of Himalaya (EMARSSH) routes). This was noted as being a fundamental long term goal of the AIRARD/TF.

5.15 Crucially, the meeting recalled that PBN Highway planning should be on the basis of identifying optimal pathways containing several near-parallel PBN routes of optimal specification to enhance capacity for the consideration of States to find solutions to this application, rather than the opposite process of designing routes around current barriers or short-comings in navigation or surveillance systems.

Afghanistan and Tajikistan ATS Route Proposals (WP21, PR11)

5.16 Tajikistan described ATS route proposals that involved Afghanistan, as facilitated by the ICAO EUR/NAT Office.

Side Meeting

5.17 A side meeting was held between Afghanistan China, Pakistan, Tajikistan, IFALPA and ICAO to discuss trans-regional ATS route proposals.

5.18 The meeting noted that China and Tajikistan would determine the most appropriate waypoint on Dushanbe – Urumqi FIR boundary for the Chinese authorities, in order to support connectivity between China and Tajikistan. This waypoint may also support connectivity to Afghanistan, Iranian and Pakistani route networks, and was noted as supporting the One Belt, One Road initiative by both sides.

5.19 IFALPA raised a concern about the high terrain involved, and stressed the need for safe escape options in the event of an emergency such as a depressurisation event. The States noted this.

ATS Route Catalogue (WP22)

5.20 The ICAO Regional Sub-Office (RSO) presented Version 18 of the *Asia/Pacific Region ATS Route Catalogue* for review and update.

IATA Climate Change Discussion (PR02)

5.21 IATA described its climate change strategy, which emphasised developments in technology, aircraft operation, ANS infrastructure and Global Market-Based Measures (GMBM). Referring to ANS specifically, the presentation stressed the need for aircraft to transition seamlessly between systems. Other areas highlighted included data exchange (and ultimately, System Wide Information Management – SWIM), efficient separation standards, PBN, ATFM, CDM, A-CDM, ANSP consultation, and a move from rigid ATS route systems to more dynamic operations.

AIRARD/TF TORs and Task List (WP23)

5.22 The meeting noted that both IATA and States had failed to provide the necessary data, analysis and papers to support the long term goals of the AIRARD/TF. Moreover, attendance by key trans-regional States and the IATA Co-Chair had not enabled the TF to function as was expected. IATA apologised for this short-coming, and stated that it would do its best to re-energise participants and find a suitable way to ensure the goals contained within the AIRARD TORs were realised in a timely manner.

5.23 The meeting agreed to the updated AIRARD/TF Task List at **Appendix F**. ICAO confirmed that unfortunately, AIRARD/TF/4 would be the last such meeting, as it was not possible to continue without a clear deliverable, noting that it was not an APANPIRG contributing body.

Civil/Military Cooperation Update (WP24)

5.24 ICAO recalled that civil-military cooperation remained one of the highest regional priorities in the *Asia/Pacific Seamless ATM Plan*. Examples were provided of military operations and activity controlled by State agencies which were of concern, so lessons could be learnt and improvements implemented. The examples included issues related to an Air Defence Identification Zones (ADIZ), Air Defence Codes (ADCs), operation of Special Use Airspace (SUA), ballistic launch and space re-entry activity, and significant delays and disruptions to civil air traffic in East Asia.

5.25 The meeting noted the commitment in the Beijing Declaration by Asia/Pacific Ministers of Civil Aviation (paragraph 2.1 d)) and *Conclusion APANPIRG/29-10 Minimising the Impact of Non-ICAO Procedures and Requirements for Military Activities Affecting Civil Aviation* to enhance civil-military cooperation.

5.26 In 2018, the launch of a Long March 4C at 08 May 2018 18:28 UTC from the Taiyuan facility in Shanxi reportedly had left a debris field over several provinces in Lao PDR. APANPIRG/29 had agreed to the use of set procedures with *Conclusion 29/9: Procedures for Ballistic Launch and Space Re-Entry Management*. Myanmar subsequently provided information about the impact of debris in its territory close to an airport, allegedly as a result of a Long March rocket launch from the Jiuquan facility, Gansu Province, China on 21 January 2019 at 05:42 UTC. Further notifications were made by China for space debris that would affect the airspace of Cambodia, Lao PDR and Thailand on 29 April 2019 and 22 May 2019. These had been discussed at the Fourteenth Meeting of the Aeronautical Information Services (AIS) – Aeronautical Information Management (AIM) Implementation Task Force (AAITF/14, Bangkok, Thailand, 20 – 24 May 2019).

5.27 On 05 June 2019 the ICAO Regional Office had also been informed of a ballistic launch by China of a debris field that affected Viti Levu, the main island of Fiji. This ‘notification’ had once again been non-compliant with the regional procedures agreed by APANPIRG as it had been sent to the USA on 01 June 2019, only four days before event, and not to Fiji. Furthermore, this and previous launch events did not appear to take into account the regional expectation that: *consideration of affected airspace users and ANSPs is made after consultation, so that the size of the airspace affected is minimized and the launch window is optimized for the least possible disruption to other users.*

5.28 China invited other States to approach China with any concerns in the first instance.

5.29 China informed the meeting that it had sent messages through diplomatic channels and AIM communications to advise of the launches. ICAO emphasised that this was not sufficient, as ATS and airspace users needed to be informed, and the AIS notifications from China had been clearly lacking, as they had been sent to the irrelevant State and were not fully in accordance with the regional policy.

Air Defence Identification Zone

5.30 In 2018, the uncoordinated establishment by Bangladesh of an ADIZ, including airspace over the high seas had been discussed by the ATM/SG/6. No change in status of the ADIZ was reported to the ATM/SG/7. The meeting was advised that both Bangladesh and India required an ADC for each flight, irrespective of the flight plan status. Bangladesh and India were invited by the meeting to consider alternative, less disruptive measures used by other Asia/Pacific States.

Major East Asian Delays

5.31 As long ago as the Third Air Traffic Management Subgroup (ATM/SG/3, Bangkok, 03 – 07 August 2015) major delays emanating from Chinese airspace had been discussed. While recognising that not all delays were caused by civil/military cooperation issues, the continuing reports of problems related to Chinese airspace led to China’s commitment in 2017 to implement some ATFM measures to better manage traffic. APANPIRG/27, APANPIRG/28 and APANPIRG/29 had noted the Subgroup reports on delays, and had urged China to address these.

5.32 In 2018, the International Federation of Air Line Pilots’ Associations (IFALPA) had issued several Deficiencies related to delays and capacity issues within Chinese airspace. These are significant because they identified that delays occur even on a ‘normal’ day with ‘no airspace or weather issues’. Moreover, the IFALPA Deficiencies indicated the safety effects of such issues in terms of radio frequency congestion, language difficulties, and non-standard altimetry that is understood to stem from the use of metric units by State aircraft.

5.33 China stated that Chinese ATC units rarely received abnormal VHF usage and congestion reports from pilots directly in the air or after landing, and ATMB had not received such reports from airlines. Chinese ATC unit also paid great attention to the use of emergency frequencies. China recommended that IFALPA encourage pilots to report to the ATC unit in a timely manner if frequency issues are encountered.

5.34 Hong Kong, China stated that they had been working closely with China and was committed to adopting a multi-pronged approach to improve the efficiency of ATFM in the region. Since the full utilisation of Route M503 in 2018, the overall capacity of the air routes between Hong Kong and Shanghai Pudong International Airport had been enhanced, with on-time performance of flights departing from Hong Kong improving from about 47% in the second quarter of 2017 to about 68% in the second quarter of 2018.

5.35 Hong Kong, China also noted that 121.5 MHz was monitored at all times and did not share the observation of ‘continual chatter’ as mentioned in WP24 or receive reports from operators. However, airlines were encouraged to submit detailed reports to facilitate investigation. China stated that monitoring on 121.5 MHz was a mandatory requirement within China for all flights.

Special Use Airspace

5.36 An example of danger areas being improperly designated by Bangladesh within or partly within India’s airspace of responsibility was also highlighted. States were only permitted to designate airspace within international airspace that was delegated to that State for the purposes of provision of ATS. The provisions of Annex 15 *Aeronautical Information Services* applied:

2.1.2 Each Contracting State shall ensure that the provision of aeronautical data and aeronautical information covers its own territory and those areas over the high seas for which it is responsible for the provision of air traffic services (ATS).

5.37 From its own experience, the Ukraine stressed the need for States to strictly comply with the requirements of the ICAO Convention to ensure that aeronautical information related to an airspace was only disseminated by the State which was responsible for the FIR concerned. ICAO proposed to submit an ANS Deficiency for Bangladesh to APANPIRG/30 regarding the Bangladesh danger areas in question, unless the situation could be resolved between the States concerned in terms of the portion within Indian airspace being published in the AIP India as Indian designated airspace, or disestablished.

5.38 ICAO noted that restricted areas were being designated in international airspace by some States without the necessary ‘Head of Power’ to do so, despite restricted areas and prohibited areas being defined by Annex 2 as only being able to be designated ‘*above the land areas or territorial waters of a State*’. The meeting recalled that the *United Nations Convention on the Law of the Sea (UNCLOS)* did not allow States to impose restrictive measures on aircraft (other than on the State’s aircraft) within international airspace. Therefore, ICAO intended to propose an APANPIRG ANS Deficiency for these non-compliances with SARPs, unless Australia, India and Indonesia were able to amend that portion which extended into internal airspace so it was compliant with the provisions of the Convention.

5.39 The UAE extended an invitation to States to attend a Civil-Military Cooperation Seminar (Dubai, UAE, 09 – 12 December 2019).

Civil-Military Coordination Update (FL02)

5.40 Lao PDR described a 2018 incident that had been caused by coordination confusion between civil and military authorities at Xiengkhaung Airport (VLXK). The information highlighted major issues that needed to be taken into account, such as common coordination and procedures, common training (joint facilities/aerodrome), Memorandum of Understanding, flexible Use of Airspace when there was an airspace closure for military activities, and the establishment of a National Airspace Policy.

Regional ATM Contingency Planning and Status Reporting (WP25)

Regional ATM Contingency Planning Status

5.41 The Secretariat presented information on contingency planning in the Asia/Pacific Region, including an update on the Asia/Pacific Regional ATM Contingency Plan. The performance expectations of the Plan were expected to be implemented by 10 November 2016, reflecting the Annex 11 requirement for contingency plans that had been applicable since November 2003.

5.42 Regional ATM Contingency Plan Monitoring and Reporting status report forms had been received from 19 Asia/Pacific Administrations. Using standardized regional criteria for the assessment of State contingency planning, based on the overall implementation of applicable elements of the regional plan, the status of State contingency planning was:

- *Robust* – Australia, Indonesia, Singapore;
- *Marginal* – Malaysia;
- *Incomplete* – Bangladesh, Cambodia, Hong Kong China, Macao China, Japan, Maldives, Myanmar, Nepal, New Caledonia, Pakistan, Papua New Guinea, Philippines, Republic of Korea, Thailand; and
- *Did Not Report* – Afghanistan, Bhutan, Brunei Darussalam, China, Cook Islands, Fiji, France (French Polynesia), DPR Korea, India, Kiribati, Lao PDR, Marshall Islands, Micronesia, Mongolia, Nauru, New Zealand, Palau, Samoa, Solomon Islands, Sri Lanka, Timor Leste, Tonga, Tuvalu, United States, Vanuatu.

5.43 The meeting recalled that the ICAO Regional Office was expected to annually report the receipt, or non-receipt of completed reporting forms, for APANPIRG ANS Deficiency consideration

ATM Emergency and Contingency Response Planning

5.44 The Ninth Meeting of the South Asia – Indian Ocean ATM Coordination Group (SAIOACG/9 – WP28) had discussed the need for appropriate checklists and guidance for ATS units' response to emergencies and contingency events. Noting that the templates for ATM emergency and contingency response considered by SAIOACG/9 were included in a proposed amendment to the Regional ATM Contingency Plan (**Conclusion ATM/SG/7-7**), the meeting agreed to the following Conclusion, drafted by SAIOACG/9 but considered within the context of contingency planning:

Conclusion ATM/SG/7-6: ATM Emergency and Contingency Response Planning

That, Asia/Pacific States are urged to ensure through regulatory oversight mechanisms that all operational positions at ATS units have ready access to information to respond to emergency and contingency situations.

Pakistan CCT

5.45 A Contingency Coordination Team (CCT) was established by the APAC Regional Office for the closure of Pakistan airspace 27 February 2019, involving the ANSPs from India (AAI), Pakistan (PCAA) and the ICAO MID Office, as well as the IATA offices in Jordan (MENA) and Singapore (ASPAC) and representatives from 19 States and three International Organizations. Several contingency routing schemes both north and south of Pakistan's airspace were developed, and also involved China, Iran and Oman. The airspace became available for normal operations on 17 July 2019. A total of 40 CCT bulletins had been issued to exchange information with key stakeholders.

5.46 The UAE commended the work of the CCT undertaken by the ICAO MID and APAC Offices, as well as all relevant stakeholders during the various contingency situations. The UAE had managed significant ground delays, citing an example of more than 184 hours of total ground delay on 09 March 2019. The UAE stated that there was an urgent need for guidelines for the implementation of progressive flow measures for extended disruptions in the network. Moreover, all stakeholders were urged to work collaboratively and provide critical information to support informative CDM. Iran also informed the meeting of the significant coordination effort that was necessary between Bahrain, Iran and Oman to manage the increased traffic.

5.47 Important lessons learned included the need for the States concerned to maintain close and regular communication with the ICAO Regional Office, as the CCT was dependent on up-to-date information which States, ANSPs and airlines could use to plan their contingency actions, and the need to ensure that both civil and military authorities understood the State's international obligations to comply with the Convention on International Civil Aviation.

5.48 Another important lesson was the need to ensure that both civil and military authorities understood the State's international obligations to comply with the Convention on International Civil Aviation. It should be recalled that: States with international airspace (as described in **Figure 6**, also at <https://www.icao.int/APAC/Documents/edocs/International%20Airspace%20and%20Civil-Military%20Cooperation.pdf>) noted that their National ATM Contingency Plans should ensure that there are provisions to facilitate the continued transit of international aircraft within such airspace, and that such airspace cannot be unilaterally 'closed' or restricted.

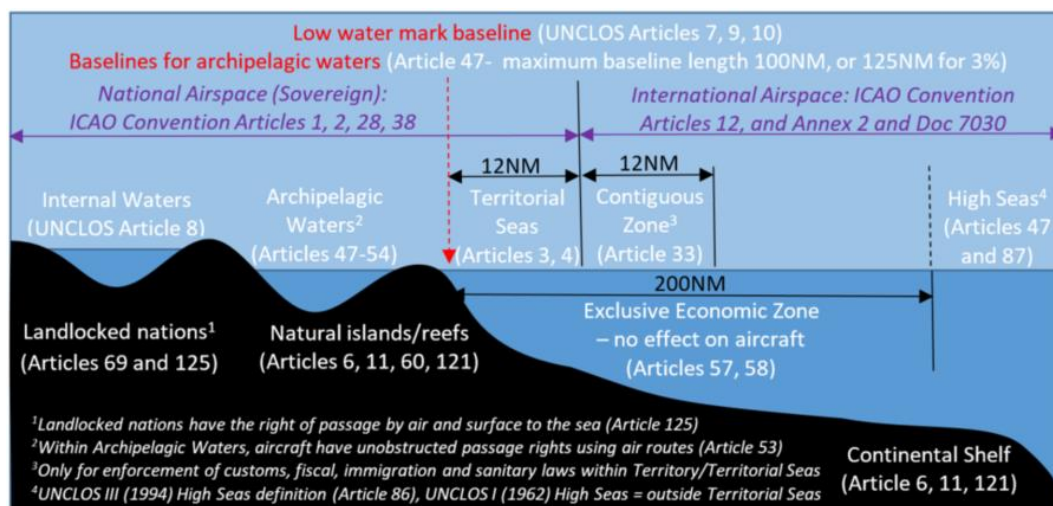


Figure 6: Maritime and Airspace Volumes as defined by the United Nations Convention on the Law of the Sea (UNCLOS = white/red) and the ICAO Convention = purple)

Regional ATM Contingency Plan Update

5.49 As a further lesson learnt from the Pakistan contingency operation, the recovery from any contingency operation can be just as difficult as the initial situation to manage. To avoid ad hoc recovery actions that place aircraft or adjacent ATC units in an unsafe situation, it is important to consider and agree with affected units recovery actions related to an agreed time of resumption of normal operations, notification warning period and process, management of active flight operations during the notification warning period and management of 'mixed mode' (contingency route/level and non-contingency route/level) operations. Accordingly, these considerations were included in the amendment of the Regional ATM Contingency Plan at **Appendix G to the Report**.

Natural Disaster and Humanitarian Aid Relief – Promulgation of NOTAMs

5.50 In September 2018 a major destructive earthquake and tsunami event occurred in Palu, Indonesia. During the coordination of contingency responses, including humanitarian aid, it became apparent that the normal distribution of NOTAM information did not necessarily provide ready access to information that would assist in the planning and deployment of humanitarian aid.

5.51 In particular, information on the status of affected aerodromes, communications, navigation and ATS facilities may, depending on the location, not be included in the international NOTAM distribution for the FIR concerned. The proposed amendment to the Regional ATM Contingency Plan at Appendix G includes a related element.

5.52 The meeting agreed to the following Conclusion:

Conclusion ATM/SG/7-7: Amendment to the Regional ATM Contingency Plan

That:

1. The Proposal for Amendment at **Appendix G to the Report** be incorporated in the Regional ATM Contingency Plan; and
2. States ensure their contingency plans include the new elements of the plan.

Contingency Coordination Team Contact Lists

5.53 States were requested to update their details in the CCT Contact Lists for the Kabul FIR Bypass Contingency Plan, and East Asia and North Pacific CCT (ATM/SG/7/WP42 refers).

Prolonged Closure of the Lahore and Karachi FIRs Consequences (WP26, PR03, PR04, PR08)

5.54 IATA provided a high-level overview of the impact of the prolonged closure of the Lahore and Karachi FIRs to overflying traffic. Thailand (PR03), EUROCONTROL (PR04) and ICAO (PR08) also provided information on the management of the contingency operation and the overall consequences to aviation and the environment. The meeting noted that the contingency operation lasted 140 days from 27 February 2019 until 17 July 2019, affecting the major traffic flow between Europe and South/Southeast Asia, and causing serious disruption to many flights.

5.55 IATA urged the States that had experienced revenue decreases not to attempt to recover this revenue through large increases in ANS charges, even those of a ‘temporary’ nature, in line with the specific recommendations in ICAO Doc 9082 *ICAO’s Policies on Charges for Airports and Air Navigation Services* regarding consultation with users on charges. The cost of this closure was estimated to be in excess of USD400,000 every day to airlines, according to IATA. The conservatively estimated cumulative extra costs were in excess of USD 55 million.

5.56 IATA noted that the Indian Parliament had recently been informed that the cost to Indian airlines (as at 02 July 2019) was USD 80 million, meaning the estimated extra costs caused by the closure for the entire industry were conservatively estimated to be between USD 140 – 160 million. This cost did not take into account the cost to ANSPs or travellers.

5.57 The daily cost to the environment based on 295 disrupted flights was approximately 560,551 kg of wasted fuel, 1,771,342 kg of extra CO₂ and 10,586 kg of NO_x based on EUROCONTROL estimates. Over the 20 weeks, this meant about 78,477 t. of extra fuel was used, and 247,940 t. of extra CO₂ and 1,482 of NO_x was emitted.

5.58 The presentations noted that there been an uneven impact on ANSPs across the APAC and MID regions due to this airspace closure. For example, extreme traffic loading on route L301 was observed via Mumbai (India) and Muscat (Oman) FIRs, while some FIRs such as the Kabul FIR suffered a major downturn in traffic. In the FIRs where there was a major increase ANSPs had worked to ensure that overloaded ATS sectors were supported by traffic flow restrictions, but this period had been a major challenge for controllers. On the other hand, the meeting noted that where there traffic movements had dropped precipitously, controllers had t manage the challenge of maintaining currency, while their ANSP had suffered a major reduction in revenue from a lack of overflight charges.

5.59 China informed the meeting that suggestions for an expedition of the process for overflight approvals had been received, and would be reported to the Civil Aviation Administration of China (CAAC) for consideration. China also informed the meeting that the arrangement of available routes was subject to strategic review twice per year, and any suggestions for additional or amended routes could be coordinated through CAAC for consideration.

5.60 Given the cost to airlines and the established ICAO policy on airspace use charges, the meeting agreed to the following Draft Conclusion:

Draft Conclusion ATM/SG/7-8: Recovery of Lost Revenue due to Airspace Closure

That, concerned States are urged to carefully consider enacting any ANS pricing changes aimed at recovering revenue lost during the 2019 Pakistan airspace closure. Should any States be considering such a move the meeting urges those States to enter into full and transparent consultations with airspace users and their representative bodies in accordance with ICAO Doc 9082 prior to any decisions being made.

Inter-Regional Contingency Management (WP27, PR10)

5.61 India presented information on the contingency management undertaken by India after 27 February 2019, due to closure of Pakistan's airspace.

5.62 India stressed the need for aircraft to comply with the provisions in the AIP India regarding maintenance of flight route and level, noting that there had been possible confusion caused by the command authority exercised by pilots during inflight emergencies. Moreover, there had been radio congestion issues due to various clarifications by aircraft in flight, the request for higher levels/shorter routings in a congested environment, which had been very difficult for ATC to manage.

5.63 India stated that the existing APAC Regional Contingency Plan had not fully addressed the procedures in case of airspace closure, particularly the Level 3 arrangement, consistent with the provisions contained in Attachment C of Annex 11, and suggested the formation of a Task Force to 'frame contingency procedures'. ICAO did not agree that a task force was necessary, as the ATFM matters discussed to support the proposal fell within the scope of the existing ATFM/SG.

5.64 The meeting noted that the Regional Framework for Collaborative ATFM included the expectation that States would have CDM processes in place which would support the ATM response to for such situations, by distributing Ground Delay Program (GDP) measures to balance capacity and demand, as also described in the regional multi-nodal ATFM concept.

5.65 It was proposed that the development of guidance for trans-regional ATFM should be undertaken by ATFM/SG. India was requested to provide a draft contingency ATFM response concept.

SAIOACG and SEACG Meeting Outcomes (WP28)

5.66 The meeting was provided with an overview of the outcomes of the Ninth Meeting of the South Asia/Indian Ocean ATM Coordination Group (SAIOACG/9, 26 – 29 March 2019, Bangkok, Thailand) and the Twenty-Sixth Meeting of the South-East Asia ATM Coordination Group (SEACG/26, 01 – 04 April 2019, Bangkok, Thailand).

5.67 The meetings updated status reports and discussed relevant technical matters such as the outcomes of informal ATM meetings, the Association of Southeast Asian Nations (ASEAN) *ATM Master Plan*, airspace safety monitoring, ATC separation standards, ANS Deficiencies, the Regional Air Navigation Plan update, PBCS, PBN, AIM and ATFM.

5.68 Regarding ATM contingency, the meetings discussed the need for more templates to be made available to aid ATS units to respond in a timely manner to emergencies and contingency events with appropriate checklists and guidance that were readily available to ATS personnel. A draft ATS Emergency Response Checklist Template and a Tower Emergency Plan Template (were provided for consideration by the meeting. ICAO thanked Australia and New Zealand for the original documents. An associated Draft Conclusion was considered under WP25.

5.69 States had been also requested to review the Regional ATM Contingency Plan and submit any proposed changes by 01 July 2019.

5.70 A side meeting had been held during the SAIOACG/9 with India, Pakistan, IATA and ICAO to discuss the on-going Pakistan airspace contingency operation. A side meeting was also held during SEACG/26 between Cambodia, Thailand and Viet Nam to discuss the validation process for the Phnom Penh, Bangkok and Ho Chi Minh FIR boundaries.

5.71 Referring to the SEACG/26 discussion of RNP2 (or equivalent) equipage on ATS routes L642 and M771, Hong Kong China informed the meeting that the results of their analysis differed from those reported at SEACG/26 by Singapore. The two Administrations agreed to coordinate offline to reach an agreed common analysis methodology. Hong Kong, China commented that a considerable level of fleet equipage of the required capability was essential to support enhancement of the route structure.

5.72 The meetings agreed to hold the SAIOACG/10 and SEACG/27 as a combined meeting in 2020, venue and timing to be confirmed.

Asia/Pacific Unmanned Aircraft Systems Task Force Outcomes (WP29)

5.73 The Secretariat presented the outcomes of the Third Meeting of the Asia/Pacific Unmanned Aircraft Systems Task Force (APUAS/TF/3, Bangkok, Thailand, 04 to 07 March 2019), and Unmanned Aircraft Systems-related issues.

5.74 The meeting was informed of changes to the ASBU scheme that would be proposed to the 40th Assembly of ICAO, removing B1-RPAS and B2-RPAS and adding new ASBU of some relevance to UAS operations – ASEP-B2/2, ASEP-B2/3 and ASUR-B2/2.

5.75 The APUAS/TF/3 meeting had agreed to the inclusion in the 2019 update of the Asia/Pacific Seamless ATM Plan of a performance expectation for UAS integration into National Airspace Systems, responding to the APUAS/TF/TOR which included, *inter alia*, the requirement to support an *Asia/Pacific Seamless ATM Plan* element. The amendment proposal was carried into the proposed revision of *the Seamless ATM Plan*.

5.76 Regarding APUAS/TF discussion of the typical limiting height above ground level (AGL), Indonesia informed the meeting that their regulation had reduced this from 500 feet AGL to 400 feet AGL, which was aligned with typical values in the regulations of other States. The meeting noted the information in the Draft Regional UAS Guidance on human factors and technical limitations in assessing the height above ground level of both unmanned and conventional aircraft operations.

5.77 APUAS/TF/3 had noted that, in response to a proposal that a harmonized approach to the detection and interception of unauthorized UAS in the vicinity of aerodromes, the concerns were shared globally. However, ICAO and its technical bodies were not yet in the position to draft such guidance.

5.78 It was also noted that the TOR of the task force related to regulatory guidance for the integration of UAS in non-segregated airspace, which necessarily included ATM contingency response to unauthorized drones, but the detection and interception of unauthorized drones was primarily a flight safety and/or security matter. CANSO also presented information on drone incursions, including methods of coping with unauthorized drones and potential paths to prevention.

5.79 APUAS/TF had completed the final draft of the *Regional Guidance for the Regulation and Safe Operation of UAS within National Airspace*. Accordingly, the meeting agreed to the following Conclusion:

Conclusion ATM/SG/7-9: Regional Guidance for the Regulation and Safe Operation of UAS within National Airspace

That, the *Asia/Pacific Regional Guidance for the Regulation and Safe Operation of UAS within National Airspace* at **Appendix H to the Report** be adopted, and uploaded to the ICAO Asia/Pacific Regional Office eDocuments web-page.

5.80 Noting that the APUAS/TF had met the objectives of its TOR, and that residual tasks had been assumed by the Secretariat, the meeting agreed to the following Draft Decision:

Draft Decision ATM/SG/7-10: Dissolution of the APUAS/TF

That, noting that the APUAS/TF has met its objective, and any residual tasks have been reassigned to the Secretariat, the APUAS/TF be dissolved.

Agenda Item 6: AOP, AIM, MET, SAR

AOP Subgroup Outcomes (WP30)

6.1 The Secretariat presented the outcomes of the Third Meeting of the Aerodrome Operations and Planning Sub-Group of APANPIRG (AOP/SG/3, Bangkok, Thailand, 24 to 26 June 2019).

6.2 AOP/SG had approved the Asia/Pacific A-CDM Implementation Plan, developed by the Asia/Pacific A-CDM Task Force (APA-CDM/TF). While APA-CDM/TF had achieved the objectives of its Terms of Reference (TOR), and had been planned to be dissolved in 2019, the APA-CDM/TF/4 meeting had recommended extending the Task Force in ***Draft Decision AOP/SG/3-3: Proposal for Amendment of the APA-CDM/TF TOR***, for consideration by APANPIRG/30

6.3 The outcomes from AOP/SG working groups included *inter alia* the draft *Asia/Pacific Regional Guidance on Aerodrome Operations Personnel Competency*, scheduled for finalization in June 2020, the development of a set of survey questionnaires to analyze problems, issues and deficiencies in wildlife hazard management, and the model TOR and composition of the National Wildlife Hazard Management Committee (NWHMC) for establishment by States.

6.4 India and Afghanistan requested an exemption to the certification requirements for military aerodromes used by civil aircraft. ICAO responded that the certification requirements were applicable to any aerodrome served by international scheduled traffic.

6.5 The meeting noted that 43 aerodromes used for international operations in the Asia/Pacific Region (approx. 15%) were yet to be certified, and the majority of APAC States had not yet published in their national AIP the status of certified aerodromes, as required under ICAO Annex 14 Aerodromes, Doc 9981 PANS-Aerodromes and Doc 10066 PANS-Aeronautical Information Management (PANS-AIM). AOP/SG/3 had agreed to Draft Conclusion AOP/SG/3-7: Certification of aerodromes used for international operations in Asia/Pacific States. APANPIRG ANS Deficiencies would be raised against several criteria in the event that States did not take all necessary action on certification of aerodromes.

AIS – AIM Implementation Task Force Outcomes (WP31)

6.6 The meeting was informed by the Secretariat of the outcomes of the Fourteenth Meeting of the ICAO Aeronautical Information Services (AIS) – Aeronautical Information Management (AIM) Implementation Task Force (AAITF/14, Bangkok, Thailand, 20 to 24 May 2019). A total of 89 participants attended the meeting, which considered 25 WPs, 14 IPs, 15 presentations and two flimsies. AAITF/14 formed six Draft Conclusions for consideration by ATM/SG.

AIS-AIM-Related APANPIRG ANS Deficiencies

6.7 AIS-related Air Navigation Deficiencies reviewed by the meeting included World Geodetic System 1984 (WGS-84) not implemented (12 States), AIP Format (two States) and Quality Management System (QMS) not implemented (22 States). No new deficiency was added to the list. One deficiency was deleted from the list at the AAITF/14 meeting – Cook Islands, WGS-84 not implemented. AAITF/14 had again been invited to note the ongoing, high level of concern about poor quality management of aeronautical information in the APAC Region, and the apparent lack of organizational priority for this safety-critical requirement.

Standardized Aeronautical Information

6.8 IATA observations and recommendations to AAITF/14 for the improvement of delivery of aeronautical information, citing the need to ensure all aeronautical information was accurate, correctly updated and easily accessible by airspace users. The meeting agreed to the following Conclusion:

Conclusion ATM/SG/7-11: Standardized Aeronautical Information

That, noting:

1. previous APANPIRG Conclusions 23/8, 24/19 and 28/7, and ATM/SG Conclusion 6/14;
2. lack of conformance of many States with the provisions of Annex 15 and PANS-AIM on the presentation and promulgation of aeronautical information; and
3. the safety-critical requirement for standardized presentation and content of aeronautical information;

States are urged to immediately take all necessary steps to fully review all aeronautical information products and rectify errors and omissions, to ensure full compliance with the provisions of Annex 15 Chapter 5 and PANS-AIM Chapter 5.

Regional AIM Implementation Progress

6.9 Regional AIM transition progress reporting continued to be poor. Only 14 Administrations had provided updated information in the period since AAITF/13. Regional AIM transition measured against Phase 1 of the ICAO Roadmap for Transition from AIS to AIM was approximately 74%, which was unchanged from AAITF/13. Phase 2 AIM transition progress was 42%, compared to 39% at AAITF/13.

6.10 AAITF/14 was informed that a cross-referencing of reported implementation steps had found that in some cases 100% implementation had been reported for transition steps that were heavily dependent on other steps, in which only minimal, or zero, implementation had been reported. The Administrations concerned – Bhutan, China, Macao China, Fiji, Nepal, Pakistan, Papua New Guinea, Republic of Korea, Tonga and USA had been requested to review their reported progress.

6.11 Twenty-six Administrations had provided information on the status of implementation of the performance expectations of the Asia/Pacific Regional Plan for Collaborative AIM. Overall regional implementation of AIM Capability Phase I (immediate implementation) and Phase II (expected implementation 07 November 2019) were 48% and 40% respectively. AAITF/14 had agreed to a proposal to consolidate the two separate regional AIM implementation status monitoring and reporting processes into one.

6.12 Known AIS/AIM compliance status measured against the relevant Universal Safety Oversight Audit Programme (USOAP) protocol questions was 64%, representing a 2% improvement since AAITF/13. However, performance recorded against AIS Quality Management-related PQs was only 46%.

6.13 The following States had either not reported progress in the implementation of electronic AIP (eAIP, **Conclusion APANPIRG 24/19 Electronic AIP** referred), or were requested to provide updated information on their eAIP website status, noting a range of problems related to access limitations and missing aeronautical information:

Bhutan, Brunei Darussalam, Cambodia, DPR Korea, Kiribati, Lao PDR, Marshall Islands, Micronesia, Nauru, Nepal, Pakistan, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Timor Leste, Tonga, Vanuatu and USA.

ICARD

6.14 The meeting was informed of the International Codes and Route Designators (ICARD) application and participation by APAC Administrations, and on procedural issues related to the allocation of waypoint names for flight procedures and ATS routes. **Figure 7** illustrated the number of duplicated 5LNC published in the AIP of APAC Administrations, and the number that APAC Administrations were required to replace.

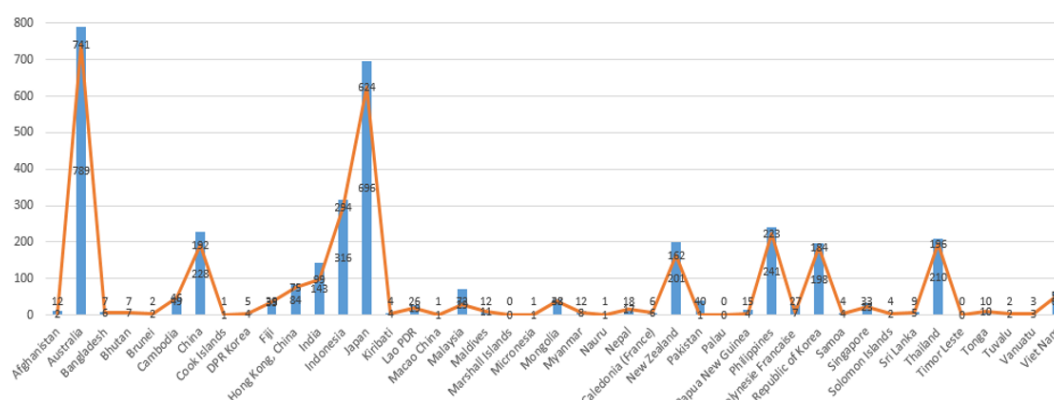


Figure 7: Duplicated 5LNC, and Number of Duplicated 5LNC requiring replacement by APAC States

6.15 The Secretariat further informed the meeting that in 2018 there were 3905 duplicated 5LNC globally, of which 2718 were in the APAC Region. 2292 were currently duplicated in the APAC Region. Pakistan had replaced all duplicated 5LNCs in their FIRs, and India, Philippines and Lao PDR had replaced all duplicates within 1,000 NM.

Space Vehicle Launch and Re-Entry

6.16 Two examples of space vehicle launch and re-entry events highlighted the need for fully coordinated notification well in advance of the launch operation, and appropriate operational response by States receiving the notification. Information had been distributed by AFTN message by China on 29 April 2019 and 22 May 2019 notifying other States of the areas affected by space vehicle re-entry debris, and the timing. In both cases, the notification did not meet the expectations of the APANPIRG-agreed Asia/Pacific Seamless ATM Plan (version 2, element 7.60), and little or no operational action was taken by two of the affected States until prompted by the ICAO Regional Office, which only became aware of the issue at very late notice.

6.17 Noting that AAITF/14 was informed that an upper management approval process was applied within some affected States when dealing with matters of political or diplomatic concern, which had led to significant delays in the operational response, the Secretariat had informed the meeting that matters related to the effect ballistic launch and space vehicle re-entry operations may have on the safety, security, and national integrity of affected States were beyond the scope of an ICAO technical meeting.

6.18 China informed the meeting that these spaceflight activities had been coordinated with affected States by the Ministry of Foreign Affairs of China. However, ICAO was particularly concerned that the necessary direct coordination between the ATS authorities for the FIRs as required in Annex 11 Section 2.19.1 had not occurred, and it appeared that the receipt of the notification did not prompt an immediate *operational* response by the States concerned to ensure appropriate ATC and NOTAM Office action. China pointed out that due to technical reasons, the relevant ballistic launch advance notification procedures expected by the *Seamless ATM Plan* and APANPIRG Conclusions were sometimes not feasible.

6.19 AAITF/14 was also informed that an AIS unit could not publish NOTAMs arbitrarily based on another State's unilateral AFTN message. Such NOTAMs could only be published as directed by the ATS authority for the FIR. The meeting agreed to the following Conclusion for consideration by APANPIRG/30:

Draft Conclusion ATM/SG/7-12: Ballistic Launch and Space Re-Entry Notification and Response

That, States are urged to:

1. Comply with Asia/Pacific Seamless ANS Plan provisions for advance notification of ballistic launch and space re-entry activities;
2. Ensure that, in addition to the coordination specified in Annex 11, and in the Asia/Pacific Seamless ANS Plan, all notifications for ballistic launch and space re-entry are addressed to:
 - a) the ATC Centres in Charge of all affected Flight Information Regions; and
 - b) the International NOTAM Office of all affected Flight Information Regions; and
3. Ensure that NOTAMs are promulgated and tactical coordination undertaken for the management of affected airspace and traffic, immediately on receipt of notification from another State, and on receipt of any notification of changes or cancellation.

6.20 These two events, and two earlier events affecting Lao PDR and Myanmar, had both resulted in space vehicle debris being found.

Management of NOTAMS

6.21 The meeting was informed of information provided by Viet Nam and the ICAO Asia/Pacific Regional Office on the numbers of permanent (PERM) NOTAMS found in surveys of PERM NOTAMS older than three months. While there had been a partial reduction in the numbers of NOTAMS, a sample Pre-flight Information Bulletin (PIB) provided by Viet Nam held 86 pages of NOTAMS which, due to its sheer scale, was rendered totally meaningless to pilots. It was entirely un

6.22 It was noted that the proliferation of NOTAMS, including PERM NOTAMS that should have long since been migrated into AIP, was largely the result of poor quality management by the data originator and the AIS, poor planning by data originators, poor understanding of AIS and its products among data originators and senior managers of the AIS, and poor senior management support for the AIS. In addition, the misuse of NOTAMS for publication of information which was required under Annex 15 and PANS-AIM provisions to be published by AIP Amendment constituted a safety risk, and every effort would be undertaken to eliminate it.

NOTAM for Flexible Use of Airspace

6.23 Following on from discussion at the ATM/SG/6 meeting in August 2018 where India, Japan and Thailand had jointly presented a working paper on the subject of NOTAM templates for Flexible Use of Airspace (FUA), the meeting agreed to the following Conclusion drafted by AAITF/14:

Conclusion ATM/SG/7-13: NOTAM Format for FUA Operation

That,

1. States are urged to use the NOTAM templates provided in **Appendix I to the Report** for promulgation of Flexible Use of Airspace information; and
2. The Flexible Use of Airspace NOTAM Templates be uploaded to the Asia/Pacific Regional Office eDocuments web-page, and included in the next update of the Asia/Pacific Region Operating Procedures for Aeronautical Dynamic Data.

Addressing Issues Related to Multi-Part NOTAM Checklist

6.24 The meeting was informed of issues associated with processing monthly NOTAM checklists which were issued in multiple parts. A typical example had been provided to AAITF/14 by Singapore, wherein a multi-part NOTAM Checklist NOTAM was missing the multi-part indicator, and was also missing items Q) to C) in its second and later parts. This had previously resulted in the NOTAMS listed in the second and later parts being automatically deleted from the NOTAM database, prior to a system re-configuration that re-directed non-compliant Checklist NOTAM to the operator queue. This solution was not sustainable in the long term, as operations progressed towards the more digitized, automated information exchange environment.

6.25 The meeting agreed to the following Conclusion:

Conclusion ATM/SG/7-14: Format for Multi-Part NOTAMS

That, States are urged to ensure that all multi-part NOTAMS, including multi-part NOTAM checklist NOTAMS, conform with the format described in the ICAO Guidance Manual for AIS in the Asia/Pacific Region.

Issue on Implementation of Data Catalogue

6.26 The meeting was informed of difficulties that had arisen in relation to the use of the data catalogue introduced in the new PANS-AIM. It was noted that there were times when data originators would not be aware of the data catalogue or how to complete it, and where AIS did not necessarily understand the information being provided. Noting there was a need for information sharing in this regard, the meeting agreed to the following Conclusion:

Conclusion ATM/SG/7-15: Aeronautical Data Catalogue

That, States are urged to:

1. utilize the Asia/Pacific Region AIM Information Sharing Website at <http://aim-tracking.org/> to share information and experience of the use of the Aeronautical Data Catalogue; and
- 2 participate in a Data Catalogue workshop activity, to be conducted in conjunction with the AAITF/15 meeting in 2020.

Amendment to the Regional AIM Plan – Consolidation of Performance Expectations

6.27 AAITF/14 had agreed to a proposed amendment to the Regional Plan for Collaborative AIM, consolidating its performance expectations to include relevant elements from the ICAO Roadmap for Transition from AIS to AIM, and updating the Regional AIM Plan Monitoring and Reporting Form.

6.28 The meeting agreed to the following Conclusion:

Conclusion ATM/SG/7-16: Amendment to the Regional Plan for Collaborative AIM

That,

1. the Amendment to the Regional Plan for Collaborative AIM at **Appendix J to the Report** be adopted, and the amended Plan be posted on the ICAO Asia/Pacific Regional Office eDocuments web-page;
2. the revised Regional AIM Implementation Status Reporting Form (Appendix D to the Regional Plan for Collaborative AIM) be separately uploaded to the Regional Office eDocuments web-page for implementation reporting by Asia/Pacific Administrations:
 - a) immediately on adoption of this Conclusion; and then;
 - b) annually, by not later than 30 April each year; and
3. Asia/Pacific Regional reporting against the transition steps in the ICAO Roadmap for Transition from AIS to AIM be discontinued, and the AIM Transition Table be removed from the Regional Office eDocuments web-page.

*Note: This Draft Conclusion supersedes **Conclusions APANPIRG 22/2 and APANPIRG/25-15.***

6.29 The merged regional data from the AIM Transition Table (discontinued) and the Regional AIM Plan reporting form was provided in **ATM/SG/7 WP31 Attachment F**.

AIM Reports

6.30 AIM Reports had been prepared for each Asia/Pacific Administration. This Regional Office activity was an extension of a similar activity conducted at the Ninth Meeting of the South Asia Indian Ocean ATM Coordination Group (SAIOACG/9) and 26th Meeting of the Southeast Asia ATS Coordination Group (SEACG/26), held in Bangkok, Thailand in March 2019. The AIM Reports were available on the AAITF/14 meeting web-page for the information of all Asia/Pacific Administrations:

<https://www.icao.int/APAC/Meetings/Pages/2019-AAITF14.aspx>

Outcomes from ICAO/EU AIS to AIM Workshops

6.31 In a collaborative effort between ICAO and the European Union, two workshops targeting sub-regional groups of States were held in June 2019 at the ICAO Asia/Pacific Regional Office in Bangkok. The workshops were primarily aimed at the service delivery level of AIS, and would therefore be mutually complementary to the planned FAA workshop on effective safety oversight of AIS (see separate IP).

6.32 At the ICAO/EU workshops, ICAO had introduced discussion on Results-Based Implementation support mechanisms. States were requested to register interest in either receiving AIM Go-Team support, or providing experts to participate in Go-Teams.

SNOWTAM Changes (FL03)

6.33 ICAO provided information on significant changes to SNOWTAM which would be applicable from 05 November 2020, and issues related to SNOWTAM validity and criteria for issuance of a new SNOWTAM. The issues included concerns around the potential for States to have implemented different SNOWTAM validity times before 05 November, and the use of SNOWTAM in response to runway surface conditions that were not associated with snow, slush or ice.

Evaluation of Quality Management System - AIM (WP32, PR06)

6.34 ICAO presented an initiative to evaluate Quality Management Systems QMS in the AIS/AIM field, noting that non-implementation featured prominently in APANPIRG ANS Deficiencies.

6.35 Evaluation of AIS/AIM QMS would be conducted annually, while the ICAO Regional Office has the necessary AIS/AIM resources in place, and reported to relevant ICAO meetings such as the AAITF, ATM/SG and APANPIRG. The evaluation would consist of a standardized scoring of State-reported data, user reviews (provided by international organizations), and an ICAO review of USOAP EI scores and examination of aeronautical information products.

Updating ICARD and Resolution of Duplicated 5LNCs (WP33)

6.36 India provided an update of action taken in regard to resolution of anomalies in the ICARD database and synchronization of ICARD with AIP India, and requested action by States sharing FIR boundaries with India to harmonize 5LNCs at the boundaries.

6.37 Of the 803 waypoints published in AIP India (735 in 2017), 663 were registered in ICARD (431 in 2017). Of the 663 waypoints registered in ICARD, the data of 20 did not match the data in ICARD (168). Neighbouring States were urged to expedite action to resolve ICARD anomalies associated with FIR boundary waypoints.

ATS Route Designation Issues (WP34, PR05)

6.38 EUROCONTROL, on behalf of the Europe (EUR) Region, presented information on identified issues in designation of ATS routes between adjacent ICAO Regions, and proposed ideas to extend existing route designators and resolve observed issues.

6.39 Examples were provided of the use of different route designators on the same route, on either side of an FIR boundary, and of multiple routes in single FIRs that could be rationalized, releasing route designators for use elsewhere. The use of route designators that were not assigned to Regions where they were used was also highlighted. A sampling of ATS routes published in the Asia/Pacific Region also revealed the use of supplementary letters that were not compliant with Annex 11 Appendix 1 paragraph 2.4. It was proposed that a route designator rationalization process be established and performed by all ICAO Regions.

6.40 In response to the proposal that ICARD be used as the database by all ICAO Regional Offices, the meeting was informed that apart from 26 ATS routes which were within the ICAO APAC block allocation but were assigned to other regions, Regional Office had populated ICARD with 411 Regional ATS routes. The Regional Office would take action to address specific issues within the limits of available resources.

Workshop on Building Effective Safety Oversight of AIS/AIM (IP14)

6.41 The meeting was informed of the Workshop on Building Effective Safety Oversight of AIS/AIM, to be conducted by the Federal Aviation Administration (FAA, USA) and the U.S National Geospatial-Intelligence Agency (NGA) from 13 to 17 January 2020. Asia/Pacific Administrations were encouraged to participate in the workshop.

Meteorology Issues Relevant to ATM (WP35)

6.42 The Secretariat provided a summary of discussions and outcomes from the Twenty-Third Meeting of the Meteorology Sub-Group of APANPIRG (MET SG/23, Bangkok, Thailand, 17 to 20 June 2019), and invited the meeting to consider consequential requirements for action in relation to updates to regional guidance material.

6.43 The meeting was also invited to endorse proposals for States to progress implementation of MET information in Meteorological Information Exchange Model (IWXXM) form and preparation for future discontinuation of MET information in traditional alphanumeric code (TAC) form, and endorse proposed updates to the MET SG TOR and work plan.

6.44 It was noted that, following the Annex 3 support for discontinuation of MET information in TAC form in 2026, it was anticipated that states may individually or bilaterally determine whether to continue providing TAC-form information for local needs.

6.45 Information was provided on, *inter alia*, improvements to the availability of MET SG meeting documents, follow-up on outcomes from MET SG/22, outcomes from the ICAO Meteorology Panel, a review of the progress of MET SG contributory bodies, the introduction of space weather advisory information services, the update to the Regional SIGMET Guide, the development of regional guidance for the alignment of cross-FIR-boundary SIGMET information, and initiatives to strengthen MET/ATM collaboration within the APANPIRG forums.

6.46 In response to a query, the meeting was informed that ICAO intended to issue a State Letter or Electronic Bulletin to promote awareness of space weather advisory information once it has confirmed the service will start in November 2019. Other information on space weather was available in ICAO Docs 8896, 9377 and 10100.

Updates from the Asia Pacific Volcanic Ash Exercises Steering Group (VOLCEX/SG) (FL06)

6.47 The meeting was provided with an update from the Sixth Meeting of the Asia and Pacific Volcanic Ash Exercises Steering Group (APAC VOLCEX/SG/6, Bangkok, Thailand, 20 to 21 June 2019). Information provided included summaries of the outcomes of VOLCEX 18/02 and 19/01, and the planned VOLCEX 19/02 and 20/01.

Development of APAC User Requirements For Swim-Based Met Information Services Supporting ATFM (WP36)

6.48 On behalf of Australia, Hong Kong China and Thailand, Thailand presented recent global and regional developments related to MET and ATM based on the SWIM concept and a proposal to develop a regional document for SWIM-based MET information services specifically to support ATFM in the Asia/Pacific Region. The Eighth Meeting of the ICAO APAC Meteorological Requirements Working Group (MET/R WG/8) recognized a need for a regional document for SWIM-based MET information services to support ATFM, in conjunction with relevant global documents.

6.49 The meeting was informed of the SWIM-based MET information service described in the Plan for Meteorology in System-Wide Information Management (the MET-SWIM Plan) being developed by the ICAO Meteorology Panel Working Group on Meteorological Information Exchange (WG-MIE), which outlined the concepts of how MET information should be exchanged in the SWIM environment. Further information was provided on potential benefits of SWIM-based MET information services.

6.50 MET/R WG/8 had agreed to develop a regional reference document that would specifically address APAC needs for SWIM-based MET information services to support ATFM, which was supported by **Decision MET SG/23-7: Development of APAC User Requirements for SWIM-based MET Information Services Supporting ATFM**. The meeting was invited to support the proposal in the Decision by encouraging subject matter experts from ATFM/SG to participate in an ad-hoc group to develop use cases and user requirements for future SWIM-based MET information services supporting ATFM.

Asia/Pacific Search and Rescue Update (WP37)

6.51 ICAO provided a brief on the outcomes of the Fourth Meeting of the Asia/Pacific Regional Search and Rescue Work Group (APSAR/WG/4, 14 – 17 May 2019, Bangkok, Thailand).

6.52 The APSAR/WG/4 had discussed the Global Aeronautical Distress and Safety System (GADSS), as provisions related to aircraft tracking, contained in Annex 6 – *Operation of Aircraft*, Part I paragraph 3.5 became applicable on 08 November 2018. It was noted that the Distress Tracking Data Repository (DTR) was planned as a centrally managed data storage facility for the Autonomous Distress Tracking (ADT) component of the GADSS, applicable from 1 January 2021.

6.53 As a result of discussion on GADSS ADT, the ATM/SG/7 meeting agreed to the following Conclusion on GADSS preparedness that had been developed by the APSAR/WG/4:

Conclusion ATM/SG/7-17: Preparation for GADSS ADT Phase

That, due to the impending implementation of the Autonomous Distress Tracking (ADT) phase of the Global Aviation Distress and Safety System (GADSS) on 01 January 2021, States are urged to:

- 1) note the basic briefing material at **Appendix K to the Report**;
- 2) consider forming a national group of stakeholders that may be affected by ADT, including regulators, airlines, Air Navigation Service Providers (ANSPs), Search and Rescue (SAR) service providers;

- 3) consider the early development of procedures for ANSP and SAR operational personnel, including coordination with adjacent States; and
- 4) consider the requirement for briefing material and training (including simulations) for operational staff.

6.54 During 2018, 406 MHz interference had been reported in parts of the Asia/Pacific, such as China, India, Japan, Malaysia, Pakistan, Papua New Guinea and ROK. In response to a question from China, the meeting noted that States should check with their Mission Control Centres (MCCs) for more information about interference reports as the data originated with the MCC.

6.55 The meeting noted that there had been no Asia/Pacific States with non-responsive or rarely responsive national SAR Points of Contact (SPOCs) during recent regular testing of Mission Control Centre (MCC)/SPOC communications.

6.56 The APSAR/WG/4 had discussed the predominance of beacon false alerts being generated by the aviation sector. In 2018, 96.85% of all Emergency Locator Transmitter (ELT) alerts had been false. The meeting noted that of those where a cause could be determined, more than 58% of ELT false alerts came from ‘beacon mishandling’ (normally either in maintenance or disposal). One in every 22 ELTs had produced a false activation, a disproportionate level compared to one in 530 Personal Locator Beacons (PLBs). In 2017, Australia had experienced 171 incidents of self-activating beacons that had been incorrectly disposed of, resulting in over AUD1.5 million spent on unnecessary searches.

6.57 ICAO had asked how effective the education had been to reduce false alerts, which Australia noted were about 10% less than the world average, but was still too high. As this high level of false alerts had not been reducing and caused significant resource issues to the SAR system, ICAO asked if States had considered the need for enforcement action such as penalties for repeated false alerts from the same company or individual. Australia stated that this was a matter for State aviation regulators to consider.

6.58 Mongolia had described a cross-border SAR response by Mongolia to support an aborted manned rocket mission Soyuz MS-555 on 11 October 2018 that had been launched from the Baikonur cosmodrome in Kazakhstan. The APSAR/WG/4 meeting noted with appreciation that this successful response to a highly unusual cross-border SAR emergency had been due to the diligence of both States, as they had conducted several Joint SAR Exercise (SAREX) in the past.

6.59 The SAR Plan-based 41 element assessment compliance as at July 2019 is indicated at **Figure 8**. ICAO had recalled that States below 90% implementation by 2019 would be considered to have a SAR deficiency at that time, so a large number of States were urged by the APSAR/WG/4 to continue their efforts to fully implement the Asia/Pacific SAR Plan (ATM/SG/7/WP39 refers).

ATM/SG/7 Report on Agenda Items

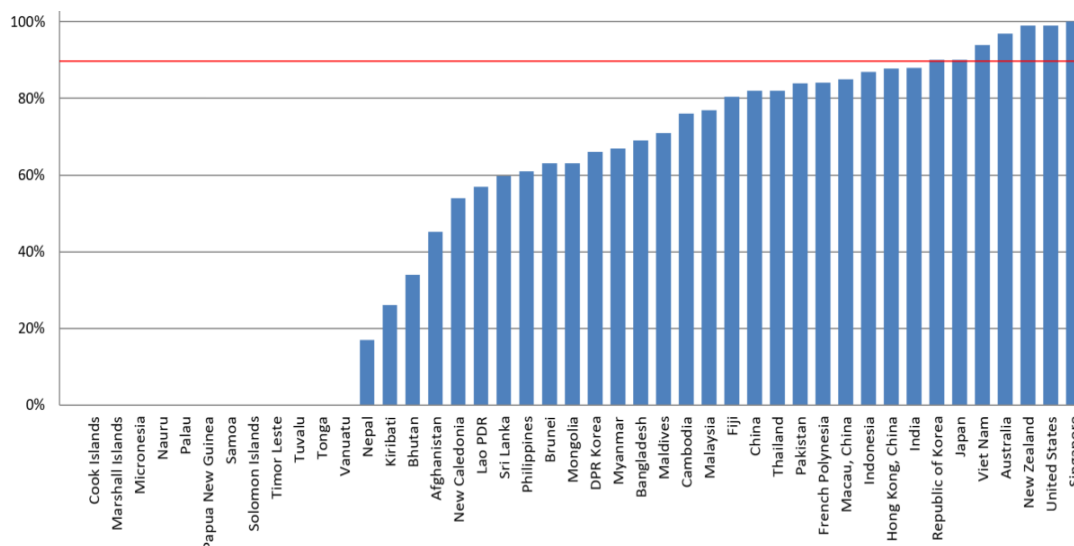


Figure 8: Asia/Pacific SAR Plan Implementation Status (as at July 2019)

6.60 The APSAR/WG/4 had undertaken an extensive review of the draft Asia/Pacific SAR Plan. The meeting had developed the following Conclusion, which was agreed by the ATM/SG/7 meeting:

Conclusion ATM/SG/7-18: Asia/Pacific SAR Plan Update

That, the Asia/Pacific SAR Plan be amended as Version 3.0 in accordance with **Appendix L to the Report**.

An Update of the Signing of SAR LOA Between Laos and Thailand (FL04)

6.61 Lao PDR provided an update to the meeting on the completion of a SAR Letter of Agreement (LOA) with Thailand.

Agenda Item 7: Air Navigation Service Deficiencies

State Update on Actions to Address ANS Deficiencies (WP38)

7.1 Maldives presented an update on actions to correct ANS Deficiencies and other implementation efforts. In addition to a brief outline of actions on ANS Deficiencies, the Maldives provided information on activities in the resolution of 5LNC duplication, the eANP FIR SRR Review, and RNP approach chart identification.

Air Navigation Service Deficiencies List (WP39)

7.2 The current confirmed ANS Deficiencies as at APANPIRG/29 are shown in **Figure 9**:

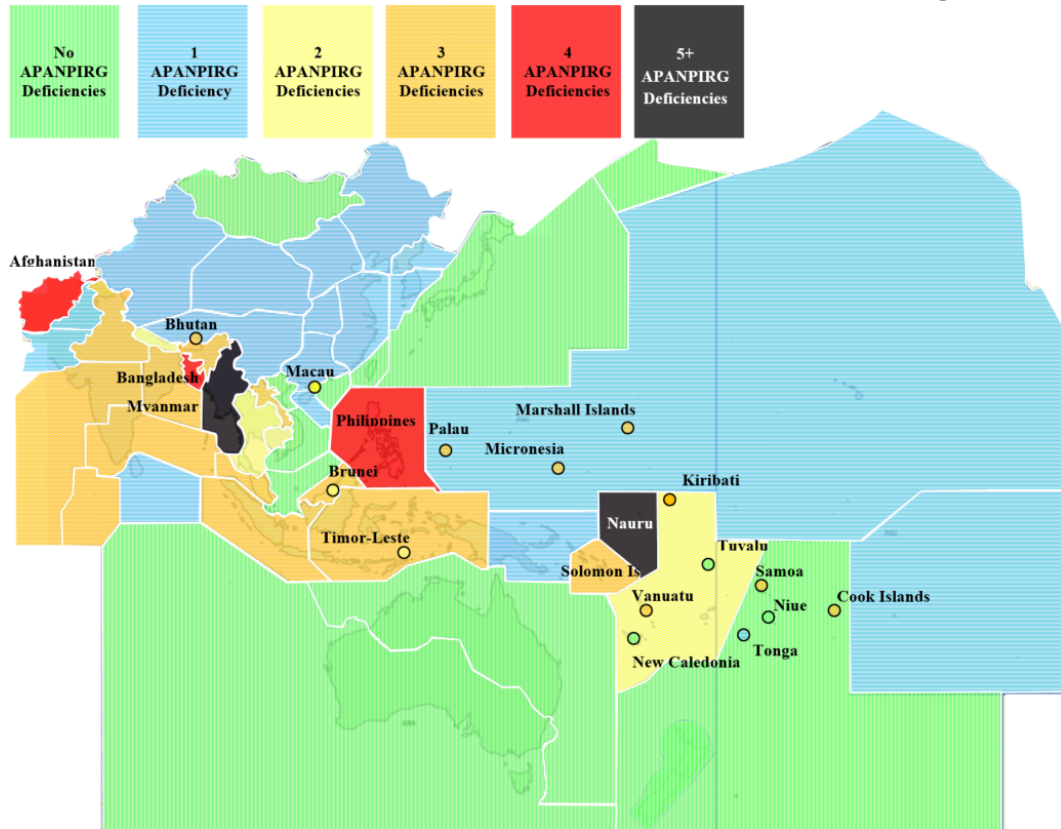


Figure 9: APANPIRG/29 ANS Deficiencies

7.3 The meeting reviewed and discussed the ATM/AIS/SAR Deficiency List included as **Appendix M** and agreed to forward the list for consolidation and presentation by APANPIRG/30.

7.4 The APSAR/WG/4 had noted that unless the data was updated to reflect an improved compliance, the following States and Administrations would be recommended for APANPIRG Deficiencies in the area of SAR at the ATM/SG/7, for consideration by APANPIRG/30, based on the 90% compliance benchmark agreed by the APSAR/WG/3 (* = States and Administrations with new potential SAR Deficiencies):

Afghanistan, Bangladesh*, Bhutan, Brunei*, Cambodia, China*, Macau China*, Cook Islands, Democratic People's Republic of Korea (DPRK), Fiji, French Polynesia*, India*, Indonesia*, Kiribati, Lao People's Democratic Republic (PDR), Maldives, Malaysia*, Marshall Islands, Micronesia, Mongolia*, Myanmar, Nauru, Nepal, New Caledonia*, Pakistan*, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka*, Thailand*, Timor-Leste, Tonga and Vanuatu.

7.5 Fiji informed the meeting that Nauru had completed an AIP, and would facilitate contact between Nauru and ICAO to remove the APANPIRG Deficiency.

7.6 The meeting discussed the IFALPA Deficiencies. IFALPA was encouraged to ensure that issues were raised to the States concerned in a timely manner (within a month) and discuss the matter with the ANSP concerned to obtain confirmation, as data may not be available after that.

Agenda Item 8: Update the ATM Task List

APANPIRG ATM Subgroup Task List (WP40)

- 8.1 The meeting agreed to the updated Task List included as **Appendix N**.
-

Agenda Item 9: Any Other Business

ATM Security (WP41)

- 9.1 ICAO provided information related to general ANSP security requirements contained in the 10 Edition (Amendment 15) of Annex 17 – *Security*, and specifically, the establishment of cyber security guidance material and resources. The meeting noted that a new Amendment 16 to Annex 17 – *Security* had been approved by the ICAO Council, with an applicable date of 16 November 2018.

ICAO RSO Activities (IP15)

- 9.2 The ICAO Asia/Pacific Regional Sub-Office (APAC RSO), established in June 2013 with the aim of providing implementation support assistance to APAC States and Administrations in ATM enhancement, presented an update on its recent activities, and proposed future activities. Information was provided on the means of action, recent and future activities in Civil-Military Cooperation CMAC and Flexible Use of Airspace, PBN, Ground-Based Augmentation Systems (GBAS) and Satellite-Based Augmentation Systems (SBAS), and future activities in ATFM and A-CDM.

ATM Points of Contact Update (WP42)

- 9.3 The Secretariat presented the current ATM Points of Contact List (**Appendix O**), and requested that administrations update this information as required.
-

Agenda Item 10: Date and venue for the next meeting

ATM/SG/7

- 10.1 The tentative timeframe and venue for the ATM/SG/8 was August 2020, Bangkok, Thailand.

Closing

- 10.2 The Chairman thanked the meeting participants for their valuable contributions.
-

List of Participants

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34.	UNITED ARAB EMIRATES (2)			
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WORKING PAPERS

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AI1 WP01	Provisional Agenda	Secretariat
AI2 WP02	APANPIRG Outcomes	Secretariat
AI2 WP03	RASG and APRAST Meeting Outcomes	Secretariat
AI2 WP04	Conference of Directors General of Civil Aviation Outcomes	Secretariat
AI3 WP05	FIT-Asia and RASMAG Outcomes	Secretariat
AI3 WP06	Seamless ATM Reporting and Monitoring Update	Secretariat
AI3 WP07	RAPMFSWG Outcomes	China
AI3 WP08	Performance Management in the Asia/Pacific and Beyond	Singapore
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AI4 WP11	Air Traffic Flow Management Steering Group Outcomes	Secretariat
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AI4 WP16	SID STAR New Procedures	Secretariat
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AI5 WP21	Afghanistan and Tajikistan ATS Route Proposals	ICAO EUR/NAT on behalf of Afghanistan and Tajikistan
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AI5 WP23	AIRARD/TF TORs and Task List ⁺	Secretariat
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AI5 WP25	Regional ATM Contingency Planning and Status Reporting	Secretariat
AI5 WP26	Prolonged Closure of the Lahore and Karachi FIRs Consequences	IATA
AI5 WP27	Inter-Regional Contingency Management	India
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AI6 WP30	AOP Subgroup Outcomes	Secretariat
AI6 WP31	AIS – AIM Implementation Task Force Outcomes	Secretariat
AI6 WP32	Evaluation of Quality Management System - AIM	Secretariat
AI6 WP33	Updating ICARD and Resolution of Duplicated 5LNCs	India
AI6 WP34	ATS Route Designation Issues ⁺	EUROCONTROL
AI6 WP35	Meteorology Issues Relevant to ATM	Secretariat
AI6 WP36	Development Of APAC User Requirements For Swim-Based Met Information Services Supporting ATFM	Australia, Hong Kong China and Thailand
AI6 WP37	Asia/Pacific Search and Rescue Update	Secretariat
AI7 WP38	State Update on Actions to Address ANS Deficiencies	Maldives
AI7 WP39	Air Navigation Service Deficiencies List*	Secretariat
AI8 WP40	APANPIRG ATM Sub Group Task List*	Secretariat
AI9 WP41	Air Traffic Management Security Requirements	Secretariat
AI9 WP42	ATM Point of Contact Update*	Secretariat

⁺AIRARD/TF Paper

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AI1 IP01	List of Tentative Working and Information Papers	Secretariat
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AI3 IP03	Development of TSD Application to Support TLS Data Collection and Assessment	Indonesia
AI4 IP04	PERTI: A CDM Model ⁺	USA
AI4 IP05	Implementation of A-CDM at Kolkata Airport	India
AI4 IP06	Capacity Enhancement Initiatives in the Hong Kong FIR	Hong Kong China
AI4 IP07	Ujung Pandang ACC Resectorization Program Phase III Achievements	Indonesia
AI4 IP08	Free Route Airspace Developments	EUROCONTROL
AI4 IP09	Long-Term Vision for Future Japanese Air Traffic Systems	Japan
AI4 IP10	Indonesia ATM Facilities Update	Indonesia
AI4 IP11	Proposed Use of Digital Tower Technology in New Zealand	New Zealand
AI4 IP12	SID/STAR Phraseology Implementation Update	Australia
AI5 IP13	Concept for Route Design – PBN Highways ⁺	India

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AI9 IP15	ICAO APAC RSO Activities	ICAO RSO

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AI4 FL01	Lao PDR AIDC Implementation Progress Report	Lao PDR
AI5 FL02	Civil-Military Coordination Update	Lao PDR
AI6 FL03	SNOWTAM Changes	Secretariat
AI6 FL04	An Update of the Signing of SAR LOA Between Laos and Thailand	Lao PDR
AI4 FL05	Introduction To the 'Three-Center Project' of ATMB CAAC	China
AI6 FL06	Updates from the Asia/Pacific Volcanic Ash Exercises Steering Group (VOLCEX/SG)	VOLCEX/SG Chair

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AI5 PR02	IATA Climate Change Discussion	IATA
AI5 PR03	Pakistan Airspace Return to Normal Operations	Thailand
AI5 PR04	Pakistan Airspace Impact	EUROCONTROL
AI6 PR05	ATS Route Designation Issues	EUROCONTROL
AI6 PR06	Evaluation of Quality Management System - AIM	Secretariat
AI3 PR07	ICAO Summary	Secretariat
AI5 PR08	ICAO Summary	Secretariat
AI4 PR09	Free Route Airspace Developments	EUROCONTROL
AI5 PR10	Inter-Regional Contingency Management	India
AI5 PR11	Afghanistan and Tajikistan Route Proposals	ICAO EUR/NAT on behalf of Afghanistan and Tajikistan

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INTERNATIONAL CIVIL AVIATION ORGANIZATION



ASIA/PACIFIC SEAMLESS ANS PLAN

Version 2.6, August 2019

This Plan was originally developed by the Asia/Pacific Seamless ATM Planning Group (APSAPG) and amended by APANPIRG

Approved by APANPIRG/30 and published by the
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SCOPE OF THE PLAN

Plan Structure

1.1 The Seamless Air Navigation Service (ANS) Plan (hereinafter referred to as the ‘Plan’) references different levels. At the upper level is a global perspective, which is guided mainly by references to the *Global Air Navigation Plan* (GANP, Doc 9750), the *Global ATM Operational Concept* (Doc 9854) and the *Global Aviation Safety Plan* (GASP). Beneath this level is regional planning primarily provided by this Plan and other guidance material, in order to define goals and means of meeting State planning objectives, such as:

- Asia/Pacific Regional Air Navigation Plan (RANP, Doc 9673) objectives;
- the Seamless ANS performance framework, with a focus on technological and human performance within Aviation System Block Upgrade (ASBU) Block 0 elements, non-ASBU elements (mainly emanating from the Concept of Operations – CONOPS, which is regional guidance material endorsed by APANPIRG/22), and civil/military cooperation elements;
- a deployment plan with specific operational improvements, transition arrangements, expected timelines and implementation examples; and
- an overview of financial outcomes and objectives, cross-industry business and performance/risk management planning.

1.2 The Plan incorporated the Asia/Pacific Air Traffic Flow Management (ATFM) Concept of Operations and the Asia/Pacific Air Navigation Concept of Operations (both hereinafter referred to as ‘CONOPS’), and the Asia/Pacific PBN Plan, superseding these documents.

1.3 The RANP is expected to incorporate key components of this Plan and information on the mechanisms that enable these objectives to be met. High-level support may be necessary from regional bodies that can effectively support the Plan’s implementation, such as the:

- Association of Southeast Asian Nations (ASEAN);
- Asia Pacific Economic Cooperation (APEC); and
- South Asian Association for Regional Cooperation (SAARC).

1.4 The Plan does not use ‘continental’, ‘remote’ and ‘oceanic’ areas to refer to an assumed geographical application area, as many Asia/Pacific States have islands or archipelagos that can support a higher density of Communications, Navigation, Surveillance (CNS) systems than in a purely ‘oceanic’ environment. In accordance with the CONOPS that air navigation services should be provided commensurate with the capability of the CNS equipment, it is important to categorise airspace in this manner, and simplify the numerous references to this capability throughout the Plan. Thus the Plan categorises airspace by reference to its CNS (Communications, Navigation and Surveillance) capability as:

- a) Category R: remote en-route airspace with Air Traffic Services (ATS) HF or CPDLC communications and outside the coverage of ground-based surveillance coverage; or
- b) Category S: serviced (or potentially serviced) en-route airspace – by direct (not dependent on a Communication Service Provider (CSP) ATS communications and surveillance; or
- c) Category T: terminal operations serviced by direct ATS communications and surveillance.

- 1.5 The word ‘States’ in the Plan includes Special Administrative Regions and territories.
- 1.6 The Seamless ANS Plan is expected to be implemented in several phases. No phase, nor any element, is binding on any State, but should be considered as a planning framework. The Seamless ANS Plan itself is therefore guidance material.
- 1.7 It is important to note that the Plan’s Phase commencement dates are planning targets, and should not be treated like a ‘hard’ date such as the implementation of Reduced Vertical Separation Minimum (RVSM). In this case, there is a potential major regional problem if all States do not implement at the same time by the specific agreed date, which was clearly not the case for the start of the Plan’s Phase I or II.
- 1.8 In that regard, although it would have been ideal if all States achieved capability on day one of Phase I, this was probably not realistic. However, States should consider the impact on stakeholders and improving capacity of the ATM system overall by not achieving target implementation dates. The Phase dates were chosen as being an achievable target for the majority of States. However, the dates were not designed to accommodate the least capable State, otherwise the region as a whole would fall behind the necessary urgent ATM improvements required by the Director’s General of Civil Aviation and APANPIRG.

Plan Review

- 1.9 The Plan needs to be updated to take into account ASBU Block 1, 2 and 3 modules, when these modules and their associated technology become mature.
- 1.10 Periodic updates to the Plan are also required in respect of the economic information contained therein.
- 1.11 As an iterative process, the Plan requires regular updating to keep current with aviation system changes. It is intended that APANPIRG and its contributory bodies conduct a complete review every three years (or a shorter period determined by APANPIRG) of the Plan to align with the review cycle of the GANP. The Plan and its subsequent revisions should be endorsed by APANPIRG.
- 1.12 Review of the Navigation and Surveillance strategies needs to result in the update to the Seamless ANS Plan to ensure consistency.
- 1.13 The review of the Plan during 2019 deletes reference Phase I as Phase II commenced in November 2019, although the uncompleted elements from Phase I were moved to Phase II. The implementation dates of Phase II PARS and PASL items align with the GANP Block 1 implementation, whereas Phase III is a mid-Block update scheduled for 2022.
- 1.14 The 2019 update of the Plan introduces new ASBU Block 1 modules. Phase III and Phase IV of the PARS and PASL implementation framework will also be referenced.

PLAN OBJECTIVES AND DEVELOPMENT

Plan Objective

2.1 The objective of the Plan is to facilitate Asia/Pacific Seamless ANS operations, by developing and deploying ATM solutions capable of ensuring safety and efficiency of air transport throughout the Asia/Pacific region. The Plan provides a framework for a transition to a Seamless ANS environment, in order to meet future performance requirements.

2.2 The Plan provides the opportunity for the Asia/Pacific region to adopt the benefits from research and development conducted by various States including the NextGen programme (United States of America), the European Single European Sky ATM Research (SESAR), and Japanese Collaborative Actions for Renovation of Air Traffic Systems (CARATS).

2.3 ICAO Doc 9854 contains a vision of an integrated, harmonized, and globally interoperable ATM System, with a planning horizon up to and beyond 2025. In this context, the Plan is expected to encourage more partnering relationships among States within sub-regions.

Hierarchy of Plans

2.4 The Plan was developed as part of a suite of Asia/Pacific air navigation plans, and thus, the Plan should not be considered in isolation. The Regional Air Traffic Flow Management (ATFM) Framework, Asia/Pacific Plan for Collaborative AIM, Asia/Pacific ATM Contingency Plan, Asia/Pacific Search and Rescue (SAR) Plan and Asia/Pacific Airport Collaborative Decision Making (A-CDM) Implementation Plan all form part of the aforementioned suite of planning and guidance material connected to the Plan (**Figure 1**).

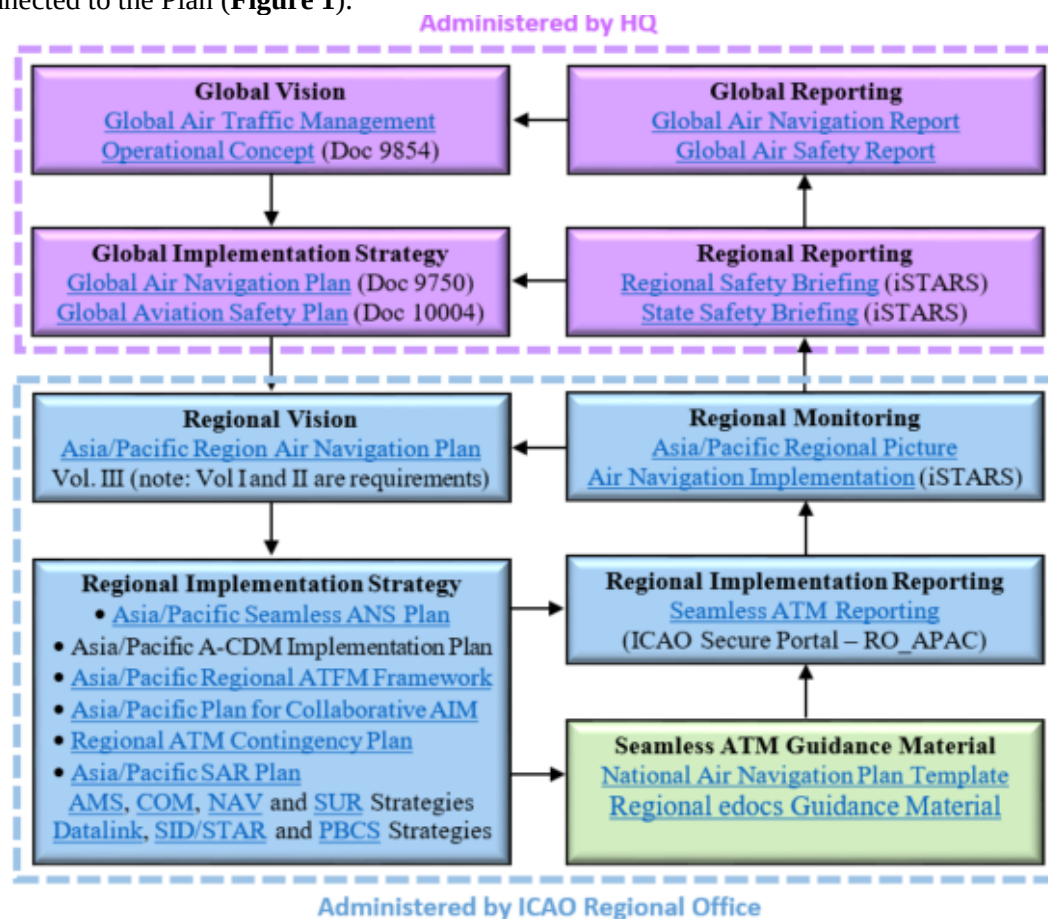


Figure 1: Structure of Global and Regional Planning and Reporting

2.5 This Plan addresses the full range of ATM stakeholders, including civil and military Air Navigation Services Providers (ANSPs), civil and military aerodrome operators as well as civil and military airspace users. The Plan has been developed in consultation with Asia/Pacific States, administrations and also with International Organizations (IOs).

Note: civil airspace users include scheduled aviation, business aviation, general aviation and Unmanned Aircraft System (UAS) operators.

2.6 States should consult with stakeholders and determine actions, in order to commit to achieving the objectives of Seamless ANS and the requisite performance objectives in the areas of safety, environment, capacity and cost-efficiency that flow from this Plan.

2.7 ASBU Block 0 modules contained technologies, systems and procedures which were expected to be available from 2013. The Plan also has references to ASBU Block 1, 2 and 3 modules, which are expected to be available from 2019, 2025 and 2031 respectively. Where such technology, systems, standards and procedures are available earlier than these dates and appropriate deliverables can be provided, the intention was to develop aggressive yet practical implementation schedules within this Plan in order to provide the earliest possible benefits.

2.8 The ICAO *Manual on Global Performance of the Air Navigation System* (ICAO Doc 9883) provides guidance on implementing a performance-oriented ATM System. The *Manual on ATM System Requirements* (ICAO Doc 9882) contains eleven Key Performance Area (KPA) system expectations, as well as a number of general performance-oriented requirements. In accordance with the expectations of these documents, the APSAPG developed the following performance objectives to facilitate Seamless ANS operations:

- a) Preferred Aerodrome/Airspace and Route Specifications (PARS); and
- b) Preferred ATM Service Levels (PASL).

2.9 The PARS/PASL introduced two Performance Objectives, which incorporate system expectations, such as general performance-oriented requirements. Each performance objective is composed of a list of expectations of different aspects of the aviation system.

2.10 In considering the planning necessary before the PARS/PASL Phase dates, it is important to ensure everyone in the planning process is aware that the necessary groundwork and capability building must take place as a priority, and that full operational capability by the Phase date commencement was a secondary consideration. It is recognised that some States would be working towards implementation during the Phase, in an effort to implement as soon as possible, and others that implemented as soon as the technology and systems were available.

2.11 Prior to implementation, each State should verify the applicability of PARS and PASL by analysis of safety, ATM capacity requirements to meet current and forecast traffic demand, efficiency, predictability, cost effectiveness and environment to meet the expectations of stakeholders. The PARS/PASL elements would be either:

- a) not applicable; or
- b) already implemented; or
- c) not implemented.

2.12 The PARS and PASL were expected to be implemented in four phases, Phase I by 12 November 2015 (past), Phase II by 07 November 2019, Phase III by 03 November 2022 and Phase IV in 27 November 2025.

2.13 The PARS contains expectations for airspace and ATS routes, including aircraft equipage to facilitate Seamless ANS operations, and are primarily for the State regulator and airspace authority,

and are of interest to airspace planners, flight procedure designers and aircraft operators.

2.14 The PASL contain the expectations for Air Navigation Service Providers (ANSP), and is therefore a matter for the State regulator or the ATS authority. The PASL is of primary interest to ANSPs and aircraft operators. The PARS and PASL together form the foundation of Seamless ANS development, and as such should be enabled by national regulations, rules and policies wherever applicable to enable a harmonised effort by all stakeholders.

Seamless ATM Definition

2.15 The objective of Seamless ATM was agreed by the Asia/Pacific Seamless ATM Planning Group (APSAPG) as follows:

The objective of Seamless ATM is the safe and interoperable provision of harmonized and consistent air traffic management service provided to a flight, appropriate to the airspace category and free of transitions due to a change in the air navigation service provider or Flight Information Region.

2.16 The APSAPG noted the following description as the CANSO definition of Seamless ATM:

Seamless ATM operations is defined as ATM operations in contiguous airspace that is technically and procedurally interoperable, universally safe, and in which all categories of airspace users transition between Flight Information Regions, or other vertical or horizontal boundaries, without requiring a considered action to facilitate that transition and without any noticeable change in:

- 1) Type or quality of service received;*
- 2) Air navigation and communications performance standards; and*
- 3) Standard practices to be followed.*

Note: the term 'Seamless ATM' was amended to 'Seamless ANS' in 2019, to reflect the fact that there are areas such as aerodromes that are not part of the Air Traffic Management field.

2.17 The ICAO Twelfth Air Navigation Conference (AN-Conf/12, Montreal, 19-30 November 2012) endorsed 10 High Level Air Navigation Policy Principles in the GANP, and the Asia/Pacific Seamless ANS Principles are aligned with these high level principles.

EXECUTIVE SUMMARY

Seamless ANS

3.1 Aviation is a significant driver of economic growth in the and contributes strongly to the economic wellbeing of the diverse cultures and people in the Asia/Pacific region. In 2016 aviation contributed USD684 billion in economic activity and generated 30.2 million jobs (Direct and indirect) to the regional economies. By 2030 it is forecast these figures will grow to USD 1.3 trillion and 70 million jobs.

3.2 Preliminary data from IATA for 2018 showed that Revenue Passenger Kilometres (RPKs) or passenger demand was strongest in the Asia/Pacific Region at 8.6%, outstripping the global industry total at 6.6% (**Figure 3**). The Region also had the largest share of Passenger Kilometres Performed (PKP), accounting for more than one third of the global total at 34.5%. Europe and North America were the two other key regions, with shares of 26.7% and 22.4% respectively (**Figure 4**).

3.3 Asia Pacific airlines flew 2,847 billion RPKs in 2018, compared with 2,207 and 1,854 for European and North American carriers respectively.

3.4 As the world's major manufacturing and distribution hub, the Asia/Pacific Region also accounted for the largest share of global air freight traffic in 2018, at 35.5%. In a challenging year for air freight, following the global inventory restocking cycle in 2017 as well having to face a number of headwinds including a moderation in world trade and deterioration in some of the key leading indicators, the Asia/Pacific region grew Freight Tonne Kilometres (FTKs) at a pace of 1.8%, below the global industry figure of 3.5% for the year.

3.5 Over the next twenty years, the number of passenger journeys to, from and within the Asia/Pacific Region was expected to increase at an average annual rate of 4.8% per year. This was the fastest growing of all regions, exceeding, by some margin, the expected global growth rate of 3.5% per year. This would result in more than 2.35 billion additional air passenger journeys per year in 2037 compared with 2017.

3.6 Given the size and diversity of the region, ATM harmonisation efforts will require the needs of the least developed ANSPs to be addressed especially in the areas of technical assistance such as funding, expertise and training. Differences in economic development may also mean that traffic demands are not uniform in the region, and therefore ATM solutions should be driven by analysis of costs and benefits and performance requirements appropriate to the traffic demands.

3.7 The diverse operating environments also mean that the implementation situation varies significantly across States. As such, the economic analysis of imleemntation activities such as ASBUs should be undertaken by States, and assisted by the Plan, which provides high-level guidance for the development of cost-benefit analysis of implementation activity.

3.8 **Figure 2, Figure 3, Figure 4 and Figure 5** indicate the projected economic and air traffic growth which has necessitated the Seamless ANS approach.

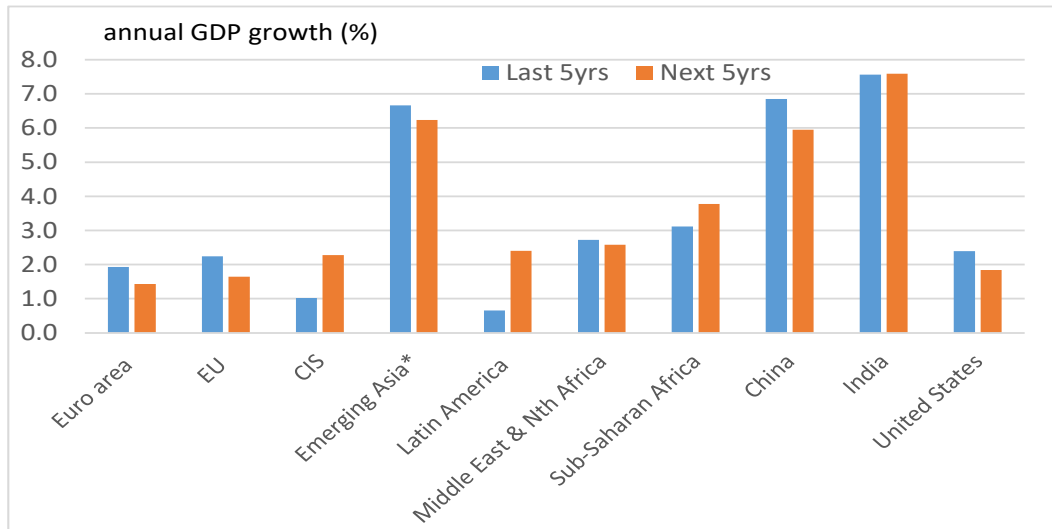


Figure 2: Regional Economic Growth (Source: IMF)

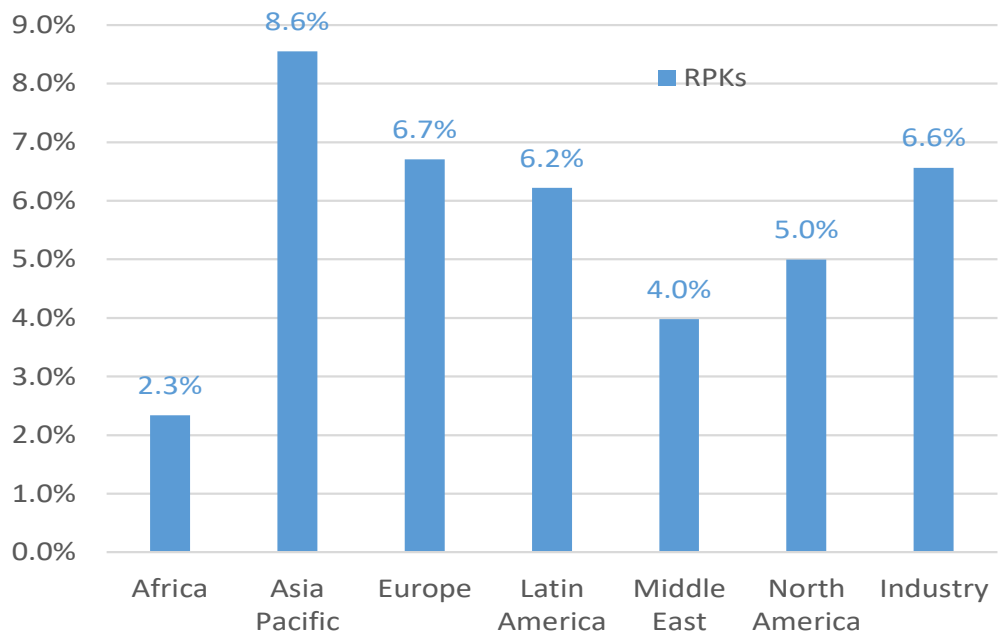


Figure 3: Regional Passenger Traffic Growth, 2018 (Source: IATA)

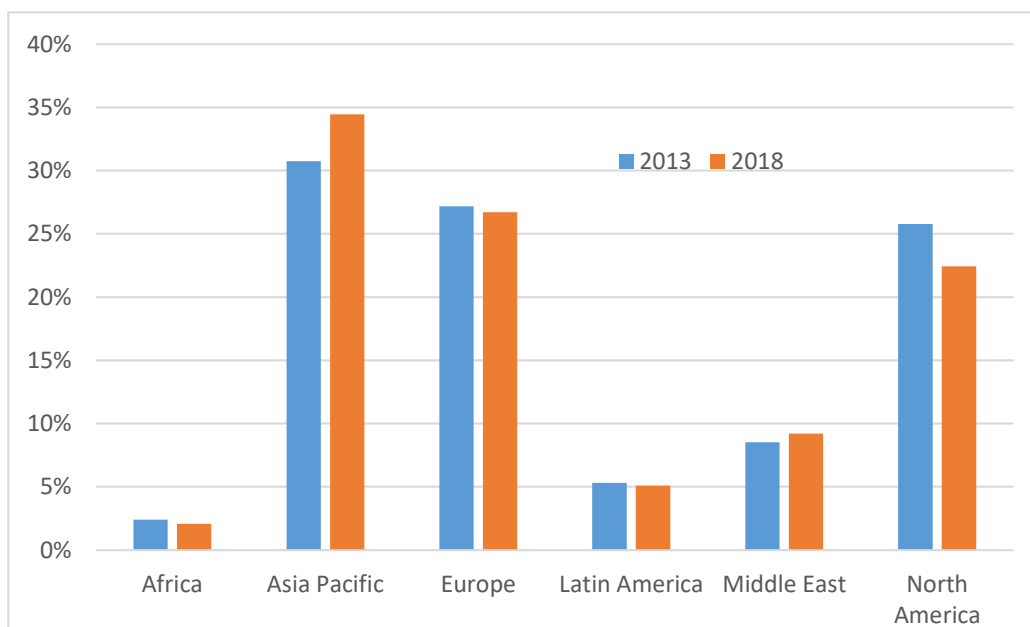


Figure 4: Regional Share of Passenger Traffic, 2013 compared to 2018 (Source: IATA)

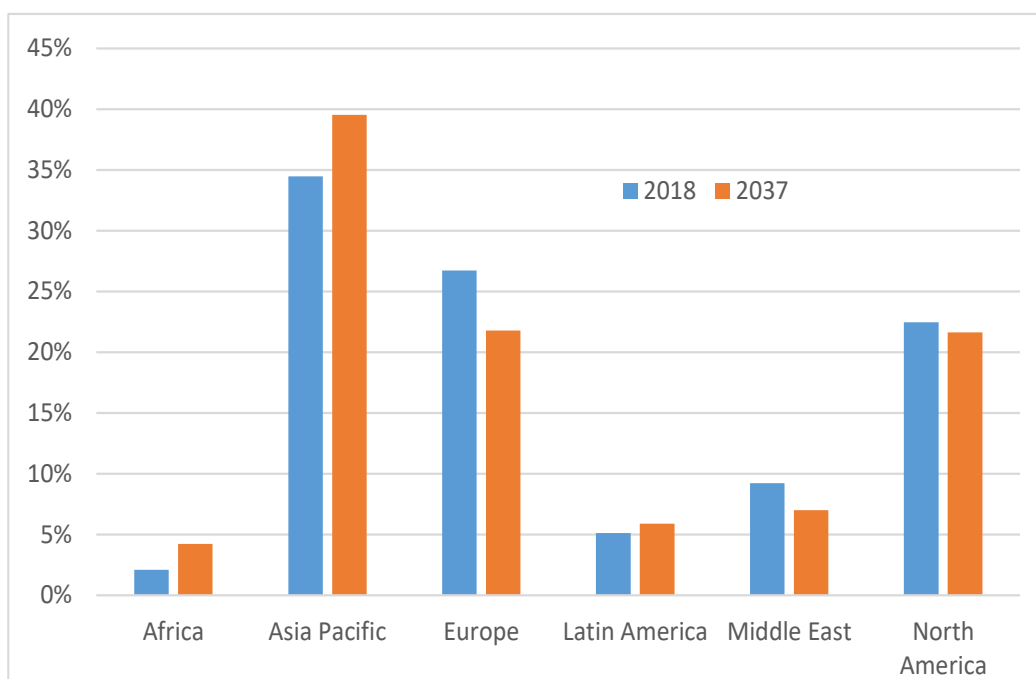


Figure 5: Regional Passenger Traffic Forecast, 2018 compared to 2037

3.9 The 46th Directors General Civil Aviation (DGCA) Conference (Osaka, October 2009) was the genesis of Asia/Pacific Seamless ANS discussion, endorsing the Kansai Statement (**Appendix A**). 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 region.

3.10 The ICAO Asia/Pacific (APAC) Seamless ANS Symposium and Ad Hoc Meeting (Bangkok, Thailand, 15 to 17 August 2011) developed:

- a) proposed APSAPG objectives;
- b) draft Seamless ANS principles;
- c) civil/military cooperation Seamless ANS aspects;

- d) the requirement for ASBUs to form a key part of Seamless ANS planning; and
- e) the requirement for a capabilities matrix to provide a target and means of progressing to the Seamless ANS objectives.

3.11 APANPIRG/22 created the APSAPG in 2011 under Decision 22/56, with a primary goal to develop an Asia/Pacific Seamless ANS Plan.

3.12 The Global Air Navigation Industry Symposium (GANIS, Montréal, 20-23 September 2011) introduced the ASBU concept. This inferred an iterative improvement, from Block 0 (zero) to 3. Although the implementation of all ASBU elements is not mandatory, it is intended to achieve the highest level of conformance; thus supporting global interoperability and Seamless ANS.

3.13 Subject to several recommendations (**Appendix B**), the AN-Conf/12 endorsed the ASBU concept and the consequential changes to the GANP. The AN-Conf/12 stressed that ASBU Block 0 implementation and requirements needed to be coordinated at a regional level based on operational requirements, and that action plans to address identified impediments to ATM modernization should be developed. This Plan is part of the Asia/Pacific strategy to address the requirement for action plans, and to guide Asia/Pacific administrations in their ATM planning.

Air Navigation Service Provider Summary

3.14 The safety and efficiency of flights transcend national borders and airspace boundaries. Seamless ANS is therefore possible only if there is close regional collaboration among States, their ANSPs and all stakeholders. Cooperation is the key to success.

3.15 Given the size and diversity of the region, ATM harmonisation efforts will require the needs of the least developed ANSPs to be addressed especially in the areas of technical assistance such as funding, expertise and training. Differences in economic development may also mean that traffic demands are not uniform in the region, and therefore ATM solutions should be driven by analysis of costs and benefits and performance requirements appropriate to the traffic demands.

Aerodrome Operator Summary

3.16 Aerodrome operations are a key component for Seamless ANS, especially in regard to infrastructure and operational efficiencies. The collaborative interaction of various stakeholders is important to ensure that aerodrome operations, facilities and equipment are suitable for all aircraft operators. Aerodrome operators require the airspace, ATM, aerodrome and aircraft operations to be cohesive and interoperable. This includes not only the aerodrome movement areas but the terminal and ancillary services, which may include border protection, fuel, baggage and passenger facilitation, which need to be aware of the interaction of their services with the aircraft operations.

3.17 Short, medium and long term aerodrome planning needs to take into account the seamless system so that capital investment is aligned to ATM operational efficiencies. Aerodrome development and airline changes are catalysts for changes driven by the aerodrome operator, but there is a need to ensure en-route and terminal ATS efficiencies are not impacted or lost, due to poor aerodrome infrastructure and operations. A saving in aircraft flight time can easily be eroded by lack of gates, poor taxiway-runway interface and inadequate terminal facilities. Stakeholder involvement and infrastructure changes needs to be coordinated to maximise the efficiencies from a systemic approach to aerodrome, airspace, air traffic management and aircraft operations.

ABBREVIATIONS AND ACRONYMS

AAR	Aerodrome Arrival Rate or Airport Acceptance Rate
ABAS	Aircraft Based Augmentation Systems
ABI	Advanced Boundary Information (AIDC)
ACARS	Aircraft Communication Addressing and Reporting System
ACAS	Airborne Collision Avoidance System
A-CDM	Airport Collaborative Decision-Making
ACIS	Airport Collaborative Information Sharing (ACIS)
ACC	Area Control Centre
ACP	Acceptance (AIDC)
ADOC	Aircraft Direct Operating Cost
ADS-B	Automatic Dependent Surveillance-Broadcast
ADS-C	Automatic Dependent Surveillance-Contract
AeroMACS	Aeronautical Mobile Airport Communication System
AIDC	ATS Inter-facility Data Communications
AIGD	ICAO ADS-B Implementation and Guidance Document
AIM	Aeronautical Information Management
AIRAC	Aeronautical Information Regulation and Control
AIRB	Basic Airborne Situational Awareness
AIRD	ATM Improvement Research and Development
AIRMET	Information concerning en-route weather phenomena which may affect the safety of low-level aircraft operations
AIS	Aeronautical Information Service
AIXM	Aeronautical Information Exchange Model
AMAN	Arrival Manager
AMHS	ATS Message Handling System
AMS	Aeronautical Mobile Service
ANSP	Air Navigation Service Provider
AN-Conf	Air Navigation Conference
AOC	Assumption of Control (AIDC)
AOM	Airspace Organization and Management
AOP	Airport Operations Plan
APAC	Asia/Pacific
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
APCH	Approach
APEC	Asia Pacific Economic Cooperation
APOC	Airport Operations Centre
APSAPG	Asia/Pacific Seamless ANS Planning Group
APUAS	Asia/Pacific Unmanned Aircraft System
APV	Approach with Vertical Guidance
APW	Area Proximity Warning
ASBU	Aviation System Block Upgrade
ASD	Aircraft Situation Display
ASEAN	Association of Southeast Asian Nations
ASM	Airspace Management
ASMGCS	Advanced Surface Movements Guidance Control Systems
ATC	Air Traffic Control
ATCONF	Worldwide Air Transport Conference
ATFM	Air Traffic Flow Management
ATIS	Automatic Terminal Information Service
ATN/OSI	Aeronautical Telecommunication Network/Open System Interconnection
ATS	Air Traffic Services
ATSA	Air Traffic Situational Awareness

ATM	Air Traffic Management
CANSO	Civil Air Navigation Services Organization
CARATS	Collaborative Actions for Renovation of Air Traffic Systems
CDM	Collaborative Decision-Making
CCO	Continuous Climb Operations
CDO	Continuous Descent Operations
CDP	Climb Decent Procedure
CFIT	Controlled Flight into Terrain
CLAM	Cleared Level Adherence Monitoring
COM	Communication
CONOPS	Concept of Operations
CNS	Communications, Navigation, Surveillance
CPAR	Conflict Prediction and Resolution
CPDLC	Controller Pilot Data-link Communications
CPWG	Cross-Polar Working Group
CSP	Communication Service Provider
CTA	Control Area
CTR	Control Zone
DARP	Dynamic Airborne Re-route Planning
DCL	Data-link Departure Clearance
DGCA	Conference of Directors General of Civil Aviation
DMAN	Departure Manager
DME	Distance Measuring Equipment
EST	Coordinate Estimate
EVS	Enhanced Vision System
FAA	Federal Aviation Administration
FANS	Future Air Navigation Systems
FDPS	Flight Data Processing System
FIR	Flight Information Region
FIRB	Flight Information Region Boundary
FL	Flight Level
FLAS	Flight Level Allocation Scheme
FLOS	Flight Level Orientation Scheme
FRMS	Fatigue Risk Management System
FUA	Flexible Use Airspace
GANIS	Global Air Navigation Industry Symposium
GANP	Global Air Navigation Plan
GASP	Global Aviation Safety Plan
GBAS	Ground-based Augmentation System
GDP	Gross Domestic Product
GLS	GBAS Landing System
GNSS	Global Navigation Satellite System
GPI	Global Plan Initiative
HF	High Frequency
HFDL	High Frequency Data Link
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IM	Interval Management Procedure
IMC	Instrument Meteorological Conditions
INS	Inertial Navigation Systems
IO	International Organizations
IPACG	Informal Pacific ATC Coordinating Group
ISPACG	Informal South Pacific ATS Coordinating Group
ITP	In-Trail Procedure

IWXXM	ICAO meteorological information exchange model
KPA	Key Performance Area
LNAV	Lateral Navigation
LVO	Low Visibility Operations
MET	Meteorological
METAR	Aerodrome routine meteorological report (<i>in meteorological code</i>)
MLAT	Multilateration
MON	Minimal Operating Networks
MSAW	Minimum Safe Altitude Warning
MTCD	Medium Term Conflict Detection Tool-
MTF	Major Traffic Flow
MWO	Meteorological Watch Office
NANP	National Air Navigation Plan
NAV	Navigation
NextGen	Next Generation Air Transportation System
NOPS	Network Operations
NSS	Non Cooperative Surveillance Radar
OPMET	Operational Meteorological (<i>information</i>)
OLDI	On-Line Data Interchange
OTS	Organised Track System
PACOTS	Pacific Organized Track System
PARS	Preferred Aerodrome/Airspace and Route Specifications
PASL	Preferred ANS Service Levels
PBN	Performance-based Navigation
PIA	Performance Improvement Area
PinS	Point in Space
PKP	Passenger Kilometres Performed
PVT	Passenger Value of Time
RAIM	Receiver Autonomous Integrity Monitoring
RAM	Route Adherence Monitoring
RANP	Regional Air Navigation Plan
RASMAG	Regional Airspace Safety Monitoring Advisory Group
RPAS	Remotely Piloted Aircraft System
RPK	Revenue Passenger Kilometres
RNAV	Area Navigation
RNP	Required Navigation Performance
RVSM	Reduced Vertical Separation Minimum
SAARC	South Asian Association for Regional Cooperation
SATVOICE	Satellite Voice Communications
SAR	Search and Rescue
SBAS	Satellite-based Augmentation System
SCS	South China Sea
SESAR	Single European Sky ATM Research
SHEL	Software, Hardware, Environment and Liveware
SID	Standard Instrument Departure
SIGMET	Information concerning en-route weather phenomena in the atmosphere which may affect the safety of aircraft operations
SPECI	Aerodrome special meteorological report
SB ADS-B	Space-Based ADS-B
SSR-DAPS	Secondary Surveillance Radar Downlink of Aircraft Parameters
STAR	Standard Terminal Arrival Route or Standard Instrument Arrival (Doc 4444)
STCA	Short Term Conflict Alert
STS	Special Handling Status
SUA	Special Use Airspace

SUR	Surveillance
SVGS	Synthetic Vision Guidance Systems
SWIM	System-Wide Information Management
TAF	Aerodrome Forecast
TAWS	Terrain Awareness Warning Systems
TBO	Trajectory Based Operations
TCAC	Tropical Cyclone Advisory Centre
TCAS	Traffic Collision Avoidance System
TOC	Transfer of Control
UAS	Unmanned Aircraft Systems
UAT	Universal Access Transceiver
UPR	User Preferred Routes
VHF	Very High Frequency
VAAC	Volcanic Ash Advisory Centre
VDL	VHF Data Link
VMC	Visual Meteorological Conditions
VNAV	Vertical Navigation
VOLMET	Meteorological information for aircraft in flight
VOR	Very High Frequency Omni-directional Radio Range
VSA	Visual Separation on Approach
VSAT	Very Small Aperture
WAFC	World Area Forecast Centre

BACKGROUND INFORMATION

Principles

5.1 There were considered to be three major areas of Seamless ANS Principles, involving People (human performance), Facilities (physical equipment), and Technology and Information. The 37 Principles agreed by APSAPG and endorsed by APANPIRG are included as **Appendix C**.

Aviation System Block Upgrade (ASBU)

5.2 At the Global level, ICAO started the ASBU initiative as a programme framework that developed a set of aviation system solutions or upgrades intended to exploit current aircraft equipage, establish a transition plan and enable global interoperability. ASBUs comprised a suite of modules organised into flexible and scalable building blocks, where each module represented a specific, well bounded improvement. The building blocks could be introduced and implemented in a State or a region depending on the need and level of readiness, while recognizing that not all the modules were required in all airspaces. ASBUs described a way to apply the concepts defined in the Doc 9854 with the goal of implementing regional performance improvements, and were used in the new edition of the GANP to guide implementation. AN-Conf/12 agreed that the ASBUs and the associated technology roadmaps were integral parts of the GANP and a valuable implementation tool kit.

5.3 ICAO estimated that US\$120 billion would be spent on the transformation of air transportation systems in the next decade. **USA UPDATE?** While NextGen and SESAR accounted for a large share of this spending, parallel initiatives were underway in many areas including the Asia/Pacific region, North and Latin America, Russia, Japan and China. ATM modernization is a very complex but necessary task, given the benefit of these initiatives as traffic levels increased. It is clear that to safely and efficiently accommodate the increase in air traffic demand — as well as respond to the diverse needs of operators, the environment and other issues, it is necessary to renovate ATM systems, in order to provide the greatest operational and performance benefits. States and ANSP must assess current domestic and international system performance needs to prioritize appropriate ASBU elements.

5.4 ASBU are comprised of a suite of modules, each having the following qualities:

- a clearly-defined measurable operational improvement and success metric;
- necessary equipment and/or systems in the aircraft and on the ground along with an operational approval or certification plan;
- standards and procedures for both airborne and ground systems; and
- a positive business case over a clearly defined period of time.

5.5 ASBU are groups of operational improvements to advance air navigational capabilities and improve the performance of their air navigation system in a cost effect way. They are classified into three functional categories:

- Information;
- Operational; and
- CNS Technology and Services.

Asia/Pacific ASBU Implementation

5.6 **Table 1** provides a summary of the Block 0 and Block 1 elements, and the expected priority for implementation within the Asia/Pacific Region. The allocation of priority was based on factors including its importance in promoting Seamless ANS:

- Priority 1 = critical upgrade assignment based on whether the implementation of an element could bring most benefit to the region or regional upgrade by States and is essential to achieve the service level required globally;
- Priority 2 = recommended upgrade for those elements which would bring benefits to the region and generally to be implemented from 2022, but States are encouraged to implement earlier if beneficial; and
- Priority 3 = assigned to those elements which may not be required for regional implementation, so may not be universally implemented) in the Asia/Pacific Region.

5.7 A cost-benefit or economic analysis before implementation was identified as essential to determine whether to implement certain elements such as SURF-B0/1/1-4, but should not preclude an economic analysis of other elements as determined by the State. Detailed information on the development, scope, objectives, stakeholders and dependencies for each ASBU element is provided at <https://www4.icao.int/ganpportal/>.

Functional Category	Element	Priority
Information	AMET-B0/1 – 4: Meteorological observations, forecast, warning, climatological and historical products, and dissemination (PASL 7.41)	1
	AMET-B1/1 – 4: Meteorological products supported by automated decision systems or aids using IWXXM (PASL 7.55)	2
	DAIM-B1/1 – 6: Provision of quality-assured digital aeronautical data and information, including AIP, terrain and obstacle, aerodrome and instrument flight procedure data sets (PASL 7.40)	1
	DAIM-B1/7: Provision of digital NOTAM improvements (PASL 7.55)	2
	FICE-B0/1: Automated basic AIDC (PASL 7.26)	1
Operational	ACDM-B0/1-2: ACIS (PARS 7.3)	1
	ACDM-B1/1 – 2: Airport CDM Integration with ATM Network, AOP and APOC (PARS 7.18)	2
	APTA-B0/1 – 2: Basic PBN SID and STAR procedures, PBN non-precision approaches (PARS 7.4, 7.5, 7.10, 7.13)	1
	APTA-B0/3 and 6: SBAS/GBAS CAT I precision approach procedures, and PBN Helicopter PinS Operations (PARS 7.6, 7.7)	3
	APTA-B0/4 – 5, 7 – 8: CDO (Basic) and CCO (Basic), and performance-based aerodrome operating minima for advanced/basic aircraft (PARS 7.19)	2
	APTA-B1/1 – 5: advanced capability PBN approaches, PBN SID and STAR procedures and performance-based aerodrome operating minima for advanced aircraft with SVGS, CDO and CCO (Advanced) (PASL 7.14, PARS 7.21, 7.22)	3
	CSEP-B1/1 – 4: basic airborne situational awareness AIRB and VSA, and performance-based horizontal separations (PARS 7.20)	2
	FRTO-B0/1 – 4: Direct routing, Airspace Planning and FUA, Flexible Routings, and basic conflict detection and conformance monitoring (PASL 7.29, 7.31, 7.36)	1
	FRTO-B1/1 – 7: Free Route Airspace, RNP routes, Advanced FUA and Airspace Management (ASM), Dynamic Sectorisation, Enhanced Conflict	2

	Detection Tools and Conformance Monitoring, and Multi-Sector Planner Function (PASL 7.29, 7.51)	
	NOPS-B0/1 – 5: Initial integration of ASM with ATFM, Collaborative Network Flight Updates, Basic Network Operation Planning and Initial Airport/ATFM slots, A-CDM Network Interface and Dynamic Slot Allocation (PASL 7.38)	1
	NOPS-B1/1 – 10: Short Term ATFM measures, Enhanced NOPS Planning, Enhanced integration of airport operations and NOPS planning, Enhanced Traffic Complexity Management, Full integration of ASM with ATFM, Initial Dynamic Airspace configurations, Enhanced ATFM slot swapping, Extended Arrival Management, ATFM Target Times and Collaborative Trajectory Options Programme (PASL 7.52)	2
	OPFL-B0/1: ITP	3
	OPFL-B1/1: CDP	3
	RATS-B1/1 – Remotely Operated Aerodrome Air Traffic Services	3
	RSEQ-B0/1 – 2: Arrival and Departure Management (PASL 7.32)	1
	RSEQ-B0/3 – Point merge	3
	RSEQ-B1/1 – Extended arrival metering (PASL 7.46)	2
	SNET-B0/1 – 4: STCA, MSAW, APW, APM (PASL 7.31)	1
	SNET-B1/1 – 2: Enhanced STCA with aircraft parameters and in complex TMAs (PASL 7.50)	2
	SURF-B0/1 – 3: Basic ATC surface operations tools, comprehensive situational awareness, situational awareness, alerting service (PASL 7.47)	2
	SURF-B1/1 – 5: Advanced surface traffic management visual aids, pilot comprehensive awareness and runway alerting, enhanced ATC alerting, routing service to support ATC and EVS for taxiing (PASL 7.48)	2
	TBO-B0/1: Introduction of time-based management within a flow centric approach (PASL 7.52)	2
	TBO-B1/1 – Initial Integration of time-based decision making processes (PASL 7.52)	2
CNS Technology and Services	ASUR-B0/1 – 3: ADS-B, MLAT, SSR-DAPS (PARS 7.8, 7.11, PASL 7.26, 7.28, 7.30)	1
	ASUR-B1/1 – Reception of aircraft ADS-B signals from space (SB ADS-B) (PASL 7.54)	2
	COMI-B0/1 – 2, 4 – 6: ACARS, ATN/OSI, VDL Mode 2 Basic, SATCOM Class C Data, HFDL (PASL 7.54)	2
	COMI-B0/3, 7: VDL Mode O/A, AMHS (PASL 7.25)	1
	COMI-B1/1 – 4: VDL Mode 2 Multi-Frequency, SATCOM Class B (SB-S) Voice and Data, ATN/IPS and AeroMACS Ground-Ground (PASL 7.53)	2
	COMS-B0/1 – 2: CPDLC (FANS 1/A & ATN B1) for domestic and procedural airspace and ADS-C (FANS 1/A) for procedural airspace (PARS 7.14, PASL 7.29, 7.53)	2
	COMS-B1/1 – 3: PBCS approved CPDLC (FANS 1/A+), ADS-C and SATVOICE for domestic and procedural airspace (PARS 7.14, PASL 7.53)	2
	NAVS-B0/1 – 4: SBAS, GBAS, ABAS, MON (PARS 7.7)	2
	NAVS-B1/1: Extended GBAS	3

Table 1: Asia/Pacific ASBU Block 0 and Block 1 Priority

Implemented Elements

5.8 The following ASBU Block 0 elements were considered Seamless ANS to be almost universally implemented within the APAC Region in terms of being established Annex 6 standards (ACAS) by or in the early stages of Block 1 from 2019 (GADSS), so were not referenced as a priority in Table 1:

- **ACAS-B1/1:** ACAS Improvements (TCAS Version 7.1); and
- **GADS-B1/1 – 2:** Aircraft Tracking and Contact directory service (PASL 7.50).

Regional Elements

5.9 The Regional elements were incorporated into the Seamless ANS framework used to assess the uptake by Asia/Pacific States.

5.10 **Table 2** provides a summary of the Regional Seamless ANS elements, and the expected priority for implementation within the Asia/Pacific Region. The allocation of priority was based on factors including its importance in promoting Seamless ANS .

Functional Category	Regional Seamless ANS Element	Priority
Operational	Aerodrome management and coordination (PARS 7.1)	2
	Optimization of runway capacity facilities (PARS 7.2)	3
	ADS-B, SSR Mode S and PBN Airspace (PARS 7.8, 7.9, 7.10)	2
	Flight Level Orientation Scheme (FLOS) (PARS 7.12)	2
	Civil/Military SUA management (PARS 7.13)	1
	Adjacent ATS sector coordination (PASL 7.19)	2
	Airspace classification (PASL 7.28)	2
	ATC horizontal separation (PASL 7.29)	2
	Flight Level Allocation Schemes (FLAS) (PASL 7.30)	2
	ATC sector capacity (PASL 7.32)	2
	Electronic Flight Progress Strips (PASL 7.34)	2
	Enhanced SAR systems (PASL 7.37)	1
	ANSP human and simulator performance (PASL 7.38)	1
	Civil/Military strategic and tactical coordination (PASL 7.39)	1
	Civil/Military common procedures and training (PASL 7.39)	2
	Ballistic launches/space re-entry management (PASL 7.40)	1
	Unmanned Aircraft Systems (PARS TBA)	2
CNS Technology and Services	ATS surveillance data sharing (PASL 7.23)	2
	Civil Military integrated systems and facilities (PASL 7.39)	2
	Departure Clearance (DCL) (PASL 7.44)	2
	Performance-based Navigation (PBN) Visual Departure and Arrival Procedures	3
	ATC simulator performance	2

Table 2: Asia/Pacific Seamless Regional Elements Priority

5.11 There were 16 Priority 1 [ASBU Block 0 and 1 and Regional] Elements as follows:

- Aeronautical Meteorology: AMET-B0/1 – 4;
- Aeronautical Information Management: DAIM-B1/1 – 6*;
- Airport CDM: ACDM-B0/1 – 2;
- ANSP human and simulator performance (Regional);

- e) ATS Inter-facility Datalink Communications: FICE-B0/1;
- f) Ballistic launches/space re-entry management (Regional);
- g) Civil/Military Special Use Airspace management (Regional);
- h) Civil/Military strategic and tactical coordination (Regional);
- i) Core data communications: VDL Mode O/A and AMHS COMI-B0/3, 7;
- j) Direct and Free Route Operations: FRTO-B0/1 – 4;
- k) Enhanced SAR systems (Regional);
- l) Ground-based Surveillance: ASUR-B0/1 – 4;
- m) Network Operations: NOPS-B0/1 – 5;
- n) Performance-based Navigation Approach Procedures: APTA-B0/1 – 2;
- o) Runway Sequencing: RSEQ-B0/1 – 2; and
- p) Safety Nets SNET-B0/1 – 4.

*Note: DAIM-B1/7 is placed within PASL Phase III.

Human Performance

5.12 The Global ATM Operational Concept (Doc 9854) states:

Humans will play an essential and, where necessary, central role in the global ATM system. Humans are responsible for managing the system, monitoring its performance and intervening, when necessary, to ensure the desired system outcome. Due consideration to human factors must be given in all aspects of the system.

5.13 The AN-Conf/12 emphasised the importance of human performance considerations by endorsing Recommendation 6/4 (**Appendix B**), which called for the integration of human performance as an essential element for the implementation of ASBU modules and in the planning and design phase of new systems and technologies, as part of a safety management approach.

5.14 The role of the human is especially important in delivering high quality and consistent services supporting Seamless ANS. Therefore, it is crucial to ensure that, training and licensing requirements are developed using a competency-based framework, fatigue-related risk is managed appropriately, and safety data, including the reporting of hazards, is collected, analysed and acted upon within ATM systems that support Seamless ANS. States should identify specific efficiency improvements expected from ASBU Element deployment. These expectations should include regulatory and/or procedural changes needed to optimize new capabilities.

5.15 One of the more important human performance aspects in order to deliver a consistent, harmonised and efficient service is ATC training, to change from a procedural mind set to one that used the tactical delivery of services based on ATS surveillance and automated safety net decision support tools (airborne and ground).

5.16 Moving from reliance on paper-based flight progress strips to an electronic equivalent connected to the ATS surveillance Flight Data Processing System (FDPS) or direct data inputs to the Aircraft Situation Display (ASD) support this paradigm shift. The use of paper flight progress strips in automated ATM environments reduces efficiency, increases transcription error/data mismatch, and artificially caps ATC capacity due to retention of manual tasks made redundant by the automation capability.

5.17 Controllers need to be trained on the application of tactical separation, including the use

of positive control techniques, such as vectoring and speed control when conflict pairs approach minimum separation. In this regard, it is important that managers facilitate a modern operating environment in terms of air safety incidents and human factors, so personnel are confident using the full capability provided by the CNS facilities.

5.18 A critical human performance issue is the training of ANSP management and regulators in human performance issues. These decision-makers had an important influence on outcomes in terms of supporting the right environment for Seamless ANS activities, whether that is providing financial resources, or establishing high-level policies and procedures.

5.19 A key component of Seamless ANS is the ability of controllers to operate, and have confidence in, a new operating environment. The appropriate use of ATC simulators to enhance their learning experience is an essential part of the necessary training.

5.20 In planning to deliver Seamless ANS services, it is assumed that each State and aircraft operator will comply with the English language proficiency requirements in accordance with ICAO Standards and Recommended Practices. States should be considering the highest levels of English language proficiency for all operational controllers to ensure they can respond appropriately to irregular occurrences (e.g.: emergencies) by use of an internationally recognised system.

5.21 States must acknowledge the challenge of modifying current practices and procedures to incorporate and optimize improved system capability. States and ANSPs are encouraged to establish sub regional or bilateral relationships to share best practices and develop strategies to improve performance.

5.22 An optimal ‘aviation culture’ within regulators and service providers can only be implemented when top managers instil an understanding of a system-wide approach that creates an organic, learning and safe environment. When considering the key factors supporting an ‘aviation culture’, it is important to acknowledge that no ‘national culture’ is perfectly aligned with ‘aviation culture’, so there will always be a need for gap analysis and changes where development of an appropriate in culture is required. In focussing on management it is therefore important to train managers, and for managers to have a level of competency in the following areas (**Figure 6**):

- a) the advantages of a responsible, informed and accountable management, which promotes a proactive organisational culture with safety as a first priority, using open communications and a team management approach; and
- b) the implementation of an appropriate organizational culture which is effectively driven by management through embedded safety review and assessment teams, allowing the organization to respond organically to its operating environment;
- c) the systematic application of human factors principles in –
 - air safety investigation;
 - system design (ergonomics, human-in-the-loop);
 - effective training (including the use of simulators);
 - fatigue management;
 - automated safety nets; and
 - contingency planning;
- d) the implementation of effective safety reporting systems that –
 - are non-punitive, supporting a ‘Just Culture’;
 - promote open reporting to management; and

- focus on preventive (systemic), not corrective (individual) actions in response to safety concerns, incidents and accidents.



Figure 6: Optimal Aviation Culture Factors

Civil/Military Cooperation

5.23 One of the key enablers for improvement of ATM efficiencies supported by Doc 9854 (Global ATM Operational Concept) is the use of FUA. This is an airspace management concept based on the principle that airspace should not be designated as purely civil or military, but rather as a continuum in which all user requirements are accommodated to the greatest possible extent. FUA normally referred to the activation of Special Use Airspace (SUA), but could also include controlled airspace.

5.24 The establishment and operation of SUA required careful assessment, review and management, to ensure the most appropriate airspace designation is used, and the airspace is operated in a cooperative manner. This is ordinarily only possible through discussion between military and civil parties. Thus a key to the establishment of effective FUA is risk-based assessments, determining the risks or security issues involved through coordinated and cooperative methods if possible.

Note: Annex 2 Rules of the Air states that restricted areas were airspace of defined dimensions, above the land areas or territorial waters of a State, which means that restricted areas must not be designated over the high seas or in airspace of undetermined sovereignty

5.25 Restricted areas designed to segregate civil aircraft from airborne military operations or ordnance firing would be expected when the risk of an accident for non-segregated operations is higher than acceptable. However, lower risk military operations (such as using small calibre weapons at an established firing range) may only require the establishment of a danger area or even no SUA. Thus the type, dimensions, activation notice and duration of SUA activity should be appropriate and commensurate with the type of activity affecting the airspace.

5.26 APANPIRG/9 (August 1998) developed the following guidelines for civil/military cooperation in the following areas: military procedures, aeronautical facilities and ground services, civil and military ATS unit personnel, airspace, research and development, common terminology, abbreviations rules and procedures, military exercises, and non-sensitive military data.

- If at all possible, military training should be conducted in locations and/or at times that do not adversely affect civilian operations, particularly those associated with major aerodromes. This requires strategic planning by formal civil/military coordination bodies.
- Consideration of the interoperability and operations of military systems is an integral part of a Seamless ANS environment. With increasingly complex aircraft equipage civil requirements, non-compliant military or other State aircraft may become more difficult to manage using Special Handling Status (STS). The limitations or requirements of military aircraft cockpits, avionics and airframes may even preclude some civil systems, and yet military aircraft still need to transit airspace used predominantly by civil operations.
- Military participation at civil ATM meetings and within ATS Centres will often lead to a better understanding of civil needs, as well as military requirements, including the operation of Unmanned Aircraft Systems (UAS). UAS have been predominately used by the military in segregated airspace, but now many forms of State missions including customs, immigration and police operations are being planned, as well as a myriad of potential civil uses.
- Responses to Search and Rescue (SAR), Civil Defence (normally natural disaster emergencies), and national security events will inevitably require civil/military coordination so this needs to be taken into account during the planning for such operations.
As these occurrences could involve a number of States, regional civil/military planning is crucial in order to reduce the response time for emergency services to aid those in need. The response to an international aviation SAR event may well involve a location over the high seas, so all States should have SAR agreements with neighbouring nations to ensure that SAR services were unimpeded to the maximum possible extent.

5.27 The Asia/Pacific Civil/Military Cooperation Seminar/Workshop (Bangkok, 28 February to 1 March 2012) recommended that the following civil/military cooperation/coordination principles and practices should be elevated to the highest political level in the Asia/Pacific regions:

- civil/military working arrangements should be enacted where discussion of both civil and military needs were able to be negotiated in a balanced manner;
- the importance of the interoperability of civil air transport infrastructure and national security was recognized;
- the interoperability of civil and military systems including data-sharing was emphasized; and
- regular review of controlled airspace and special use airspace was encouraged to be undertaken by States to ensure its establishment, size, activation and operation was appropriate in terms of optimal civil/military operations.

5.28 The Asia/Pacific Civil/Military Cooperation Seminar/Workshop requested ICAO to update existing provisions related to civil/military cooperation/coordination and further develop guidance material related to airspace planning and management, including FUA.

5.29 Data sharing arrangements (including aircraft surveillance), are a key part of civil/military cooperation for tactical operational responses, and to increase trust between civil and military units. Data sharing between the civil and military could facilitate CDM, a vital component of ATFM. The Regional Surveillance Strategy espouses civil/military cooperation and system interoperability.

5.30 Aircraft operating ADS-B technology transmit their position, altitude and identity to all listeners, conveying information from co-operative aircraft that have chosen to equip and publicly broadcast ADS-B messages. Thus there should be no defence or national security issues with the use and sharing of such data.

Note: Some military transponders may support ADS-B using encrypted messages, but this data is not normally decoded or used at all by civil systems. In many cases, tactical military aircraft are not ADS-B equipped or could choose to disable transmissions. In future, increasing numbers of military aircraft would be ADS-B capable, with the ability to disable these transmissions. ADS-B data sharing should not influence the decision by defence agencies to equip or not equip with ADS-B. Moreover, it is possible for States to install ADS-B filters that prevent data from sensitive flights being shared. These filters can be based on a number of criteria and typically use geographical parameters to only provide ADS-B data to an external party if aircraft were near the boundary.

5.31 The ten civil/military elements identified by APANPIRG are as follows:

- a) **Strategic Coordination.** This element emphasised the creation of a permanent body, facilities and procedures to facilitate long and medium-term planning for optimal civil and military operations, and the daily, safe and efficient tactical management of operations. This element features the establishment of a national body that encompasses military (and State aircraft operators) and civil stakeholders, to develop high level civil/military cooperation policy.
- b) **Tactical Coordination.** The establishment of facilities and procedures derived from the high level strategic coordination body. Tactical coordination features participation of military officers at appropriate civil ATM meetings, airspace scheduling through interaction and communications between civil and military units, and military representation within civil ATC Centres where necessary.
- c) **Military SUA.** The minimisation of airspace exclusively assigned for civil or military use in accordance with FUA principles, assessed by the percentage of military SUA within an FIR.
- d) **SUA Review.** The regular review of SUA, to ensure that the means and notice of activation provide adequate warning for other airspace users, and the airspace designations (SUA types) as well as the lateral and vertical limits are the minimum required to safely contain the activity therein. The review of airspace should be conducted by an airspace authority independent or a collaboration of civil and military airspace users.
- e) **International SUA.** The minimisation of SUA that affected international civil ATS routes. Restricted and prohibited areas must not be designated in international airspace or airspace of undefined sovereignty.

- f) **Integrated Civil/Military ATM Systems.** The integration of civil and military ATM systems where practicable, including joint procurement of systems where possible.
- g) **Joint Civil/Military Aerodromes and Navigation Aids:** The operation of joint civil/military aerodromes if possible, and the provision of navigation aids that could be utilised by both civil and military aircraft where practical.
- h) **Shared Civil/Military Data:** The provision of ATS surveillance data from civil surveillance systems to military units to improve monitoring (thereby reducing the need for individual defence identification authorisation), trust and confidence. The provision of surveillance data from military surveillance systems where this would enhance ATS surveillance coverage and redundancy; suitably filtered as appropriate.
- i) **Common Civil/Military Training and Procedures.** The familiarisation of civil and military ATM personnel in each other's systems and procedures where national security allows. Training and licensing of civil and military air traffic controllers to equivalent standards. The implementation of the same or equivalent standards, procedures and policies for the provision of ATS and the management of air traffic.
- j) **Ballistic Launch and Space Re-entry.** The effective coordination mechanisms established by States responsible for ballistic launch and space re-entry activities to ensure the safety of civil air navigation in the air and on the ground, with particular emphasis on how such activity affects other States.

5.32 The efficient management of rocket/missile launch and space re-entry activity by both State and civil agencies is critical to minimize disruption to other airspace users. Increasingly, ballistic launch and space re-entry activity may be conducted by other State or civil/private agencies, which should conform with the same expectations in this Plan as military agencies. The coordination of all the stakeholders will be enhanced by: coordination agreements between the State civil aviation authority, the ANSP, and the launch/re-entry agency concerned; strategic coordination conducted between the State civil aviation authority prior the activity and tactical management of the launch/re-entry activity.

5.33 A State Planning Checklist and additional guidance for ballistic launch and space re-entry activity is at <https://www.icao.int/APAC/Pages/new-eDocs.aspx>.

Airspace Equipage Mandates

5.34 From an operators' perspective, the following were important considerations:

- Preparation Time: Operators need time to prepare for any mandated equipage requirement – if new equipment is involved, several years may be required to allow fitment to take place during normal airframe maintenance cycles.
- Cost Benefit: Operational improvements, including the use of new technologies or implementing ASBUs, need to provide operational benefits that outweighed the total cost of implementation and operation. This included the airspace user side of the equation. States/ANSPs should carry out studies of the costs and benefits for all stakeholders.

- Education and promulgation: States/ANSPs should work with local airlines and International Organizations to ensure industry and other stakeholders are educated and informed regarding upcoming aircraft equipage mandates very early in the planning process. Ideally, the dialogue should begin with user consultation pertaining to the selection of appropriate solutions. Once a decision has been made, user education should include briefings, media notifications as well as required AIS promulgation.
- Service Outcomes: States/ANSPs must ensure the service delivery efficiencies enabled by an aircraft equipage mandate are actually delivered operationally coincident with the implementation date of the mandate. If service delivery is delayed, any related aircraft equipage mandate should also be delayed accordingly. States/ANSPs should consider offering operational advantages to early adopters of the desired equipage or capability to offset costs. This would enable operators to make at least partial use of the mandated capability in advance of the mandated date.
- Harmonization: it is essential that States/ANSPs harmonize requirements with neighbours as far as practicable, including implementation dates.
- Regulatory considerations: it is essential that regulators are involved very early in the planning process. Experience shows that regulatory approvals are often a problem with the introduction of aircraft equipage mandated environments.
- High Seas: Where airspace over the High Seas is affected, States must ensure appropriate ICAO processes are followed, including amendments to the required ICAO provisions.

Regulation and Safe Operation of Unmanned Aircraft Systems

5.35 The 27th Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/27, Bangkok, Thailand, 05 to 08 September 2016), noted that ICAO was developing standards for Remotely Piloted Aircraft Systems (RPAS, generally above 25 kg) that were focused on international IFR RPAS operations.

5.36 APANPIRG/27 noted the challenges from many thousands of Unmanned Aircraft Systems (UAS) that operate outside the scope of the developing ICAO standards, and agreed to a recommendation that a specific UAS element be incorporated within the Asia/Pacific Seamless ATM Plan to facilitate a harmonized approach.

5.37 The Asia/Pacific UAS Task Force (APUAS/TF) was therefore formed by APANPIRG to develop guidance material that supports an Asia/Pacific Seamless ATM Plan element, including regional expectations for the regulation and safe operation of UAS that fall outside the scope of the ICAO RPAS Panel, within non-segregated airspace and from an ATM perspective, by November 2019.

5.38 Asia/Pacific regional guidance material developed by APUAS/TF is expected to be available in the late 2019 - mid-2020 timeframe, and will be published in the ATM section of the ICAO Asia/Pacific Regional Office eDocuments web-page at:

<https://www.icao.int/APAC/Pages/new-eDocs.aspx>

5.39 The ICAO Headquarters Secretariat, supported by the Unmanned Aircraft Systems Advisory Group (UAS-AG), has also developed a global resource of information and guidance material, as including:

- the UAS Toolkit, providing general guidance on such issues as UAS regulations and risk-based approaches to regulation, training and education needs and authorizations, and examples of, and links to, existing UAS regulations of 39 States; and
- a UAS Traffic Management (UTM) framework, summarizing key principles, lessons learned and best practices in the establishment of requirements for approval of UTM service providers.

Note: the UTM framework is subject to ongoing development, in line with the growth of global knowledge and experience in UTM.

5.x The UAS Toolkit, UTM framework and other relevant information is available on the ICAO Unmanned Aviation web pages at:

<https://www.icao.int/safety/UA/Pages/default.aspx>

5.40 Considering the rapid growth of the UAS industry, and the consequent economic and social benefits arising, there is an immediate need for an aviation regulatory response to facilitate access to non-segregated airspace while protecting the safety and access to airspace of conventional airspace users. For this purpose, an Asia/Pacific regional performance expectation for the regulation of UAS is included in PARS Phase II.

CURRENT SITUATION

Aerodrome Analysis

6.1 In the 1990s and the first decade of the new millennium, aerodrome operators in Asia-Pacific invested billions of dollars to enhance capacity of existing aerodromes and to build new ones to meet increasing air traffic demand. Notable examples are the opening of Bangalore, Hong Kong, Incheon, Kuala Lumpur International, Shanghai Pudong and Suvarnabhumi airports and the expansion of New Delhi and Beijing Capital airports. The automation and the adoption of self-service technology for passenger handling such as check-in and automated border control has enabled many airports to build up capacity without expanding passenger terminal footprint.

6.2 Runways are typically the capacity bottleneck of aerodromes but aircraft parking stands, baggage sorting and transfer facilities, aprons and passenger security screening points operating close to or over capacity are becoming choke points as well, especially at hub airports. A-CDM promises to alleviate congestion but the close collaboration between airport management and other stakeholders such as its shareholder, ATM and airlines is essential to a coordinated development of the capacity of the regional air transport network in the long-term.

Implementation Progress

6.3 The progress of implementation of the Plan had been unacceptably slow, with the Plan having been endorsed by APANPIRG in 2013, and the Phase 1 elements expected to be at least partly implemented by the start of Phase 1 in November 2015, to ensure a matching of ground-based capability with that on modern aircraft systems. However, and noting the as at March 2019, the implementation progress by States and Administrations that had been reporting was illustrated in **Figure X**:

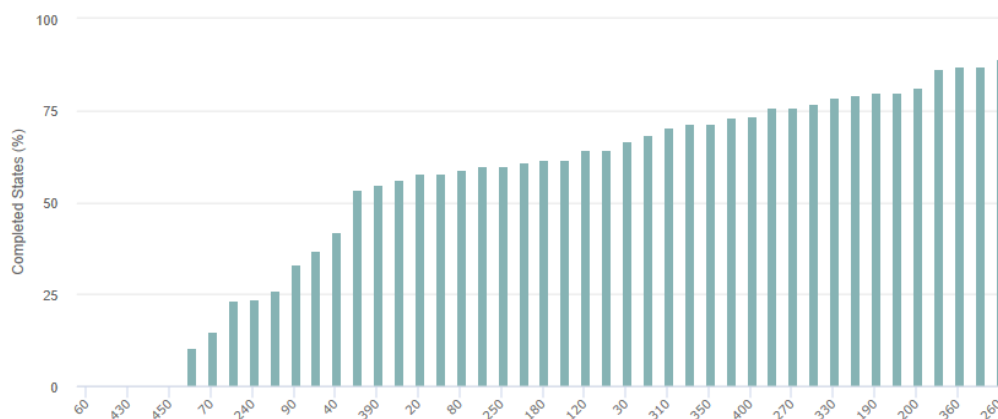


Figure x: Percentage of Completed Seamless ATM Elements (March 2019)

6.4 The following APANPIRG Conclusions are related to implementation actions that Asia/Pacific States and Administrations should have taken:

APANPIRG 24/55 State Seamless ATM Planning

That, given the urgency and priority of Seamless ATM planning for the Asia/Pacific as acknowledged by the 46th 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.*

APANPIRG 27/1 Mobilization of Human / Financial Resources to Achieve the Seamless ATM Plan Objectives

That, States/Administrations not achieving the expected implementation progress of regional priorities for Air Navigation Systems, should: a) give highest priority to the implementation of regional priorities and provide human/financial resources to CAAs and ANSPs to complete Seamless ATM phase I implementation; and b) mobilize human and financial resources to plan for timely implementation of phase 2 and phase 3 elements assessed as relevant by their national gap analysis.

6.5 In 2013, the Asia/Pacific Region agreed in endorsing APANPIRG Conclusion 24/55 that it was essential to brief decision-makers and to review the Plan to develop State planning. Three years later, APANPIRG/27 had noted that: *the ten regional targets planned for completion in November 2015 were far from being achieved as of August 2016; the second cycle of the seamless ATM planning is starting and needs focus from high decision makers to mobilize adequate resources.*

6.6 Notwithstanding these APANPIRG Conclusions and associated Action Items (such as Action Item 52/21) from the Conferences of Directors General of Civil Aviation Asia and Pacific Regions, the lack of adherence to commitments first outlined in the Kansai Statement in 2009 indicated a lack of high-level agreement to modernisation by many States. Therefore, a stronger emphasis on a whole-of government planning approach to include all stakeholders using a National Air Navigation Plan (NANP) is necessary, to ensure greater buy-in, resource allocation and accountability through monitoring.

MORE TEXT REQUIRED (USA?)

Airspace and FIR Analysis

6.7 During earlier studies, there were several features of the lack of Seamless ANS facilities and practices that had been evident in the Asia/Pacific region.

- a) Size of FIR – fragmented FIRs resulting in flights transiting multiple FIRs with multiple TOC points.
- b) Traffic density – the capacity of ANSP infrastructure and airspace had not kept up with traffic growth.
- c) Airspace and ATS route design and capacity –
 - route structure based on historical requirements and not on current aircraft navigational capability;
 - ground-based navigation aid routes, around which SUAs have grown;
 - crossing tracks with and without ATS surveillance, whereby States mainly rely

on the use of FLAS for procedural flight level separation;

- requirement for vertical transitions because of the two different FLOS (metric and imperial) in the region;
- routes with flight level, direction, and time restrictions making flight planning more complex;
- routes with restrictions that are un-coordinated with neighbouring FIRs; and
- restrictive route structures agreed to in a historical context which is inadequate for today's traffic requirements.

d) ATS surveillance and communications capability -

- non- existent/unreliable surveillance or communications capability at times;
- capability not fully utilised to provide appropriate level of service; and
- hand-off procedures not aligned to ATM facilities and capabilities.

e) Compatibility between FIRs –

- Infrastructure development based only on national requirements, resulting in duplicated and yet uncoordinated facilities; and
- Unnecessarily conservative separation requirements at TOC points (it was not clear if this is due to lack of confidence in adjacent FIRs capability to adhere to agreed procedures, or for other operational reasons).

f) ATC standards –

- Apparent reluctance in applying ICAO standard separation minima (it was not clear if this is due a lack of confidence in ATM competence or capability); and
- Although GNSS separation is available in Doc 4444, few ANSPs in the Asia/Pacific Region used this as an alternative means of providing longitudinal separation.

g) Focus groups

- Lack of effective focus groups to address airspace capacity and FIR issues, although there had been an increase in informal and bi-lateral ATM coordination;
- Lack of a requirement for regular review mechanisms of operational issues within an FIR, including feedback from aircraft operators.

h) Uncoordinated and limited use of AIDC.

6.8 Generally flights operating on Major Traffic Flows (MTFs) between large FIRs (particularly where there were multiple FIRs being provided services by one State) in Category R airspace were already reasonably seamless, such as in the Pacific. However, apart from being largely oceanic in nature, these MTFs had the advantage of being usually in an east/west alignment between continents and were not impacted by busy crossing routes.

6.9 In addition, lower traffic density MTF enabled flexible tracks such as UPR applications. It was notable that these MTFs tended to have dedicated focus groups like Informal South Pacific ATS Coordinating Group (ISPACG) and Informal Pacific ATC Coordinating Group (IPACG) conducting regular reviews of operational efficiency.

6.10 Where long and short haul routes crossed multiple smaller FIRs, particularly with busy regional flows, there was a greater likelihood of reduced efficiency caused by a combination of

inconsistent application of ATM procedures and standards, non-harmonized infrastructure development, route structure, TOC and other legacy issues. However, there were also examples of partly Seamless ANS between some busy city pairs (such as Singapore/Kuala Lumpur and the Kuala Lumpur/Bangkok) in the region, resulting from bilateral efforts between ANSPs.

6.11 The Pearl River Delta airspace contained very dense air traffic served by Hong Kong, Macau, Shenzhen, and Guangzhou aerodromes, and associated heliports had Airspace Organization and Management (AOM) and civil/military coordination issues that stemmed largely from the division of responsibility between FIRs (**Figure 7**). Segregated SIDs and STARs, application of FUA and holistic ‘Metropolplex’ planning principles as well as more integrated ATS systems were needed to achieve greater optimisation of the limited airspace available.

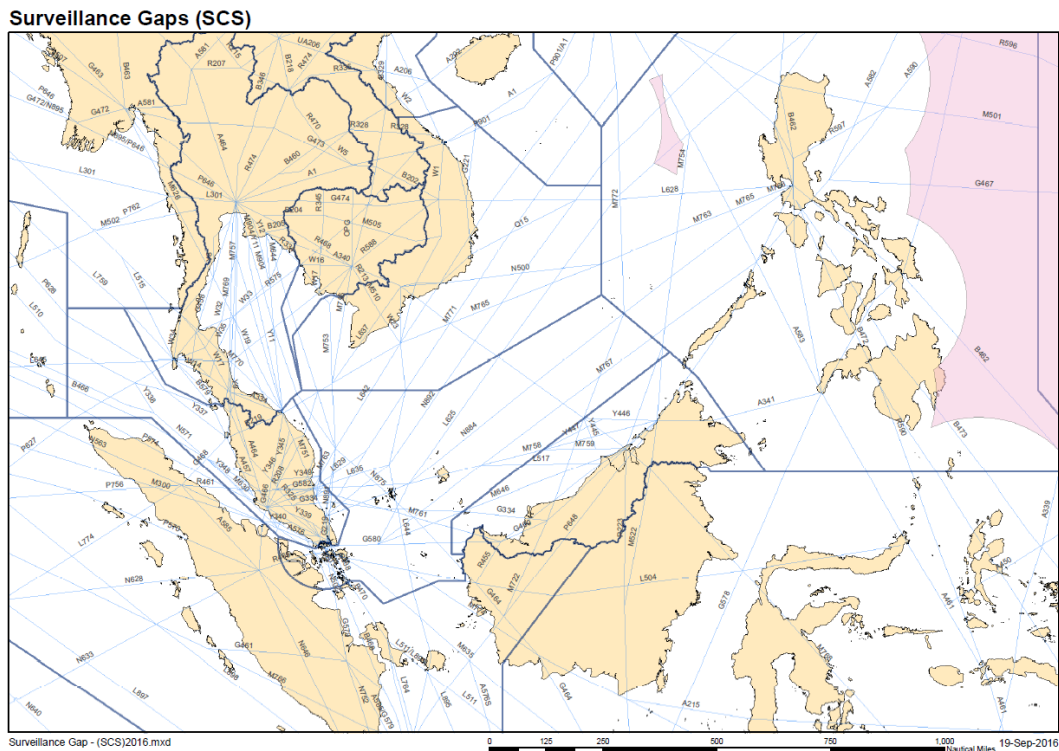


Figure 7: South China Sea ATS surveillance gaps (as at 19 September 2016) **needs updating**

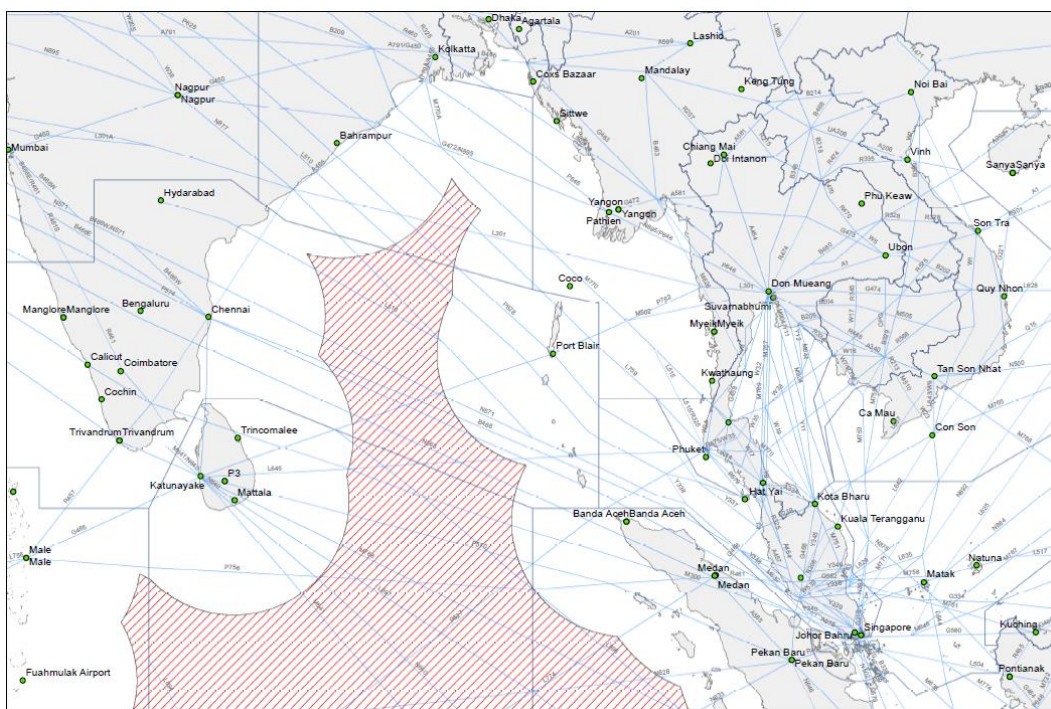


Figure 8: Bay of Bengal ATS surveillance gaps (as at December 2015) **needs updating**

6.12 The main areas of the Asia/Pacific region lacking ATS surveillance and communication coverage which need to be rectified with such capability from ground or space-based solutions due to traffic density, weather deviations and contingency responses are as follows:

- a) highest priority: South China Sea (SCS) airspace between Viet Nam, Brunei Darussalam and the Philippines (**Figure 6**);
- b) high priority: Bay of Bengal (BOB) airspace between the Indian subcontinent and the Andaman Islands (**Figure 8**), the Indian subcontinent and the Arabian Sea;
- c) medium priority:
 - airspace between Indonesia and Australia (between Java and West Australia);
 - airspace between the Philippines and Indonesia (**Figure 7**); and
- d) lower priority: Coral Sea between Papua New Guinea and Australia.

Europe – Asia/Pacific Trans-Regional Issues

6.13 A number of ATS routes from the Russian Federation converged within Mongolian airspace because of the limited number of entry/exit points on the Mongolian/Chinese airspace boundary. Military restrictions had affected ATS route development to China/Mongolia/DPRK and Japanese airspace. An enhancement of civil/military cooperation and ATM coordination is necessary to address these trans-regional issues.

6.14 There is a long-standing problem with the incompatibility of some elements of the European On-Line Data Interchange (OLDI) system with the more global AIDC messages from the Russian Federation to China and Mongolia. It is possible that a solution may be determined by the Inter-Regional APAC/NAT AIDC Task Force. **UPDATE REQUIRED FROM CNS**

6.15 Russia utilised a 30 km (16NM) separation within its upper airspace, while Mongolia initially used 80NM when ATS surveillance was implemented in mid-2012, with an intention to reduce this to a surveillance-based separation after appropriate training. **UPDATE (MONGOLIA)**

6.16 Given the need to minimise safety issues such as Large Height Deviations and to improve confidence in order to minimise trans-regional separations, ATS surveillance data-sharing between the Russian Federation and China/Mongolia is necessary in accordance with PASL Phase I, even if only based on ADS-B.

North/South America – Asia/Pacific Trans-Regional Issues

6.17 There were no major trans-regional issues between Asia and North America via the Anchorage Oceanic, Fukuoka and Oakland Oceanic FIR due to the continuing work at the IPACG involving Japan and the United States. The Cross-Polar Working Group (CPWG) also discussed operations extending into the area between Asia and North America. The Fukuoka and Oakland Oceanic FIRs had high-density Category R airspace but is served by an OTS (PACOTS; Pacific Organized Track System). ADS-C, CPDLC and AIDC were fully deployed in the Anchorage Oceanic, Fukuoka and Oakland Oceanic FIRs, and common procedures, including 30NM separation standards based on RNP4, DARP, UPR were applied.

6.18 The Oakland Oceanic FIR and South Pacific utilised technologies consistent with Block 0 and with Conflict Prediction and Resolution (CPAR), AIDC, CPDLC and ADS-C, were able to provide a Seamless ANS service already between Asia/Pacific and North America. This included the provision of UPRs and DARP where operationally possible. These developments had been managed through the ISPACG, and were a model for other oceanic regions in the Asia/Pacific.

6.19 The airspace between the Pacific and South America had very low density traffic. South American States had not yet developed the same Seamless ANS services capability in the trans-regional airspace to support ATM and essential SAR services. However, Chile is an active member of ISPACG.

Middle East/Africa – Asia Trans-Regional Issues

6.20 The transition of traffic from the Muscat FIR to the Mumbai FIR is identified as a contributing factor to the congestion in the Bahrain FIR and causal factor for the delayed departures from airports, particularly in the United Arab Emirates. India had recently reduced horizontal separation on some routes to 50/50NM. In addition, a FLAS is also used by India and applied to low density traffic from/to African Regions, against the higher density Middle East routes.

6.21 Oman required 10 minute longitudinal separation between eastbound aircraft from the United Arab Emirates regardless of the level the aircraft were climbing to, with plans to reduce this to seven minutes, consistent with the 50NM standard applied within the Mumbai FIR. However, this is still very restrictive, given the ATS surveillance coverage within the Muscat FIR and the fact that the aircraft were climbing to a number of different flight levels. **UPDATE REQUIRED (INDIA?)**

6.22 The problem of OLDI conversions to AIDC between India and the Sultanate of Oman had prevented implementation of AIDC trans-regionally in this area thus far. **UPDATE REQUIRED (INDIA?)**

ADS-B Collaboration

6.23 Potential projects highlighted in the past include ADS-B data sharing between Myanmar and India over the BOB and among Singapore, Brunei Darussalam and the Philippines in the eastern part of the SCS.

6.24 In May 2015 the ANSPs of India and Myanmar signed an ADS-B data sharing agreement at the sidelines of the CANSO Asia Pacific Conference in Fukuoka, Japan thus establishing the collaborative framework for ADS-B data sharing involving ADS-B stations in India (Port Blair and Agartala) and ADS-B stations in Myanmar (Coco Island and Sittwe). The objective was to provide

end-to-end surveillance for several busy airways over the BOB similar to that accomplished over the SCS.

6.25 ADS-B collaboration over the eastern part of the SCS had also been making progress. Singapore had worked closely with the Philippines and Brunei Darussalam to share ADS-B data and VHF communications to plug surveillance gaps on the trunk routes M767 and N884, and was also implementing Space-Based ADS-B (SB ADS-B) to fill any remaining gaps. When completed, these airways the SCS should have complete surveillance coverage.

United States NextGen Economic Benefits

6.26 The Federal Aviation Administration had conducted a business case study for the Next Generation Air Transportation System (NextGen). NextGen is a wide-ranging transformation of the air transportation system, including ATM technologies and procedures; airport infrastructure improvements; and environmental, safety and security-related enhancements. It is consistent with the GANP and the ASBU initiative.

6.27 The cost and benefit calculations underlying the business case for NextGen were developed based on the FAA's 2011 Mid-Term Concept of Operations and the 2012 NextGen Implementation Plan. Modelling of NextGen benefits and costs was based on various inputs. For basic inputs, the USA used traffic data from 2010, along with traffic and fleet forecasts released in early 2011. Recommended economic values, such as those for passenger value of time, etc., were used from early 2011. Based on these inputs, the FAA's analysis showed that NextGen mid-term improvements (until 2020) would generate more than two-and-a-half times in benefits as costs (Figure 9). **UPDATE REQUIRED**

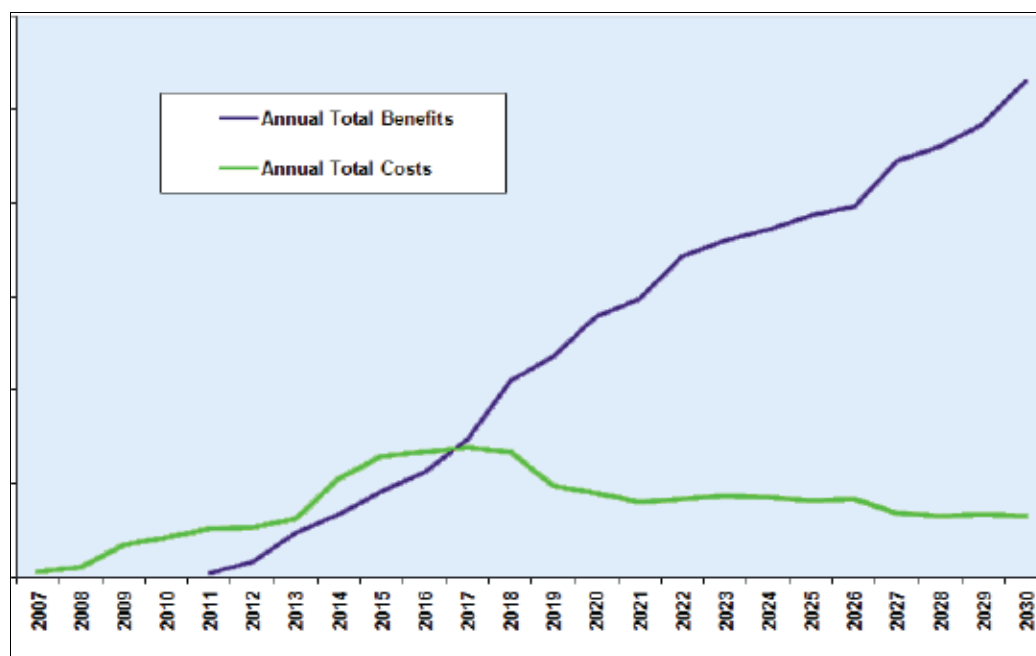


Figure 9: Annual Costs and Benefits

6.28 The NextGen business case focused on the direct benefits to aircraft operators, passengers, and taxpayers from the rollout of NextGen improvements. Benefits identified in the business case were:

- ADOC;
- PVT;

- Reduced FAA operating costs;
- Additional flights enabled by greater capacity;
- Reduced flight cancellations;
- Increased safety; and
- Environmental benefits from reduced aircraft emissions (CO₂ only).

6.29 Types of benefits that were **not** included in the business case were:

- New jobs and economic growth associated with major technology initiatives;
- environmental benefits of bio-fuels or improved engine/aircraft technologies; and
- Environmental benefits from reduced aircraft emissions (NO_x or SO₂).

The resulting benefit estimates are shown in **Figure 10**:

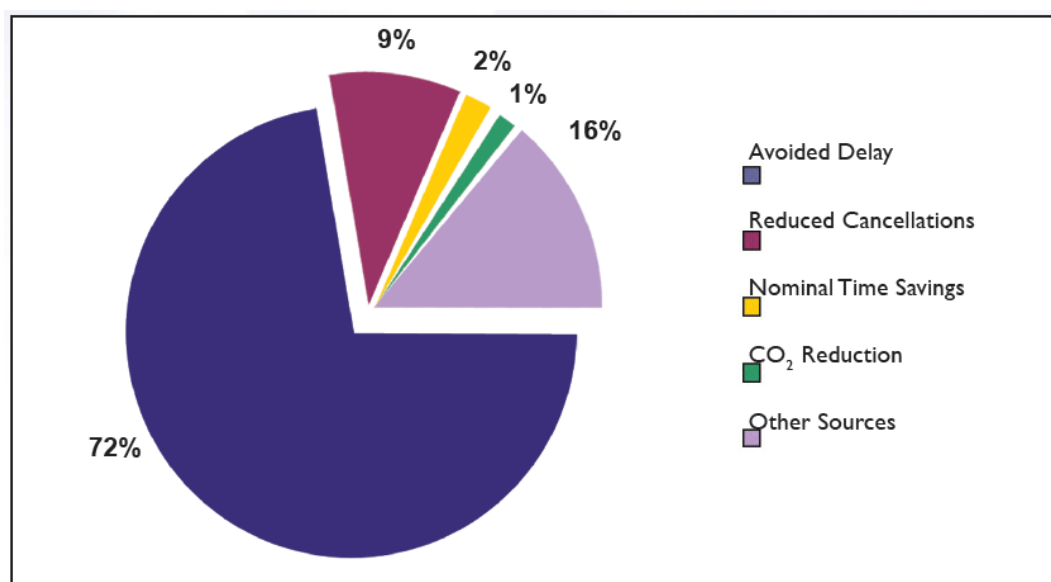


Figure 10: Types of NextGen Benefits until 2030

IATA Seamless ANS Cost-Benefit Analysis

6.31 As general rule, prior to any significant system change, a cost/benefit analysis (CBA) would be conducted to demonstrate the value, negative or positive, of the projected change.

6.32 A CBA of the transition to an Asia Pacific Seamless ANS environment will be developed when the Seamless ANS Plan has been accepted by APANPIRG on behalf of all Asia Pacific States. Although each State retains responsibility for their sovereign airspace, acceptance of the Seamless ANS Plan by APANPIRG, on behalf of all States, creates an obligation on each State, as far as practicable, to follow the agreed upgrade path.

6.33 Although a CBA for the region would not be possible due to the complexity of the task, it was felt necessary to demonstrate, at a high level, the benefits of the proposed Seamless ANS Plan.

6.34 IATA conducted an initial economic analysis which was tabled at APSAPG/3 (Chennai, India, 21-25 January 2013).

6.35 Today, demand exceeds capacity at many locations and along some MTF. Many Asia Pacific airports have implemented slot management schemes for part of the day when demand

exceeds supply. The consequence of this demand-supply gap is that many MTF are subjected to lengthy delays (e.g. BOB) due to capacity limitations.

6.36 Any system delay causes the costs to increase exponentially. When the demand approaches the capacity limits, aircraft must wait to use the system, or various parts of it, until they can be accommodated. These delays impose costs both in terms of aircraft operating expenses and the value of wasted passengers' time. In addition to the economic and cost benefits, the existing operational environment also causes longer flight trajectory, inefficient airport capacity usage, flight inefficiencies, higher CO₂ emission impacting environment and lower predictability of flight operations.

6.37 IATA's initial economic analysis indicated that if the States in Asia Pacific do not implement the critical ICAO ASBU elements of the Seamless ANS Draft Plan, aviation's contribution to the Regional GDP will fall from today's **2.2%** to **0.81%** by 2030.

6.38 Although a 'worst case' scenario this would represent a Regional potential economic benefit **loss** of **US\$16.63 billion per annum** (based on 2012 data), which will reach an accumulated loss of **US\$ 502 billion by 2030**. Upgrading the existing operational environment of ATM is essential in order to enhance the region's economic growth.

6.39 It can be argued that lack of investment in aviation infrastructure will result in this investment being diverted to sectors. However, investment in aviation infrastructure, given the reliance in Asia Pacific on aviation, will yield a greater benefit than any other transport modality investment.

PERFORMANCE IMPROVEMENT PLAN

Preferred Aerodrome/Airspace and Route Specifications (PARS)

Note 1: prior to implementation, the applicability of PARS should be verified by analysis of safety, current and forecast traffic demand, efficiency, predictability, cost effectiveness and environment to meet expectations of stakeholders.

Note 2: Phase I had an expected implementation by 12 November.

PARS Phase II (expected implementation by 07 November 2019)

Aerodrome Operations

7.1 All international aerodromes should enable, in accordance with an Airport Master Plan, aerodrome management and coordination services:

- a) when traffic density requires, an appropriate apron management service to regulate aircraft operations in coordination with ATS;
- b) ATS coordination (including meetings and agreements) related to:
 - airport development and maintenance planning;
 - local authority coordination (environmental, noise abatement, and obstacles);
- c) regular airport capacity analysis, which included a detailed assessment of passenger, airport gate, apron, taxiway and runway capacity.

*Note 1: Sample runway capacity figures are provided from several States in **Appendix D**.*

7.2 Where practicable, all international aerodromes should provide, in accordance with an Airport Master Plan, the following facilities to optimise runway capacity:

- a) additional runway(s) with adequate separation between runway centrelines for parallel independent operations;
- b) parallel taxiways, rapid exit taxiways at optimal locations to minimize runway occupancy times and entry/exit taxiways;
- c) rapid exit taxiway indicator lights (distance to go information to the nearest rapid exit taxiway on the runway);
- d) twin parallel taxiways to separate arrivals and departures;
- e) perimeter taxiways to avoid runway crossings;
- f) taxiway centreline lighting systems;
- g) adequate manoeuvring area signage (to expedite aircraft movement);
- h) holding bays;
- i) additional apron space in contact stands for quick turnarounds;
- j) short length or tailored runways to segregate low speed aircraft;
- k) taxi bots or towing systems, preferably controlled by pilots, to ensure efficiency and the optimal fuel loading for departure; and
- l) advanced visual docking guidance systems.

7.3 All international aerodromes should operate an A-CDM system for ACIS integrated with the ATM network function consistent with **ACDM-B0/1 – 2** (Priority 1).

Terminal Operations (Category T airspace)

7.4 All international aerodromes should have **RNAV 1** (ATS surveillance environment) or **RNP 1** (ATS surveillance and non-ATS surveillance environments) SID/STAR procedures consistent with **APTA-B0/2** (Priority 1).

Note 1: Where a short length or tailored runway designed to segregate low speed aircraft is established, the runway should be served by PBN procedures including SID and STAR that provided segregation from the procedures serving other aerodrome runways as far as practicable.

Note 2: PBN procedures that overlay visual arrival and departure procedures should be established where this provided an operational advantage.

7.5 Where practicable, all international aerodromes with instrument runways serving aeroplanes should have the following precision approach systems (or if an APV is not practical, PBN non-precision approaches) consistent with **APTA-B0/1** and **3 (APTA-B0/1 Priority 1)**:

- a) SBAS/GBAS precision approaches; or ILS/MLS approaches (with APV approach as a backup); or
- b) Approaches with Vertical Guidance (APV), either RNP APCH with Barometric Vertical Navigation (Baro-VNAV) or augmented GNSS (e.g. SBAS); or
- c) if an APV is not practical, straight-in RNP APCH with Lateral Navigation (LNAV).

Note: When establishing the implementation of PBN approach procedures in accordance with Assembly Resolution A37-11, States should first conduct an analysis of the instrument runway eligibility for APV approaches. This analysis should include the feasibility of the APV at a particular location, the presence of regular commercial operations and the current or projected user fleet capability for APV. Locations where APV approach were either not feasible or where regular operators could not realise the benefit of APV should implement RNP APCH with LNAV minima instead of APV, to provide the safety benefits of straight-in approach procedures.

7.6 All international aerodromes with rotary wing operations should establish PBN arrival/departure, approach and/or en-route transiting procedures. PBN Helicopter PinS Operations should be established consistent with **APTA-B0/6** where there is an operational benefit (Priority 3).

7.7 SBAS, GBAS, ABAS and MON systems should be established as appropriate to the level and type of aircraft operations and the operating environment consistent with **NAVS-B0/1 - 4**, subject to an assessment of benefits and costs.

Note 1: the application of GNSS and its augmentations such as GBAS Landing System (GLS) is recommended where these systems were economically beneficial.

Note 2: As far as practicable, airspace and instrument flight procedures associated with international aerodromes should not be constrained by international borders and political barriers, and be established only after appropriate consideration of:

- a) environmental efficiencies;
- b) noise abatement and local authority regulations;
- c) adjacent aerodromes;
- d) conflicting instrument flight procedures; and
- e) affected ATC units or ATM procedures.

7.8 Unless supported by alternative means of ATS surveillance (such as radar, where there are no plans for ADS-B), all Category T airspace supporting international aerodromes should be designated as non-exclusive or exclusive as appropriate ADS-B airspace requiring operation of ADS-B OUT using 1090ES with DO-260/260A and 260B capability to support **ASUR-B0/1**.

Note 1: non-exclusive means that non-ADS-B aircraft may enter the airspace, but may be accorded a lower priority than ADS-B equipped aircraft, except for State aircraft.

Note 2: in areas where ADS-B based separation service was provided, a mandate for the carriage of ADS-B OUT using 1090ES with DO260/60A or 260B is recommended.

Note 3: States should refer to the ADS-B implementation in the ICAO ADS-B Implementation and Guidance Document (AIGD).

7.9 All Category T airspace supporting international aerodromes should require the carriage of an operable mode S transponder within airspace where Mode S radar services are provided to support **ASUR-B0/3**.

7.10 All Category T airspace supporting international aerodromes should be designated as non-exclusive or exclusive PBN airspace as appropriate to allow operational priority for PBN approved aircraft, except for State aircraft, to facilitate seamless operations and off-track events such as weather deviations to support **APTA-B0/1 – 3 and 6**.

En-route Operations

7.11 Unless supported by alternative means of ATS surveillance (such as radar, where there are no plans for ADS-B), all Category S upper controlled airspace supporting international aerodromes should be designated as non-exclusive or exclusive as appropriate ADS-B airspace requiring operation of ADS-B OUT using 1090ES with DO-260/260A and 260B capability to support **ASUR-B0/1**.

7.12 All Category R and S upper controlled airspace should require the carriage of an operable mode S transponder within airspace where Mode S radar services are provided to support **ASUR-B0/3**.

7.13 All Category R and S upper controlled airspace should be designated as non-exclusive or exclusive PBN airspace as appropriate to allow operational priority for PBN approved aircraft, except for State aircraft, to facilitate seamless operations and off-track events such as weather deviations to support **APTA-B0/2**.

Note 1: airspace mandates should be harmonised with adjacent airspace and implemented in accordance with guidance provided in this document.

7.14 As far as practicable, all new ATS Routes should be PBN Routes in accordance with the following specifications to support **B0/1 – 8**, and **APTA-B1/1 – 5**:

- Category R airspace – **RNP 4, RNP 10** (RNAV 10) (other acceptable navigation specifications – RNP 2 oceanic); and
- Category S airspace – **RNAV 2 or RNP 2**.

Note 1: ATS routes should be designated with a navigation performance specification commensurate with the CNS/ATM operational environment (within Category S airspace, the PBN specification is not significant to ATC as it is used for track-keeping assurance, not ATC separation. The ATS route navigation performance specification selected should be harmonised and utilise the least stringent requirement needed to support the intended operation. When obstacle clearance or ATC separation requirements demand, a more stringent navigation specification may be selected.

Note 2: RNP 2 is expected to be utilised before Phase 2, when the RNP 2 instrument procedure design, ATC separation standards and operational approval are in place. The Asia/Pacific recognises an equivalency for RNP 2 as being an aircraft approved for RNAV 2, RNP 1 and with GNSS. Prior to the ICAO standard flight plan being updated to recognise RNP 2, States should ensure that aircraft operators with RNP 2 approval file designator 'Z' in field 10 and 'NAV/RNP 2' in field 18 (in addition to designator 'R' to indicate PBN approved).

Note 3: within Category R airspace, transition to RNP 4 or RNP 2 oceanic specifications is recommended at the earliest opportunity. RNP 4 and RNP 2 requires ADS-C and CPDLC, whereas RNP 2 oceanic requires dual independent installations.

Note 4: the Nineteenth Meeting of the Regional Airspace Safety Monitoring and Advisory Group (RASMAG/19, 26 – 30 May 2014) endorsed the application of 8NM spaced RNAV 2 ATS routes within Category S airspace by the Republic of Korea, as it had demonstrably met the Target Level of Safety.

7.15 All States should use the ICAO Table of Cruising Levels (FLOS) based on feet as contained in Annex 2 Appendix 3a.

Civil/Military Cooperation

7.16 Civil/Military Airspace expectations are as follows:

- a) SUA should only be established after due consideration of its effect on civil air traffic by the appropriate Airspace Authority to ensure it will be:
 - used for the purpose that it is established;
 - used regularly;
 - as small as possible, including any internal buffers, required to contain the activity therein;
 - if applicable, operated in accordance with FUA principles; and
 - activated only when it is being utilised; and
- b) SUA should be regularly reviewed to ensure the activities that affect the airspace, and size and timing of such activity are accurately reflected by the SUA type, dimensions, activation notice and duration of activation.

Unmanned Aircraft Systems

7.17 States should implement regulations supporting the integration of UAS operations in non-segregated airspace, using a risk-based approach and in accordance with the Asia/Pacific Regional Guidance for the Regulation of UAS, as a minimum.

Seamless PARS Phase III (expected implementation by 03 November 2022)

7.18 All international aerodromes should operate an A-CDM system integrated with the ATM network, and an AOP and where practicable an APOC consistent with **ACDM-B1/1 – 2**.

7.19 All international aerodromes should implement CCO and CDO operations consistent with **APTA-B0/4 – 5** where practicable, and performance-based aerodrome operating minima-advanced and basic aircraft consistent with **APTA-B0/7 – 8**.

Note: this does not preclude a State considering implementation of CCO/CDO and performance-based aerodrome operating minima at other aerodromes as appropriate.

7.20 Unless excepted by ATC, all aircraft operating within Category S and T controlled airspace should have systems that enable basic airborne situational awareness AIRB and VSA and where applicable, performance-based horizontal minima consistent with **CSEP-B1/1 – 4**.

7.21 As far as practicable, all new ATS Routes should be PBN Routes in accordance with the following specifications to support **COMS-B0/1 – 2**, **COMS-B1/1 – 3**, **APTA-B0/1 – 8**, and **APTA-B1/1 – 5**:

- Category R airspace – **RNP 2 Oceanic** (other acceptable navigation specification – **RNP 4**); and
- Category S airspace – **RNAV 2** or **RNP 2**.

PARS Phase IV (expected implementation by 27 November 2025)

7.22 All international aerodromes should implement advanced capability PBN SID and STAR procedures and performance-based aerodrome operating minima for advanced aircraft with SVGS consistent with **APTA-B1/1 – 3**.

Note: this does not preclude a State considering implementation of advanced capability PBN SID and STAR procedures and performance-based aerodrome operating minima for advanced aircraft at other aerodromes as appropriate.

7.23 Where there is an operational benefit, all international aerodromes should implement Advanced CDO and CCO operations consistent with **APTA-B1/4 – 5**.

Preferred ANS Service Levels (PASL)

Note: prior to the implementation, the applicability of PASL should be verified by analysis of safety, current and forecast traffic demand, efficiency, predictability, cost effectiveness and environment to meet expectations of stakeholders.

PASL Phase II (expected implementation by 07 November 2019)

ATS Communications

7.24 All ATS sectors providing ATS surveillance in adjacent airspace should have direct speech circuits or digital voice communications, meeting pre-established safety and performance requirements, and where practicable, automated hand-off procedures that allow the TOC of aircraft without the necessity for voice communications, unless an aircraft requires special handling.

Note: this element is applicable to ATC sectors within ATS units and between ATS units providing services in adjacent airspace.

7.25 Where applicable, all ATC Sectors should be supported by VDL Mode O/A and AMHS communication systems consistent with **COMI-B0/3, 7** (Priority 1).

7.26 ATS systems should enable AIDC (version 3 or later), or an alternative process that achieves at least the same level of performance as AIDC, between en-route ATC units and terminal ATC units where transfers of control are conducted consistent with **FICE-B0/1**, unless alternate means of automated communication of ATM system track and flight plan data are employed (Priority 1). As far as practicable, the following AIDC messages types should be implemented:

- Advanced Boundary Information (ABI);
- Coordinate Estimate (EST);
- Acceptance (ACP);
- TOC; and
- Assumption of Control (AOC).

Note: States should note the necessity to utilise Logical Acknowledgement Message processing (LAM) when implementing AIDC (refer to guidance in Chapter XX in PAN ICD).

ATS Surveillance

7.27 ADS-B (using 1090ES), MLAT or radar surveillance systems should be used to provide coverage of all Category S airspace as far as practicable, and Category T airspace supporting international aerodromes, consistent with **ASUR-B0/1 – 2**. 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).

Note 1: ATM systems, including ATS surveillance systems and the performance of those systems, should support the capabilities of PBN navigation specifications and ATC separation standards applicable within the airspace concerned. Guidance on the performance of ATS communication and surveillance systems is available in ICAO Document Doc 10037 (Global Operational Data-link Document)

Note 2: ATC units with ADS-B where Category S and Category T airspace supporting high-density aerodromes may consider utilizing ADS-B for situational awareness and/or separation.

Note 3: ATC units operating within controlled airspace wholly served by Mode S SSR and/or ADS-B surveillance should implement the use of the standard non-discrete Mode A code 1000 for Mode S transponder equipped aircraft to reduce the reliance on assignment of discrete Mode A SSR codes and hence reduce the incidence of code bin exhaustion and duplication of code assignment.

7.28 Subject to appropriate filtering, ATS surveillance data, particularly from ADS-B, should be shared with neighbouring ATC units to support **ASUR-B0/1 – 2**.

7.29 Within Category R airspace, ADS-C surveillance and CPDLC should be enabled to support PBN-based separations, as well as UPR and DARP, consistent with **COMS-B0/1 – 2** and **FRT0-B0/1-4** and **FRT0-B1/1 – 7**.

Note: At the 6th Worldwide Air Transport Conference (ATCONF, Montréal, 18-22 March 2013) support was expressed for work to be undertaken on the schemes of economic incentives, ‘best equipped or capable, best served’ and ‘most capable, best served’ concepts. The CONOPS states that in each case where any aircraft that does not meet specified requirements, it should receive a lower priority, except where prescribed (such as for State aircraft).

7.30 Mode S surveillance and the use of Mode S Downlinked Aircraft Parameters (DAPS) should be enabled in all upper level Category S airspace and all Category T airspace servicing high density city pairs consistent with **ASUR-B0/3**. ATM automation system specifications should include the processing and presentation in ATC human-machine interfaces and decision support and alerting tools, the communications, navigation and approach aid indicators received in items 10 and 18 of FPL and ATS messages, where applicable, and the following Mode S or ADS-B downlinked aircraft parameters as a minimum:

- Aircraft Identification;
- Aircraft magnetic heading;
- Aircraft indicated airspeed or Mach Number; and
- Pilot selected altitude.

Note1: DAPS may not be present in downlinked reports from some aircraft ADS-B applications.

Note 2: Downlinking of correct Aircraft Identification (Flight ID) enables automated coupling of ATS surveillance system information with the flight plan, and unambiguous ATC identification of aircraft. States should undertake comprehensive education programs to ensure pilots set the correct Flight ID. Guidance on the correct use of the aircraft identification function is provided in the ADS-B Implementation and Operations Guidance Document, available on the ICAO Asia/Pacific Regional Office website.

7.31 ATS surveillance systems should enable basic conflict detection and conformance monitoring STCA, MTCD, APW, APM and MSAW consistent with **FRT0-B0/4** and **SNET-B0/1 – 4** (Priority 1). Route Adherence Monitoring (RAM) should be utilised when monitoring PBN route separations. Cleared Level Adherence Monitoring (CLAM) should be utilised to monitor RVSM airspace.

Air Traffic Management

Note: ATM system design (including ATS communication and surveillance, ATC separation minimum, aircraft speed control and ATC training) should be planned and implemented to support optimal aerodrome and enroute operations determined by the capacity expectations for the runway(s) and airspace concerned.

7.32 All international aerodromes where ATFM facilities are required should be served by AMAN/DMAN facilities consistent with **RSEQ-B0/1 – 2** (Priority 1).

Note: All AMAN systems should take into account airport gates for runway selection and other aircraft departures from adjacent gates that may affect arriving aircraft.

7.33 Controlled airspace classification should be consistent with Annex 11 Appendix 4 and applied as follows:

- a) Category R upper controlled airspace– **Class A**; and
- b) Category S upper controlled airspace– **Class A**, or if there are high level general aviation or military VFR operations: **Class B** or **C**; and
- c) Category S lower controlled airspace- **Class C, D** or **E** airspace, as determined by safety assessments.

7.34 All ATC units should authorise the use of the horizontal separation minima stated in ICAO Doc 4444 (PANS ATM), or as close to the separation minima as practicable, taking into account such factors as:

- a) the automation of the ATM system, including automated hand-off between sectors;
- b) the capability of the ATC communications system;
- c) the performance of the ATS surveillance system, including data-sharing or overlapping coverage at TOC points; and
- d) ensuring the competency of air traffic controllers to apply the full tactical capability of ATS surveillance systems.

Note 1: the delivery of ATC services should be based primarily on the CNS/ATM capability. When using Annex 10 compliant ATS surveillance, 5NM (enroute) or 3NM (terminal) surveillance-based separations should be authorised within ATC sectors. At the TOC points in such environments, 5-10NM should be authorised with auto hand-off and surveillance data-sharing or overlapping coverage at the TOC point, and 5-20NM without auto hand-off, as determined by an appropriate safety assessment.

Note 2: the efficacy, continuity and availability of ATM services should be supported by adherence with regional planning and guidance material regarding ATM automation and ATM contingency systems (regarding ATM contingency operations, refer to the Regional ATM Contingency Plan).

7.35 Priority for FLAS level allocations should be given to higher density ATS routes over lower density ATS routes. FLAS should comply with Annex 2, Appendix 3a unless part of an OTS. FLAS other than OTS should only be utilised for safety and efficiency reasons within:

- a) Category R airspace with the agreement of all ANSPs that provide services:
 - within the airspace concerned; and
 - within adjacent airspace which is affected by the FLAS; or
- b) Category S airspace with the agreement of all ANSPs that provide services:
 - where crossing track conflicts occur within 50NM of the FIRB; and
 - ATS surveillance coverage does not overlap the FIRB concerned, or ATS surveillance data is not exchanged between the ATC units concerned.

7.36 ATC units should conduct Airspace Planning and enable systems that manage direct and flexible routings where practicable, and the optimal operation of FUA consistent with **FRTO-B0/1 –**

4 (Priority 1).

7.37 All ATC Sectors should have a nominal aircraft capacity figure based on a scientific capacity study and safety assessment, to ensure safe and efficient aircraft operations.

Note: A study of the terminal ATC Sector airspace capacity every 15 minutes is provided in Appendix D.

7.38 All ACCs operating within FIRs where demand may exceed capacity should implement ATFM incorporating CDM to enhance capacity, using bi-lateral and multi-lateral agreements, initial integration of ASM with ATFM, Collaborative Network Flight Updates, Basic Network Operation Planning and Initial Airport/ATFM slots, A-CDM Network Interface and Dynamic Slot Allocation consistent with **NOPS-B0/1 – 5** (Priority 1).

Note 1: refer to the Asia/Pacific ATFM Framework on Collaborative ATFM for more details on Network Operations expectations.

Note 2: full FUA is not yet incorporated into the Asia/Pacific ATFM Framework for Collaborative ATFM.

7.39 ATC systems should utilise electronic flight progress strips wherever automation systems allow the capability due to efficiency and transcription error/data mismatch issues.

Air Navigation Services

7.40 ATM systems should be supported by digitally-based AIM systems consistent with **DAIM-B1/1 – 6**, in adherence with ICAO and regional AIM planning and guidance material. ATM systems should be supported by aeronautical information digital data exchange of at a minimum, version AIXM 5.1 (Priority 1).

Note: Regional AIM policies are contained within the Asia/Pacific Collaborative AIM Plan.

7.41 Aeronautical meteorological observations, forecast, warning, climatological and historical products (such as aerodrome meteorological forecasts and reports, aerodrome warnings and wind shear warnings) should be disseminated to users consistent with **AMET-B0/1-4**, and in accordance with global and regional guidance material. An agreement between the MET authority and the appropriate ATS authority should be established to ensure the appropriate exchange of meteorological information obtained from aircraft (Priority 1).

7.42 An appropriate enhanced SAR system and systems to support aircraft tracking capability should be established consistent with the provisions of Annex 12 and to support **GADS-B1/1 – 2**, and in accordance with the *Asia/Pacific SAR Plan*.

ANSP Human and Simulator Performance

7.43 The following systems should be established to support human performance in the delivery of a Seamless ANS service. The systems should consider all the elements of the SHEL Model (Software, Hardware, Environment and Liveware – humans), in accordance with the ICAO Human Factors Digest No. 1 and related reference material:

- a) human performance training for all managers of operational air navigation services (such as aerodrome operators, ATC organisations and aeronautical telecommunications), such training to include the importance of:
 - a proactive organisational culture where managers and operational staff are informed and safety is a first priority, using open communications and an effective team management approach;

- assessment and management of risks by safety review and assessment teams comprising multidisciplinary operational staff and managers which review safety performance and assess significant proposals for change to ATM systems, particularly those related to human capabilities and limitations;
 - human factors in –
 - air safety investigation;
 - system design (ergonomics, human-in-the-loop);
 - effective training (including the improved application of simulators);
 - fatigue management;
 - automated safety nets; and
 - contingency planning;
 - effective safety reporting systems that –
 - are non-punitive, supporting a ‘Just Culture’;
 - promote open reporting to management; and
 - focus on preventive (systemic), not corrective (individual) actions in response to safety concerns, incidents and accidents.
- b) human performance-based training and procedures for operational staff providing ATS, including:
- the application of tactical, surveillance-based ATC separation;
 - control techniques near minimum ATC separation; and
 - responses to ATM contingency operations, irregular/abnormal operations and safety net alerts.
- c) human performance-based training and procedures for staff providing operational air navigation services (such as aerodrome staff operating ‘airside’, air traffic controllers and aeronautical telecommunications technicians) regarding the importance of:
- an effective safety reporting culture; and
 - ‘Just Culture’ (Priority 1).

Note 1: prevention of fatigue systems should be established to support human performance in the delivery of a Seamless ANS service. The systems should be consistent with guidance within ICAO Doc 9966 FRMS – Fatigue Risk Management System.

Note 2: regarding ATM contingency operations, refer to the Regional ATM Contingency Plan.

Civil/Military Cooperation

7.44

Civil/Military ATM expectations are as follows:

- a) a national civil/military body should be formed to coordinate strategic civil-military activities (military training should be conducted in locations and/or at times that do not adversely affect civilian operations, particularly those associated with major aerodromes);
- b) formal civil-military liaison should take place for tactical responses by encouraging military participation at civil ATM meetings and within ATC Centres;

- c) integration of civil and military ATM systems using joint procurement, and sharing of ATS surveillance data (especially from ADS-B systems) should be provided as far as practicable;
- d) joint provision of civil/military navigation aids and aerodromes;
- e) common training should be conducted between civil and military ATM units in areas of common interest; and
- f) civil and military ATM units should utilize common procedures as far as practicable.

Note: the term 'military' in this context may include other State functions such as customs, police, and paramilitary activities.

7.45 All States with organisations that conduct ballistic launch or space re-entry activities should ensure:

- a) the development of written coordination agreements between the State civil aviation authority and the launch/re-entry agency concerned;
- b) that strategic coordination is conducted between the State civil aviation authority and any States affected by the launch/re-entry activity at least 14 days prior to the proposed activity, providing notice of at least:
 - i) three days for the defined launch window; and
 - ii) 24 hours for the actual planned launch timing;
- c) that consideration of affected airspace users and ANSPs is made after consultation, so that the size of the airspace affected is minimized and the launch window is optimized for the least possible disruption to other users ; and
- d) that communication is established with affected ANSPs to provide accurate and timely information on the launch/re-entry activity to manage tactical responses (for example, emergencies and activity completion) (Priority 1).

Note 1: increasingly, ballistic launch and space re-entry activity is being conducted by commercial organisations, so this element applies equally to State or private operations.

Note 2: guidance for States on ballistic launch and space re-entry activity is available on the ICAO Asia/Pacific eDocuments webpage.

Seamless ANSPASL Phase III (expected implementation by 03 November 2022)

Aerodrome Operations

7.46 All ATC units providing services to international aerodromes should operate extended arrival metering consistent with **RSEQ-B1/1**.

7.47 All ATC units providing services to international aerodromes should operate basic ATC surface operations tools, comprehensive situational awareness, situational awareness, alerting service consistent with **SURF-B0/1 – 3**.

7.48 All ATC units providing services to international (ICAO codes 3 and 4) aerodromes should operate advanced surface traffic management visual aids, pilot comprehensive awareness and runway alerting, enhanced ATC alerting, routing service to support ATC and enhanced vision systems (EVS) for taxiing and runway safety alerting logic consistent with **SURF-B1/1 – 5**.

Note1: AMAN/DMAN arrival/departure management needs to be integrated with advanced surface management systems: A-SMGCS with SMAN or ASDE-X.

Note 2: SURF standards are provided in EUROCAE/RTCA documents ED-159/DO-312/ED-165.

7.49 All ATM systems serving international aerodromes should implement Data-link Departure Clearance (DCL) compliant with EUROCAE WG78/RTCA SC 214 standards.

7.50 ATS surveillance systems should enable Enhanced STCA with aircraft parameters and in complex TMAs consistent with **SNET-B1/1 – 2**.

En-Route Operations

7.51 ACCs should enable, where practicable, Free Route Airspace, RNP routes, Advanced FUA and Airspace Management (ASM), Dynamic Sectorisation, Enhanced Conflict Detection Tools and Conformance Monitoring and Multi-Sector Planner Function consistent with **FRTO-B1/1 – 7**.

Note: CPAR is a key enabler for 'free route airspace' and enroute UPR and DARP operations.

7.52 All ACCs operating within FIRs where demand may exceed capacity should operate systems that enable, where applicable, Short Term ATFM measures, Enhanced NOPS Planning, Enhanced integration of airport operations and NOPS planning, Enhanced Traffic Complexity Management, Full integration of ASM with ATFM, Initial Dynamic Airspace configurations, Enhanced ATFM slot swapping, Extended Arrival Management, ATFM Target Times and Collaborative Trajectory Options Programme consistent with **NOPS-B1/1 – 10** supporting the integration of time-based management within a flow centric approach, consistent with **TBO-B0/1** and **TBO-B1/1**.

7.53 All ATC units should be equipped with or be able to interface with communication systems appropriate to support the service provided, consistent with:

- a) **COMI-B0/1 – 2, 4 – 6** including ACARS, ATN/OSI, VDL Mode 2 Basic, SATCOM Class C Data, and HFDL; and
- b) **COMI-B1/1 – 4**, including VDL Mode 2 Multi-Frequency, SATCOM Class B (SB-S) Voice and Data, ATN/IPS and AeroMACS Ground-Ground; and
- c) **COMS-B0/1 – 2**, including CPDLC (FANS 1/A & ATN B1) for domestic and procedural airspace and ADS-C (FANS 1/A) for procedural airspace; and

- d) **COMS-B1/1 – 3**, including PBCS approved CPDLC (FANS 1/A+), ADS-C and SATVOICE for domestic and procedural airspace.

Note 1: the Asia/Pacific Region has established the CRV (Common aeRonautical Virtual private network), in order for ANSPs serving as Inter-regional Backbone Boundary Intermediate Systems to connect to the IP network infrastructure of other regions. Note 2: ANSPs should upgrade their ATS voice communication systems or implement analogue/digital VoIP converters in compliance with the EUROCAE ED-137 standards (interoperability standards for VOIP ATM components).

- 7.54 ACCs operating within Category R airspace should implement SB ADS-B consistent with **ASUR-B1/1**, subject to an assessment of costs and benefits.

Note: this does not preclude the use of SB ADS-B by other ATC units to augment surveillance capability or to act as a backup.

Air Navigation Services

- 7.55 ATM systems should be supported by digitally-based NOTAM consistent with **DAIM-B1/7**.

Note: Regional AIM policies are contained within the Asia/Pacific Collaborative AIM Plan.

- 7.56 All States should ensure that aeronautical meteorological products supported by automated decision systems or aids using IWXXM consistent with **AMET-B1/1 – 4**.

PASL Phase IV (expected implementation by 27 November 2025)

NIL

RESEARCH AND FUTURE DEVELOPMENT POSSIBILITIES

Research and Development

8.1 To develop the tools and systems required to meet foreseeable long-term requirements, there is a need for States to undertake and co-operate on ATM Improvement. This includes major efforts to define concepts, to extend knowledge and invent new solutions to future ATM challenges so these new concepts are selected and applied in an appropriate timely manner. Such efforts could be forged through collaborative partnerships between, States, ANSPs, International Organizations, institutes of higher learning and specialised technical agencies. This concept is consistent with Seamless ANS Principle 36 (*Inter-regional cooperation ('clustering') for the research, development and implementation of ATM projects*).

8.2 The need for concepts beyond current technology and systems had been reinforced at APANPIRG/23. 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 should 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 are possible areas that should be considered for future development, in order to continue pursuance of Seamless ANS beyond ASBU Block 0 implementations and global interoperability:

- a. Space-Based ATS Surveillance - The AN-Conf/12 endorsed Recommendation 1/9 regarding space-based ADS-B systems being included in the GANP (**Appendix B**);
- b. Sub-Regional ATFM - Inter-linked (data-sharing) ATFM units (which may be virtual offices) should be developed to serve various sub-regions. This concept is consistent with Seamless ANS Principle 8 (*Sub-regional ATFM based on system-wide CDM serving the busiest terminal airspace and MTF*). The Global ATM Operational Concept paragraph 2.4.3 states: *Demand and capacity balancing will be integrated within the ATM system*;
- c. Collaborative Air Navigation Services - This concept is consistent with the following Seamless ANS Principles: 9 (*Cross-border/FIR cooperation for use of aeronautical facilities and airspace, collaborative data sharing, airspace safety assessment and ATM Contingency planning*) and 15 (*Collaboration by ANSPs for evaluation and planning of ATM facilities*). The AN-Conf/12 endorsed Recommendation 5/1, regarding collaboration in airspace organization and routing, which emphasised, *inter alia*, the need to take advantage of improved models for inter-regional coordination and collaboration to achieve seamless air traffic management and more optimum routes through airspace (**Appendix B**);
- d. Airspace Optimisation - the CONOPS states: *Where possible the number of FIRs should be minimized particularly along traffic flows. FIRs should not necessarily be based strictly on the boundaries of sovereign territories*. This concept is consistent with and the following Seamless ANS Principles: 12 (*The optimisation of airspace structure through amalgamation and use of technology*) and 16 (*Optimization of ATM facilities through amalgamation and the use of technology, including automation, satellite-based systems and remote facilities*). The Global ATM Operational Concept paragraph 2.2.2 states: *While acknowledging sovereignty, airspace will be organized globally. Homogeneous ATM areas and/or routing areas will be kept to a minimum, and consideration will be given to consolidating adjacent areas*;

- e. Consistent Operating Practices and Procedures - this is aligned with Seamless ANS Principle 3 (*Harmonised regional or sub-regional rules and guidelines*) and 4 (*Shared ATM operational standards, procedures, guidance materials through common manuals and templates*); and
- f. Transition Altitude/Layer Harmonisation – this is consistent with AN-Conf/-12 Recommendation 5/1 b).

MILESTONES, TIMELINES, PRIORITIES AND ACTIONS

Milestones

9.1 Section 7 (Performance Improvement Plan) provides milestones and timelines for a number of elements in the PARS and PASL Phase II, III and IV, being effective 07 November 2019, 03 November 2022 and 27 November 2025 respectively. Phase I elements that had not been completed as at 2019 were moved to Phase II.

9.2 It should be noted that States should commence planning for the various elements, such as PBN specifications detailed in the PARS to cover overall ATM operations, taking into account the whole phase of flight. This should be planned from the approval of this Plan, to ensure a smooth transition by the onset of Phase I, and should include consideration of issues such as:

- aircraft equipage and certification;
- safety/operational analysis and assessment;
- cost-effectiveness;
- budgetary issues;
- development of operational procedures; and
- training.

9.3 States should commence planning for PBN specifications detailed in the PARS and other initiatives which have been globally documented, to facilitate a smooth transition by the onset of Phase I. The Regional PBN Plan is expected to transition to a general guideline for implementation during this period, with the prescriptive PBN specifications being incorporated into this Plan.

9.4 Section 8 (Research and Future Development Possibilities) provides, subject to future agreement by concerned parties, possible Seamless ANS improvements beyond 2019 until 2031.

Priorities

9.5 It is a matter for each State to determine priorities in accordance with its own economic, environmental, safety and administrative drivers. Such drivers may include a data driven assessment of their own performance.

Actions

9.6 Noting that the Plan had the status of guidance material in terms of regional policy expectations, this Plan necessitated a number of implementation actions.

9.7 The ICAO Seamless ANS Reporting System supports the implementation of the global and regional items by monitoring progress of States and administrations.

9.8 A non-binding NANP template is provided on the ICAO Asia/Pacific website under 'eDocuments' at <https://www.icao.int/APAC/Pages/new-eDocs.aspx>. States were expected to maintain a NANP to ensure a whole-of-government level of planning.

9.9 The NANP supports implementation of the Global Air Navigation Plan and regional air navigation planning. The NANP was expected to be accessible to key stakeholders, including ICAO; however, specific details related to national security may be withheld from public release.

9.10 The NANP should detail the State's assessment of its requirements and the

implementation process for applicable global and regional air navigation planning elements.

9.11 States were expected to report their implementation progress and status of the applicable global and regional air navigation planning elements at least once each year (preferably prior to 01 April) to support:

- global and regional plans (including the Seamless Air Traffic Management Plan and the Regional Air Navigation Plan Volume III); and
- specific plans for aerodromes, Aeronautical Information Management (AIM), Air Traffic Flow Management (ATFM), Air Traffic Management (ATM) contingency and Search and Rescue (SAR).

9.12 The NANP should include the following Basic Planning Elements:

Background – a brief introduction aimed at high level decision-makers that describes the need for the plan with benefits and costs, including the necessity for global and regional harmonization and interoperability:

- a) general (not necessarily quantitative) description of the Plan's benefits;
- b) general description of the costs*; and
- c) details of how the State Plan connects to the global and regional planning hierarchy.

**Note 1: this is a matter for the State to determine, and could be in terms of quantitative, qualitative, cost of implementation or cost of not implementing.*

**Note 2: ICAO do not require details of costs from States, as this is for the State's benefit.*

Stakeholder Consultation – high level descriptions and statements:

- a) of the process used to consult with stakeholders, including the military; and
- b) from key stakeholders (such as Heads of CAAs, ANSPs, military organisations, etc.) endorsing the State Plan.

Analysis – Information on the State's analysis of:

- a) all applicable ASBU and regional elements deemed to be applicable, including a statement of the State's priorities* for implementation; and
- b) elements that are deemed to be not applicable, and how these were determined.

**Note: this assessment should be guided by the priorities determined by APANPIRG*

Planning – descriptions of:

- a) the implementation process, such as how the different stakeholders will work together, design systems and provide feedback on implementation; and
- b) each applicable global and regional element's implementation managers (those responsible for execution of the implementation) and timelines.

Progress – details in the State Plan as to the progress of implementation against the planning timelines.

Note: this also provides an indication that the Plan is a 'living document' subject to periodic review and update.

9.13 APANPIRG and its contributory bodies such as the ATM Sub-group and the CNS Sub-group are responsible for the oversight of air navigation issues within the Asia/Pacific, so these bodies needed to be made aware of State implementation progress of Seamless ANS initiatives. APANPIRG and its contributory bodies need to manage the implementation of Seamless ANS through the ASBU framework and this Plan.

9.14 Section 6 (Current Situation) provides detailed analysis and major concerns in the region. Some of the non-ICAO sub-regional collaborative frameworks or actions have successfully achieved ATM operational improvements in the past. These forums will continue to be important in Seamless ANS implementation in the future.

9.15 The ICAO Asia and Pacific Regional Office is responsible for taking actions that assisted the implementation of Seamless ANS within its accredited States. In addition, the Asia and Pacific Regional Office coordinated with adjacent ICAO regional offices on an ad hoc basis or at relevant trans-regional meetings.

Appendix A: KANSAI Statement

The Directors General of Civil Aviation (DGCA) of the Asia and Pacific Regions met for the 46th DGCA Conference in Japan, 12-16 October, 2009. Recalling that the 45th Conference had endorsed the Theme Topic for the 46th DGCA Conference as “Seamless Sky: Bringing Together the Asia/Pacific Regions,” Directors General of the Region held a productive discussion focusing on three aspects of the “Seamless Sky,” namely Air Traffic Management (ATM), Air Cargo Security, and Aviation Safety, and agreed to issue this Kansai Statement.

KANSAI STATEMENT

1. We recognized that as civil aviation develops and globalization progresses, harmonization in civil aviation systems is becoming critically important in the Asia and Pacific Region, which has been characterized by the diversities of the member States. What people expect from harmonization in civil aviation is that aircraft operators will become capable of seamlessly flying between regions, that the whole of the network will be secured at the agreed level, and that transparent and interoperable standards will be set among States and regions. In this regard, “Seamless Sky” is particularly important in the areas of air traffic management, aviation security and aviation safety.
2. Regarding Air Traffic Management (ATM), we recognized that the ICAO has been leading the development and implementation of the Global Air Traffic Management system with the implementation target of 2025. The Global Air Traffic Management system will be based on the components described in the Global ATM Operational Concept. We also recognized that the United States and Europe have been developing their future air traffic modernization programmes. Taking such global trends of future ATM system into consideration, we recognized the necessity of planning the future ATM system for the Asia and Pacific Region by the active collaboration and participation of the whole of the Region. In this regard, we agreed that APANPIRG be the starting platform to discuss and plan the future ATM system of the Asia and Pacific Region including targets and a time schedule.
3. Regarding aviation security, we recognized the significance of enhancing air cargo security. Such efforts will enable member States to protect the flow of air cargo, raise security standards and facilitate international trade in the Asia and Pacific Region. To achieve these desired outcomes effectively, member States are encouraged to collaborate with one another and with ICAO towards developing internationally harmonized measures and processes in air cargo security. We agreed that the further sharing of information and best practices should be promoted, and to consider including provisions on air cargo security into Annex 17, taking into account the need to protect the entire cargo supply chain.
4. Regarding the aviation safety, we acknowledged the ICAO’s leadership in the improvement of aviation safety. We recognized the importance of the member States’ role in ensuring that their air operators establish and maintain the highest standards in safety through the proper implementation of Safety Management System as envisaged under the State Safety Programme. In addition, we recognized the importance of the safety monitoring activities regarding foreign aircraft by the member States in the Region. We agreed to further enhance the cooperation in these efforts and activities in the Region in a harmonized manner.
5. We are determined to realize the Seamless Sky in the Asia and Pacific Region from this conference onwards. We agreed to make efforts to move forward toward the harmonized aviation in the Asia Pacific Region in cooperation with all the member States and the ICAO Asia Pacific Regional Office.

Appendix B: Relevant 12th Air Navigation Conference Recommendations

1 Recommendation 1/7 – Automatic dependent surveillance — broadcast

That States:

- a) recognize the effective use of automatic dependent surveillance — broadcast (ADS-B) and associated communication technologies in bridging surveillance gaps and its role in supporting future trajectory-based air traffic management operating concepts, noting that the full potential of ADS-B has yet to be fully realized;
- b) recognize that cooperation between States is key towards improving flight efficiency and enhancing safety involving the use of automatic dependent surveillance — broadcast technology.

That ICAO:

- c) urge States to share automatic dependent surveillance — broadcast (ADS-B) data to enhance safety, increase efficiency and achieve seamless surveillance and to work closely together to harmonize their ADS-B plans to optimize benefits.

2 Recommendation 1/9 – Space-based automatic dependent surveillance — broadcast

That ICAO:

- a) support, subject to validation, the inclusion in the GANP, development and adoption of space-based automatic dependent surveillance — broadcast surveillance as a surveillance enabler;
- b) develop Standards and Recommended Practices and guidance material to support space-based automatic dependent surveillance — broadcast as appropriate; and
- c) facilitate needed interactions among stakeholders, if necessary, to support this technology.

3 Recommendation 2/1 – ICAO aviation system block upgrades relating to airport capacity

That States:

- a) according to their operational needs, implement the aviation system block upgrade modules relating to airport capacity included in Block 0;
- b) endorse the aviation system block upgrade modules relating to airport capacity included in Block 1 and recommended that ICAO use them as the basis of its standards work programme on the subject;
- c) agree in principle to the aviation system block upgrade modules relating to airport capacity included in Blocks 2 and 3 as the strategic direction for this subject.

4 Recommendation 3/1 – ICAO aviation system block upgrades relating to Interoperability and data – through globally interoperable system-wide information management

That States:

- a) endorse the aviation system block upgrade module relating to interoperability and data – through globally interoperable system-wide information management included in Block 1, and recommend that ICAO use it as the basis of its work programme on the subject;
- b) agree in principle with the aviation system block upgrade module relating to interoperability and data – through globally interoperable system-wide information management included in Block 2, as the strategic direction for this subject; and

That ICAO:

- c) include, following further development and editorial review, the aviation system block upgrade modules relating to interoperability and data – through globally interoperable system-wide information management for inclusion in the draft Fourth Edition of the *Global Air Navigation Plan* (Doc 9750, GANP).

5 Recommendation 4/2 – ICAO ASBU relating to ground surveillance using ADS-B/MLAT, air traffic situational awareness, interval management and airborne separation

That States:

- a) according to their operational needs, to implement the aviation system block upgrade modules relating to ground surveillance, improved air traffic situational awareness and improved access to optimum flight levels included in Block 0;
- b) endorse the aviation system block upgrade modules relating to interval management included in Block 1 and recommend that ICAO use them as the basis of its work programme on the subject;
- c) endorse the aviation system block upgrade modules relating to airborne separation included in Blocks 2 and 3 as the strategic direction for this subject;

That ICAO:

- d) include, following further development and editorial review, the aviation system block upgrade modules relating to airborne separation in the draft Fourth Edition of the *Global Air Navigation Plan*;
- e) adopt “airborne separation” concepts involving controllers assigning tasks to flight crews, with controllers able to apply different, risk-based separation minima for properly equipped ADS-B IN aircraft;
- f) in the development of provisions, acknowledge the relationship between airborne separation and airborne collision avoidance system;
- g) modify aviation system block upgrade (ASBU) Module B2-85 to reflect e) and f), modify ASBU Module B2-101 to reflect f); and
- h) review the concept and terminology supporting B2-25 “airborne separation” and amend the module accordingly.

6 Recommendation 5/1 - Improved operations through enhanced airspace organization and routing

Considering that performance-based navigation (PBN) is one of ICAO's highest air navigation priorities and the potential benefits achievable through creation of additional capacity with PBN:

That States:

- a) implement performance-based navigation in the en-route environment;
- b) fully assess the operational, safety, performance and cost implications of a harmonization of transition altitude and, if the benefits are proven to be appropriate, undertake further action on a national and (sub) regional basis;
- c) take advantage of improved models for inter-regional coordination and collaboration to achieve seamless air traffic management and more optimum routes through the airspace;
- d) through the planning and implementation regional groups improve their methods of coordination to increase implementation of en-route performance-based navigation in order to achieve more optimum routes through the airspace;

That ICAO:

- e) encourage the planning and implementation regional groups to support the early deployment of performance-based navigation.

7 Recommendation 6/1 – Regional performance framework – planning methodologies and tools

That States and PIRGs:

- a) develop and maintain regional air navigation plans consistent with the Global Air Navigation Plan;
- b) finalize the alignment of regional air navigation plans with the Fourth Edition of the *Global Air Navigation Plan* by May 2014;
- c) focus on implementing aviation system block upgrade Block 0 Modules on the basis of operational requirements, recognizing that these modules are ready for deployment;
- d) use the electronic regional air navigation plans as the primary tool to assist in the implementation of the agreed regional planning framework for air navigation services and facilities;
- e) consider how the continuous monitoring approach to safety oversight maps to the evaluation of Member States' safety oversight capabilities concerning aviation system block upgrades;
- f) involve regulatory and industry personnel during all stages of planning and implementation of aviation system block upgrade modules;
- g) develop action plans to address the identified impediments to air traffic management modernization as part of aviation system block upgrade planning and implementation activities.

8 Recommendation 6/4 – Human performance

That ICAO:

- a) integrate human performance as an essential element for the implementation of ASBU modules for considerations in the planning and design phase of new systems and technologies, as well as at the implementation phase, as part of a safety management approach. This includes a strategy for change management and the clarification of the roles, responsibilities and accountabilities of the aviation professionals involved;
- b) develop guidance principles, guidance material and provisions, including SARPs as necessary, on ATM personnel training and licensing including instructors and assessors, and on the use of synthetic training devices, with a view to promoting harmonization, and consider leading this effort with the support of States and industry;
- c) develop guidance material on using field experience and scientific knowledge in human performance approaches through the identification of human-centred operational and regulatory processes to address both current safety priorities and the challenges of future systems and technologies;
- d) assess the impact of new technologies on competencies of existing aviation personnel, and prioritize and develop competency-based provisions for training and licensing to attain global harmonization;
- e) establish provisions for fatigue risk management for safety within air traffic services operations;
- f) develop guidance material on different categories of synthetic training devices and their respective usage;
- g) provide human performance data, information and examples of operational and regulatory developments to ICAO for the benefit of the global aviation community;
- h) support all ICAO activities in the human performance field through the contribution of human performance expertise and resources;
- i) adopt airspace procedures, aircraft systems, and space-based/ground-based systems that take into account human capabilities and limitations and that identify when human intervention is required to maintain optimum safety and efficiency; and
- j) investigate methods to encourage adequate numbers of high quality aviation professionals of the future and ensure training programmes are in line with the skills and knowledge necessary to undertake their roles within a changing industry.

9 Recommendation 6/12 – Prioritization and categorization of block upgrade modules

That States and PIRGs:

- a) continue to take a coordinated approach among air traffic management stakeholders to achieve effective investment into airborne equipment and ground facilities;
- b) take a considerate approach when mandating avionics equipage in its own jurisdiction of air navigation systems provision, taking into account of burdens on operators including foreign registry and the need for consequential regional/global harmonization;

That ICAO:

- a) continue to work on guidance material for the categorization of block upgrade modules for implementation priority and provide guidance as necessary to planning and implementation regional groups and States;
- b) modify the block upgrade module naming and numbering system using, as a basis, the intuitive samples agreed by the Conference; and
- c) identify modules in Block 1 considered to be essential for implementation at a global level in terms of the minimum path to global interoperability and safety with due regard to regional diversity.

Appendix C: Seamless ANS Principles

People: Cultural and Political Background

1. High-level political support (including development of educational information for decision-makers) to support Seamless ANS initiatives, including military cooperation and AIM.
2. Education and implementation of non-punitive reporting and continuous SMS improvement systems.

Aviation Regulations, Standards and Procedures

3. Harmonised regional or sub-regional rules and guidelines, modelled on the regional application of common regulations incorporated by reference into local legislation.
4. Shared ATM operational standards, procedures, guidance materials through common manuals and templates.
5. The promotion of mutual recognition of ATM qualifications between States.
6. An emphasis on delivery of ATM services based on CNS capability, resulting in flexible, dynamic systems.
7. The use of high-fidelity simulators to train controllers on the optimal application of ATC separations and procedures that support Seamless ANS applications, emergency and contingency responses, testing of software releases, and may serve as a backup ATM platform.

ATM Coordination

8. Sub-regional ATFM based on system-wide CDM serving the busiest terminal airspace and MTF.
9. Cross-border/FIR cooperation for use of aeronautical facilities and airspace, collaborative data sharing, airspace safety assessment and ATM Contingency planning.
10. Encouragement of military participation in civil ATM meetings and in ATS Centres where necessary.

Airspace Organisation

11. Promoting flexible use airspace arrangements and regular review of airspace to ensure it is appropriate in terms of purpose, size, activation and designation.
12. The optimisation of airspace structure through amalgamation and use of technology.

Facilities: Aerodromes

13. To encourage aerodrome operators to actively participate in ATM coordination in respect of Airport CDM development and operational planning, including aerodrome complexity and capacity.
14. Planning and coordination with local authorities and government agencies to take into account environmental issues, obstacles, aerodrome and PBN development.

ATS Units

15. Collaboration by ANSPs for evaluation and planning of ATM facilities.
16. Optimization of ATM facilities through amalgamation and the use of technology, including automation, satellite-based systems and remote facilities.

Navigation Aids

17. The continued rationalisation of terrestrial navigation aids to satellite-based procedures, while retaining a minimum network necessary to maintain safety of aircraft operations.
18. Support for a GNSS-based global PBN approval standard.
19. Regional cooperation for augmentation systems in terms of interoperability and increased service areas, and a GNSS ionospheric monitoring network.

Telecommunication

20. Encouragement of the use of ground-ground ATN/AMHS and diverse satellite communication systems.
21. Enhancement of data-link capabilities (VHF including VDL M2, SATCOM).
22. Where cost beneficial and appropriate, the implementation of:
 - SATVOICE technologies and standards;
 - HF data-link;
 - VSAT networks in support of COM and SUR.
23. The prioritisation of AIDC systems to alleviate ATC coordination issues.

ATS Surveillance

24. The encouragement of ADS-B and/or MLAT implementation to improve ATS surveillance coverage, redundancy and multiple tracking capability.
25. Establishment of ADS-C where radar, ADS-B (including satellite –based ADS-B) and/or MLAT is not possible.
26. Expansion of ATS surveillance data-sharing initiatives.

Technology and Information: Flight Operations

- 27. Implementation of UPR and DARP where practicable.
- 28. Implementation of CDO and CCO where possible.
- 29. The encouragement of appropriate technologies that support Trajectory-Based Operations.

Aeronautical Data

- 30. Early implementation of AIM, including cooperative development of aeronautical databases and SWIM to support interoperable operations.

ATM Systems and Safety Nets

- 31. Application of ground-based safety nets, which includes tactical and strategic conflict probing (such as APW, STCA) and MSAW.
- 32. Support for Inter-facility Flight Data Processing System capability.
- 33. Collaborative development of CDM, ATFM, A/MAN and D/MAN support tools.
- 34. Encouragement of Digital ATIS and VOLMET information systems.
- 35. Encourage sharing of air traffic data between military ATM systems and civil ATM systems.

ATM Modernisation Projects

- 36. Inter-regional cooperation ('clustering') for the research, development and implementation of ATM projects.
- 37. A focus on technologies for earliest deployment and best cost benefits.

Appendix D: Capacity Expectations

1 Capacity metrics will vary considerably, depending upon many factors such as the COM and SUR capabilities, the presence of terrain, physical attributes of aerodromes and weather. Thus the expectations outlined for the following States need to be treated with caution, however they form a useful guide as to the sort of capability being achieved with modern systems and appropriately trained controllers.

2 **Table D1** provides an indication of potential Aerodrome Arrival Rate (AAR) for a single runway, given aircraft ground speeds and aircraft spacing near the runway threshold (source: *Guide for the Application of a Common Methodology to Estimate Airport and ATC Sector Capacity for the SAM Region, Attachment 7: Calculation of the Aerodrome Acceptance Rate used by the FAA*).

Speed	3NM	3.5NM	4NM	4.5NM	5NM	6NM	7NM	8NM	9NM	10NM
140kt	46	40	35	31	28	23	20	17	15	14
130kt	43	37	32	28	26	21	18	16	14	13
120kt	40	34	30	26	24	20	17	15	13	12

Table D1: Potential Runway Arrival Rate

3 ATC capacity calculations needed to take into account the volume of airspace of each sector, which varied considerably by State, and factors such as automation, density of traffic and complexity of routes/airspace. The ICAO *Manual on Collaborative Air Traffic Flow Management* (Doc 9971) contained guidelines for ATC sector capacity assessment. **Table G2** provides simplified ATC sector calculation guidance from Doc 9971.

Average sector flight time (minutes)	Optimum sector capacity value (aircraft)
3 minutes	5 aircraft
4	7
5	8
6	10
7	12
8	13
9	15
10	17
11	18
12 minutes or more	18

Table D2: Simplified ATC Sector Capacity Table (no complexity/automation allowance)

4 Australia, Japan, New Zealand, Singapore, Thailand and the United States provided runway and airspace (ATC Sector) capacity data, to indicate potential capacity figures in varying Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC) circumstances.

Australia

5 Brisbane and Melbourne aerodrome capacity expectations:

- single runway: **48** (24 arrivals - 150 seconds between arrivals, 24 departures, VMC);
- single runway: **40** (20 arrivals - 180 seconds, 20 departures, IMC).

Japan

6 Aerodrome capacity expectations:

- Narita (dual runways): 56-64;
- Haneda (4 runways): 74.

New Zealand

7 Auckland aerodrome capacity expectations:

- single runway: **45** (VMC);
- single runway: **39** (IMC circling);
- single runway: **37** IMC below circling with missed approach protection for jets);
- single runway: **32** (IMC below circling with missed approach protection)

8 ATC Sector capacity expectations:

- terminal/low level Category T airspace: **12** aircraft; and
- en-route Category S airspace: **15** aircraft;
- en-route Category R airspace: **15** aircraft.

Singapore

9 Changi aerodrome capacity expectations:

- single runway: **30** (IMC); and
- two parallel/near parallel runways: **72** (IMC);
- three parallel/near parallel runways: to be confirmed, possibly 100+ (IMC).

10 ATC Sector capacity expectations:

- terminal/low level Category T airspace: **14** aircraft; and
- en-route Category S airspace (sector dimension of 150NM x 100NM): 7 aircraft (extrapolated $\sqrt[6]{6.66 \times \text{airspace volume}} = 2.58 \times 7 = \mathbf{18}$).

Thailand

11 Suvarnabhumi aerodrome capacity expectations:

- single runway: **34** (VMC/IMC).

United States of America

12 **Table D3** provides an indication of optimal aerodrome parallel or near parallel arrival rate runway arrival capacity at selected USA aerodromes. It should be noted that multiple runway combinations or whether runways were used for arrivals, departures, or both yielded a number of permutations from the data.

Aerodrome	Runways	IMC	VMC
ATL	5	104	126
ORD	5	84	112
DFW	5	90	96

ATL	4	92	112
DEN	4	-	114
LAX	4	64	80
ORD	4	-	92
ATL	3	76	96
DEN	3	-	96
IAD	3	72	100
ATL	2	68	82
JFK	2	-	58
SDF	2	40	52
ATL	1	34	42
SDF	1	20	26
SFO	1	25	27

Table D3: Capacity at selected US airports

13 Average aerodrome arrival capacity expectations (range):

- single runway: IMC average **26** (25-34), VMC average **32** (26-42);
- two parallel/near parallel runways: IMC **55** (40-68), VMC **64** (52-82);
- three parallel/near parallel runways: IMC **74** (72-76), VMC **97** (96-100);
- four parallel/near parallel runways: IMC **78** (64-92), VMC **100** (80-112);
- five parallel/near parallel runways: IMC **92** (84-104), VMC **111** (96-126).

14 ATC Sector capacity expectations:

- terminal/low level Category T airspace: **12-18** aircraft; and
- en-route Category S airspace: **16-20** aircraft; and
- en-route Category R airspace: **17-24** aircraft.

Summary

15 **Table D4** summarises runway and airspace capacity expectations from States, with the greatest capacity achieved in optimum conditions highlighted in bold.

	Parallel or Near Parallel Runway Capacity					ATC Sector Capacity		
	1	2	3	4	5	T	S	R
Australia	40-48							
Japan		56-64		74				
NZ	32-40					12	15	15
Singapore	30	72				14	18	
Thailand	34							
USA	61	95	150	177	211	12-18	16-20	17-24
Doc 9971 Simplified Table Comparison						15	18	18

Table D4: Capacity Expectations Summary

Note: Given the unique operation environment and constraints of individual States, these figures are indicative only and do not represent the same expectation across different States in the region

Appendix E: List of References

Global and Regional Framework

Doc 9673 *Asia/Pacific Regional Air Navigation Plan*
Doc 9750 *Global Air Navigation Plan*
Doc 9854 *Global Air Traffic Management Operational Concept*
Doc 10004 *Global Aviation Safety Plan*

Air Navigation Services

Annex 10 *Aeronautical Telecommunications*
Annex 11 *Air Traffic Services* (particularly Chapter 2 [2.1 and 2.30], and Attachment C)
ASBU Document
ASEAN *Master Plan on ASEAN Connectivity*
Asia/Pacific Air Traffic Flow Management Concept of Operations
Asia/Pacific Air Navigation Concept of Operations
Asia/Pacific Regional Performance-Based Navigation Implementation Plan (V4.0)
Circular 330 *Civil-Military Cooperation in Air Traffic Management*
Doc 4444 *Procedures for Air Navigation Services Air Traffic Management (PANS ATM)*
Doc 8071 *Manual on Testing of Radio Navigation Aids Volume 2*
Doc 9613 *Performance-based Navigation Manual*
Doc 9882 *Manual on ATM System Requirements*
Doc 9883 *Manual on Global Performance of the Air Navigation System*
Doc 9906 *Quality Assurance Manual for flight Procedure Design Volume 5*
Doc 9971 *Manual on Collaborative Air Traffic Flow Management*
Global Operational Data-link Document
ICAO AN-Conf/12 Yellow Cover Report on Agenda Item 1
Roadmap for the Transition from AIS to AIM

Flight Operations

Annex 6 *Operation of Aircraft*
Doc 8168 *Procedure for Air Navigation Service Aircraft Operations Volume I Flight Procedures*
Doc 8168 *Procedure for Air Navigation Service Aircraft Operations Volume II Flight Procedures*
Doc 9931 *Continuous Descent Operations (CDO) Manual*
Doc 9993 *Continuous Climb Operations (CCO) Manual*

Human Factors

Annex 1 *Personnel Licensing*
Circular 214 *Fundamentals on Human Factors*
Circular 227 *Training of Operational Personnel on Human Factors*
Circular 241 *Human Factors in ATC*
Circular 249 *Human Factors in CNS and ATM Systems*
Circular 318 *Language Testing Criteria for Global Harmonization*
Circular 323 *Guidelines for Aviation English Training Programmes*
Doc 9835 *Manual on the Implementation of ICAO Language Proficiency Requirements*
Doc 9966 *Fatigue Risk Management Systems*
Human Factors Digest No. 1

[State] National Air Navigation Plan

Template version 6.0

Note to States (delete this note) - The NANP doesn't need to be called a 'NANP'. It can be titled whatever the State wants, and could be several different documents depending on how the State does planning. It could even be in html form using an Internet-based portal instead of a traditional document, as long as it sets out key steps in the planning process.

NANP are primarily for the State and not the region, so ICAO is only interested that that State has a NANP, and that it addressed certain Basic Planning Elements (BPEs). The detail within each BPE is not really of interest to ICAO either, especially the security-related parts which should only be made available to State officials. NANP excerpts should be all that required to establish the structure of the NANP that addresses the BPEs.

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Background

Specific regional blue text to be modified by other regions as required

States to modify the yellow text accordingly

1.1 The *Asia/Pacific Seamless ANS Plan*, which was first approved by the Twenty Fourth Meeting of the International Civil Aviation Organization (ICAO) Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/24, September 2013), is the regional air navigation planning framework for the civil aviation system. The *Asia/Pacific Seamless ANS Plan* also contains expectations for military and other State agencies whose activities interface with civil aviation.

1.2 This National Air Navigation Plan (NANP) is necessary to describe the State's planning arrangements to align with both regional and global objectives, to ensure the greatest degree of harmonization and interoperability with other States.

1.3 Insert here a brief introduction aimed at high level decision-makers that further describes the purpose for the NANP in the context of the State's aviation system, challenges to the aviation system such as increased passenger demand and how important aviation is to the State in terms of its economy, transport connectivity, etc. Some States may wish to include reference to the specific ICAO and governmental policies that determine objectives, priorities and development directions.

1.4 Describe the scope of what the National Air Navigation Plan (NANP) covers, who it affects, and what is expected to be achieved, including the necessity for global and regional harmonization and interoperability.

1.5 Provide a general (not necessarily quantitative) description of the Plan's benefits.

1.6 Provide a general description of the costs. It should be noted that this is a matter for the State to determine, and could be in terms of quantitative, qualitative, cost of implementation or cost of not implementation. ICAO does not require details of costs from States, as this is for the State's benefit.

1.7 Provide details of how the NANP connects to the global and regional planning hierarchy.

Stakeholder Consultation

2.1 The *Asia/Pacific Seamless ANS Plan* was expected to be implemented by the use of a NANP that encompassed a whole-of-government approach. Key stakeholders were expected to include military agencies, heads of regulatory bodies and Air Navigation Service Providers (ANSPs), and users such as airlines.

2.2 Provide a high level description of the process used to consult the NANP with affected stakeholders, including military agencies.

2.3 Insert here statements from Heads of CAAs, ANSPs, military agencies, space launch agencies, airlines, major airports etc. At the end of this Section there should be a place for the Heads to sign the document to indicate their concurrence and their organisation's continued support for the agreed plans in the NANP.

Analysis

3.1 Insert here Information on the State's analysis of all applicable Aviation System Block Upgrade (ASBU) and regional elements deemed to be applicable to the State, including a statement of the State's priorities for implementation. This assessment should be guided by the priorities determined by APANPIRG.

3.2 Describe the ASBU and regional elements that are deemed to be not applicable, and how these were determined.

Planning

4.1 The following section contains descriptions of the implementation process for each planning element, such as how the different stakeholders will work together, design systems and provide feedback on implementation and post-implementation. Each applicable global and regional element's implementation managers (those responsible for execution of the implementation) and the project timelines are provided, including regular review milestones.

4.2 Table X provides an overview of the planning elements that originate from the Global Air Navigation Plan and their priorities. Table Y provides an overview of the regionally-specific planning elements that originate from the Planning and Implementation Regional Group (PIRG).

Functional Category	Element	Regional Priority	State Priority
Information	AMET-B0/1 – 4: Meteorological observations, forecast, warning, climatological and historical products, and dissemination (PASL 7.41)	1	
	AMET-B1/1 – 4: Meteorological products supported by automated decision systems or aids using IWXXM (PASL 7.55)	2	
	DATM-B1/1 – 7: Provision of quality-assured digital aeronautical data and information, including AIP, terrain and obstacle, aerodrome and instrument flight procedure data sets, and NOTAM improvements (PASL 7.40)	1	
	FICE-B0/1: Automated basic AIDC (PASL 7.26)	1	
	ACDM-B0/1-2: ACIS (PARS 7.3)	1	
	ACDM-B1/1 – 2: Airport CDM Integration with ATM Network, AOP and APOC (PARS 7.18)	2	
	APTA-B0/1 – 2: Basic PBN SID and STAR procedures, PBN non-precision approaches (PARS 7.4, 7.5, 7.10, 7.13)	1	
	APTA-B0/3 and 6: SBAS/GBAS CAT I precision approach procedures, and PBN Helicopter PinS Operations (PARS 7.6, 7.7)	3	
	APTA-B0/4 – 5, 7 – 8: CDO (Basic) and CCO (Basic), and performance-based aerodrome operating minima for advanced/basic aircraft (PARS 7.19)	2	
	APTA-B1/1 – 5: advanced capability PBN approaches, PBN SID and STAR procedures and performance-based aerodrome operating minima for advanced aircraft with SVGS, CDO and CCO (Advanced) (PASL 7.14, PARS 7.21, 7.22)	3	
	CSEP-B1/1 – 4: basic airborne situational awareness AIRB and VSA (PARS 7.20)	2	
Operational			

Operational	FRT0-B0/1 – 4: Direct routing, Airspace Planning and FUA, Flexible Routings, and basic conflict detection and conformance monitoring (PASL 7.29, 7.31, 7.36)	1	
	FRT0-B1/1 – 7: Free Route Airspace, RNP routes, Advanced FUA and Airspace Management (ASM), Dynamic Sectorisation, Enhanced Conflict Detection Tools and Conformance Monitoring, and Multi-Sector Planner Function (PASL 7.29, 7.51)	2	
	NOPS-B0/1 – 5: Initial integration of ASM with ATFM, Collaborative Network Flight Updates, Basic Network Operation Planning and Initial Airport/ATFM slots, A-CDM Network Interface and Dynamic Slot Allocation (PASL 7.38)	1	
	NOPS-B1/1 – 10: Short Term ATFM measures, Enhanced NOPS Planning, Enhanced integration of airport operations and NOPS planning, Enhanced Traffic Complexity Management, Full integration of ASM with ATFM, Initial Dynamic Airspace configurations, Enhanced ATFM slot swapping, Extended Arrival Management, ATFM Target Times and Collaborative Trajectory Options Programme (PASL 7.52)	2	
	OPFL-B0/1: ITP	3	
	OPFL-B1/1: CDP	3	
	RATS-B1/1 – Remotely Operated Aerodrome Air Traffic Services	3	
	RSEQ-B0/1 – 2: Arrival and Departure Management (PASL 7.32)	1	
	RSEQ-B0/3 – Point merge	3	
	RSEQ-B1/1 – Extended arrival metering (PASL 7.46)	2	
	SNET-B0/1 – 4: STCA, MSAW, APW, APM (PASL 7.31)	1	
	SNET-B1/1 – 2: Enhanced STCA with aircraft parameters and in complex TMAs (PASL 7.50)	2	
	SURF-B0/1 – 3: Basic ATC surface operations tools, comprehensive situational awareness, situational awareness, alerting service (PASL 7.47)	2	
	SURF-B1/1 – 5: Advanced surface traffic management visual aids, pilot comprehensive awareness and runway alerting, enhanced ATC alerting, routing service to support ATC and EVS for taxiing (PASL 7.48)	2	

Operational	TBO-B0/1: Introduction of time-based management within a flow centric approach (PASL 7.52)	2	
	TBO-B1/1 – Initial Integration of time-based decision making processes (PASL 7.52)	2	
CNS Technology and Services	ASUR-B0/1 – 3: ADS-B, MLAT, SSR-DAPS (PARS 7.8, 7.11, PASL 7.26, 7.28, 7.30)	1	
	ASUR-B1/1 – Reception of aircraft ADS-B signals from space (SB ADS-B) (PASL 7.54)	2	
	COMI-B0/1 – 2, 4 – 6: ACARS, ATN/OSI, VDL Mode 2 Basic, SATCOM Class C Data, HFDL (PASL 7.54)	2	
	COMI-B0/3, 7: VDL Mode O/A, AMHS (PASL 7.25)	1	
	COMI-B1/1 – 4: VDL Mode 2 Multi-Frequency, SATCOM Class B (SB-S) Voice and Data, ATN/IPS and AeroMACS Ground-Ground (PASL 7.53)	2	
	COMS-B0/1 – 2: CPDLC (FANS 1/A & ATN B1) for domestic and procedural airspace and ADS-C (FANS 1/A) for procedural airspace (PARS 7.14, PASL 7.29, 7.53)	2	
	COMS-B1/1 – 3: PBCS approved CPDLC (FANS 1/A+), ADS-C and SATVOICE for domestic and procedural airspace (PARS 7.14, PASL 7.53)	2	
	NAVS-B0/1 – 4: SBAS, GBAS, ABAS, MON (PARS 7.7)	2	
	NAVS-B1/1: Extended GBAS	3	

Table X: Regional Planning Elements Related to the GANP

Functional Category	Regional Seamless ANS Element	Regional Priority	State Priority
Operational	Aerodrome management and coordination (PARS 7.1)	2	
	Optimization of runway capacity facilities (PARS 7.2)	3	
	ADS-B, SSR Mode S and PBN Airspace (PARS 7.8, 7.9, 7.10)	2	
	Flight Level Orientation Scheme (FLOS) (PARS 7.12)	2	
	Civil/Military SUA management (PARS 7.13)	1	
	Adjacent ATS sector coordination (PASL 7.19)	2	
	Airspace classification (PASL 7.28)	2	
	ATC horizontal separation (PASL 7.29)	2	
	Flight Level Allocation Schemes (FLAS) (PASL 7.30)	2	
	ATC sector capacity (PASL 7.32)	2	
	Electronic Flight Progress Strips (PASL 7.34)	2	
	Enhanced SAR systems (PASL 7.37)	1	
	ANSP human and simulator performance (PASL 7.38)	1	

	Civil/Military strategic and tactical coordination (PASL 7.39)	1	
	Civil/Military common procedures and training (PASL 7.39)	2	
	Ballistic launches/space re-entry management (PASL 7.40)	1	
	Unmanned Aircraft Systems (PARS TBA)	2	
CNS Technology and Services	ATS surveillance data sharing (PASL 7.23)	2	
	Civil Military integrated systems and facilities (PASL 7.39)	2	
	Departure Clearance (DCL) (PASL 7.44)	2	

Table Y: Regional Planning Elements Related to Regionally-Specific Requirements

4.3

X

Progress

5.1 The following section contains details of the progress of implementation of each element against the planning timelines. It should regularly updated to reflect the actual implementation of the applicable elements.

5.2 This section should also provide information on the results and lessons learnt from post-implementation reviews, including the effectiveness of any improvements against planning goals and Key Performance Indicators.

Asia-Pacific Air Traffic Management Performance Measurement Framework

ATM Bureau of Civil Aviation Administration of China

National Key Lab of Air Traffic Flow Management

2018-11

AMENDMENTS

<i>Amendment</i>	<i>Source</i>	<i>Subject(s)</i>
1	The Fifth Meeting of the APANPIRG ATM Sub-Group (ATM /SG/5)	a) Introduction of new definitions for delay on board , airport arrival capacity variation, and flight plan variation; b) Revision of implement stages of framework; c) Revision of key performance indicators framework; d) Introduction of the roadmap for the execution of Asia-Pacific ATM performance measurement.

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Asia-Pacific Air Traffic Management Performance

Measurement Framework

(The outcomes of RAPMF/SWG, Supported by NUAA of CHINA)

1. Background

With huge economic increase in Asia-Pacific region, air transportation has been developing rapidly, which leads to a large raise of flights. Considering massive and high density of air traffic is exposed to countries in Asia-Pacific region, some of the international flights may cross the national border during the flight operation phase. Lack of unified management approach and evaluation standard, many unexpected accidents have taken place.

ICAO data indicates that the Asia/Pacific Region in 2011 was the busiest in the world in terms of Passenger Kilometers Performed (PKP): 1,496 billion compared to 1,434 for North America and 1,385 for Europe, with growth rates of 8.0 - 8.8%, 2.3 - 3.5% and 4.2 - 4.8% over the 2012-2014 period respectively. In 2012, the Asia/Pacific region had the largest regional market share of total domestic and international Revenue Passenger Kilometers (RPK) at 30%, compared to 27% for both Europe and North America. Under the circumstances of those, in 2013, ICAO has published Asia-Pacific Seamless ATM Plan, which provides a framework for a transition to a seamless ATM environment, in order to meet future performance requirements. The objective of this plan is to facilitate Asia-Pacific Seamless ATM operations, by developing and deploying ATM solutions capable of ensuring safety and efficiency of air transport throughout the Asia-Pacific region. In the context of globalization, this plan provides the opportunity for the Asia/Pacific region to adopt the benefits from research and development conducted by various States including the NextGen (United States of America), the European Single European Sky ATM Research (SESAR), and Japanese Collaborative Actions for Renovation of Air Traffic Systems (CARATS).

This report is aimed at providing a systematical and scientific performance framework to evaluate the operation performance which is subject to Key Performance Area of air transport system in Asia-Pacific region. We take the performance oriented and data based approach according to Doc 9883 Manual on Global Performance of the Air Navigation System to select the Key Performance Indicators, which has been considered about the operation features and the availability of data of Asia-Pacific region. To achieve the goals of Asia-Pacific Seamless ATM operations plan, we want to use the most widely accepted KPAs such as safety, capacity, efficiency, predictability, environment and cost-efficiency to evaluate the operation performance of ANSPs(Air Navigation Service Providers) and AOs(Aerodrome Operators),

and go further to improve the performance of air transportation system and aid decision making for ANSPs and AOs.

Most of current practice for KPA and KPI can be found in the International Civil Aviation Organization (ICAO). A review of current practice which is carried out by ANSPs and national regulating authorities shows that most organizations attempt to comply with the ICAO framework when monitoring performance. However, not all KPAs have useful KPIs to provide stakeholders with unique information. The following sources provide some of the additional information of KPAs and KPIs, which are regionally and globally used:

- ☐ Global Air Traffic Management Operational Concept (ICAO Doc 9854)
International Civil Aviation Organization, 2005.
- ☐ Global Air navigation plan (ICAO Doc 9750), International Civil Aviation Organization, 2013.
- ☐ Manual on Global Performance of the Air Navigation System (ICAO Doc 9883), International Civil Aviation Organization, 2009.
- ☐ EUR Region Performance Framework Document (EUR Doc 030),
International Civil Aviation Organization, 2014.
- ☐ Airport CDM Implementation, European Organization for the Safety of Air Navigation, 2012.
- ☐ The PRC'S European ATM Performance Measurement System, European Organization for the Safety of Air Navigation, 2011.
- ☐ Comparison of Air Traffic Management-Related 2013 Operational Performance: U.S./Europe, EUROCONTROL/FAA Air Traffic Organization System Operations Services, 2014.
- ☐ Performance Review Report: An Assessment of ATM in EUROPE during the Calendar Year 2014, European Organization for the Safety of Air Navigation, 2015.
- ☐ Recommended Key Performance Indicators for Measuring ANSP Operational Performance, civil air navigation services organization, 2015.
- ☐ Services Charter 2014/15-2015/16, Airservices Australia, 2015.
- ☐ A BRIEF TO CHINA'S ATM KPIS, 2014.
- ☐ The report of china civil flights operation efficiency in 2014, Airspace Operation Center of China, 2015.
- ☐ European Union Regulation (EU) No 390/2013,
- ☐ UK NATS Fuel Efficiency Metric (3Di)

In consideration of serviceability of those practices, we mainly take ICAO and Eurocontrol's work as reference. ICAO has identified 11 KPAs for monitoring performance of ATM system, which have been described in ICAO's Global Air Traffic Management Operational Concept Report (Doc 9854) and Manual on Global Performance of the Air Navigation System (Doc 9883). Those documents contain a high level description of goals of the Performance-Based Approach (PBA) to management, especially the Doc 9883 which describes the foundational requirements for measuring performance and a list of key performance indicators (KPIs) that may be considered for tracking operational performance. Following the 12th Air Navigation

Conference (ANC/12), ICAO produced the Global Air Navigation Plan 2013-2018, Fourth Edition (Doc 9750) (GANP). This document specifies air navigation technology improvements as a series of ‘Aviation System Block Upgrades’ (ASBUs), which is a programmatic and flexible global system engineering approach to allowing all Member States to advance their air navigation capabilities based on their specific operational requirements. The ultimate objective of ICAO is to urge all Member States to align their future aviation system developments against the GANP to achieve a seamless sky and global harmonization. Accordingly, we take the fifth draft of GANP as reference.

The table in Appendix 2 shows the KPAs identified for ASBU Block 0. The majority of the KPAs are related to capacity, efficiency, cost, and safety. ICAO has developed a performance reporting framework which provides specific performance indicator definitions to cover the shortage of GANP through their Planning and Implementation Regional Groups (PIRGs), which are expected to report implementation and performance information using the Air Navigation Report Form (ANRF). The ANRF also simplifies the reporting from the key performance areas shown in the table of Appendix 2 to five priority KPAs: access and equity; capacity; efficiency; environment; and safety.

As is shown in Figure 1-1, ICAO has identified a number of concepts to describe different elements which have different characters and function. We have introduced the concept of this performance evaluation framework to refine our indicators.

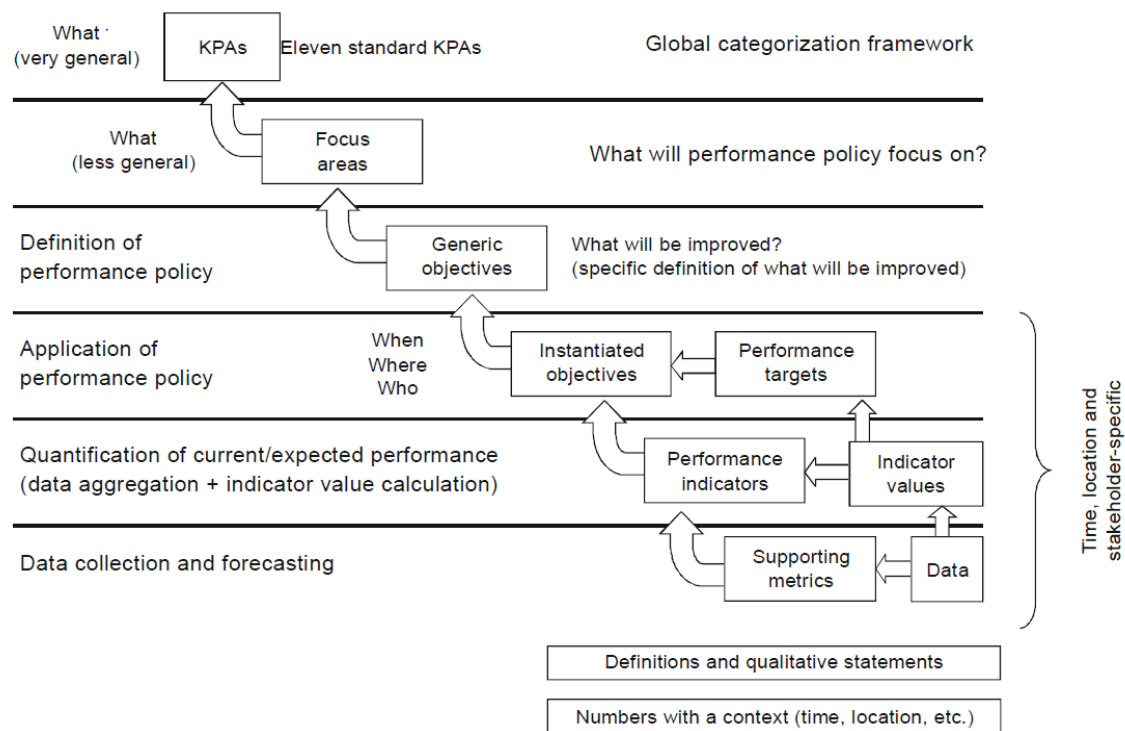


Figure 1-1 ICAO performance evaluation framework

Moreover, CANSO’s safety programme helps ANSPs improve safety through elements such as safety management systems, best practices and benchmarking. Seeking predictive measures of risk and positive safety performance metrics, the Safety Performance Measurement

Workgroup (SPMWG) in Canso creates new leading indicators so that members of CANSO can better understand their safety performance and risk control effectiveness.

In China , CAAC(Air Traffic Management Bureau) formulates the Civil Aviation ATM Modernization Strategy(CAAMS). CAAMS evolves from navigation alone to providing comprehensive ATM services, in combine with the Required Communication Performance (RCP), Required Navigation Performance (RNP) and Required Surveillance Performance (RSP) of airborne system and ground system, so as to provide differentiated ATM service capability based on different performance levels and requirements of airspace users. Besides, CAAMS has developed a complete performance system about its main tasks, including safety, capacity, efficiency, service, management.

2. Framework composition

2.1 Relationship between elements of indicator framework

2.1.1 Key Performance Areas

There are a number of features of the air transport system which have constraints imposed by external bodies. These constraints reduce the ability of stakeholders to make a full trade-off between KPAs. The requirements imposed by external agencies must be strictly observed and performance must be optimized subject to those requirements.

Over and above these constraints, there are trade-offs that can be made. For example, an ATSP may choose to implement a higher level of safety than imposed by the regulator if it believes this reflects the users' preferences. This choice would be made in the full knowledge that there would be trade-offs with other KPAs e.g. delays may increase or costs would be higher. It is possible that the regulatory process may facilitate this type of information exchange between users and ATS Providers by establishing a formal means of consultation. Since trade-offs between the key performances areas are inevitable, it is necessary to ensure that the trade-offs that will be made are done in such a way as to increase the overall benefits of the system to users. To assist the process of assessing the costs and benefits of the tradeoffs it is necessary to have an over-arching objective for the air transport system. An appropriate objective is to give users over the long term safe services and the levels of capacity and quality they require, and for which they are prepared to pay, with price being based on the costs of efficient operations.” With a focus on this objective, stakeholders can decide how changes to the current system will increase the benefits over and above the status quo and how this will be monitored by the indicators. For example, if demand for ATS is expected to grow beyond the present capacity of the system there are two possible outcomes. If capacity does not expand to meet the demand then indirect costs will increase due to, for example, additional delays. If capacity is increased to cope with the additional demand, the direct cost of providing ATS will increase. There is a direct conflict between indicators measuring delays and indicators measuring cost. The decision to go ahead with the capacity increase will depend on the relative value users place on increased delays that will occur when current capacity is fully utilized and the increased cost of ATS necessary to fund the extra capacity. The desired response is for additional capacity to be provided up to the point where the additional benefits cover the extra costs.

As the Asia-Pacific Seamless ATM Plan said, the applicability of Preferred Aerodrome/Airspace, Route Specifications (PARS) and Preferred ATM Service Levels (PASL) should be verified by analyzing safety, current and forecast traffic demand, efficiency, predictability, cost effectiveness and environment to meet expectations of stakeholders. In those KPAs, cost effectiveness and environment are highly related to efficiency, and traffic demand has also been embodied in capacity.

Capacity

Capacity of airport terminal, runway and en-route ATC sector mentioned in the performance improvement plan of the Asia-Pacific Seamless ATM Plan should be monitored and assessed. In research and development part, the problem about balancing demand and capacity is emphasized to be integrated within the ATM system. There are some specific requirements in ASBU. Before 2018 Asia-Pacific ATM performance of capacity should reach the standard level of Block 0. For example, B0-APAT, B0-WAKE, B0-RESQ, B0-ACDM in performance improvement areas of greener airport are mentioned in order to improve the capacity of runway, namely, the capacity bottleneck.

Never before has air transport been so rapidly developing as it is today. Accordingly, compared with the early stage of development, the complexity of air traffic environment is increasing as well.

The method of how to accurately, reasonably and effectively assess airspace and airport capacity will become the most important basis of the implementation of air traffic flow management, maintain the balance of airspace system between supply and demand and improve the flight punctuality. Capacity is the description of airspace and airport capability. To meet the demand of air traffic, it is needed to select and implement comprehensive capacity assessment indicators to improve the ability to assess the accuracy and timeliness of the results. It will bring benefits to improvement and perfection of airspace and airport management and can help to improve level of air traffic flow management, go further to promote air space proper planning. It has an extremely important significance to alleviate the contradiction between the increasing air traffic flow and the scarce air space resource. Next we will assess air space capacity from the perspective of the spatial dimension and the match of capacity and demands.

All of KPIs of capacity will be implemented in Stage 1.

Efficiency

Efficiency, the same as safety, is another main goal of Asia-Pacific Seamless ATM operations plan. Asia-Pacific Seamless ATM Plan divides the operation phase into aerodrome operation, terminal operation and en-route operation to execute performance evaluation and performance improvement plan. So, our report establishes a phased evaluation approach according to the plan to making a fine analysis and finding the targeted pressure point. The seamless skies initiative is designed to improve the efficiency of air navigation services through increased harmonization, interoperability and flight path optimization which are detailed in B0-SURF, B0-FICE, B0-AMET, B0-RESQ, B0-ACDM, B0-FRTO, B0-OPFL, B0-TBO, B0-CDO and B0-CCO.

The efficiency of air traffic control department reflects the utilization of airspace resources. As Doc.9883 stated, efficiency should comprise both “Temporal Efficiency” (i.e. delay) and “Flight Efficiency” (trajectory oriented), so we enumerate indicators to assess the efficiency of air traffic control system from the dimension of time and space.

● Time Dimension

Based on a time dimension for evaluating efficiency, indicators which we call delay or additional flight time, mainly reflect the difference between estimated or unimpeded time and actual time by each airspace unit. Due to large difference in operating characteristics of each

flight phase and management of ANSPs, it is necessary to evaluate the efficiency of aircraft in terms of different flight phases.

- **Space dimension**

The space we discuss here not only refer to three-dimensional space where we live but also the conditional space of capacity and complexity etc. Efficiency based on the dimension of space is the utilization ratio of space resource of ANSPs.

Flight Efficiency under space dimension can be measured in terms of the deviation from four-dimension trajectory or flight dynamic data.(i.e. number of changing heading) Deviation can take several forms and include additional route length, non-optimum vertical profile, speed differences from the optimum, additional taxi time and time in stack. For example, a measure of efficiency should be based on fuel consumption, though it varies markedly by phase of flight. Comparing total fuel consumption for a given journey with the optimum for aircraft types in service, might be a better measure. However, we abandoned this one considering the accessibility of fuel consumption data.

Predictability

Predictability is defined in ICAO document 9854, Global Air Traffic Management Operational Concept as the “ability of airspace users and ANSPs to provide consistent and dependable levels of performance”. If delay is entirely predictable at different time of a day not varying from its predicted value, an aircraft operator will calculate anticipated delays in consideration of schedule and flights will always arrive on time. As delay variability grows, more and more disruption will influence an aircraft operator’s schedule and flight connectivity will be damaged. Lateness causes increased operating costs for an aircraft operator due to the inefficient use of resources and support facilities. Earliness could be considered as a lost opportunity for fleet and crew usage.

Similar to efficiency focusing on the utilization of resource, predictability, however, pays particular emphasis on consistent and efficient use of airspace or other resource based on flight plan and history data.

Safety

In Asia-Pacific region, safety is certainly the number one priority of air navigation service providers. For this reason, a large share of KPIs and activities supporting this over-arching goal are related to safety. To ensure that safety remains an integral part in evolution of aviation system which becomes more and more complex, States and service providers are encouraged to proactively engage in safety risk modelling. The improved understanding of how various elements of ATM system contribute to overall safety levels can not only help to better identify risk areas today but also ameliorate the system to improve performance in the future.

For safety performance metrics, there is specific working group to study and promote the performance indicators. In the construction of this framework, safety is taken as an individual section which will not be focused on. But we still provide relevant indicators suggestion as reference.

According to ICAO, within the safety KPA common metrics focus on the number of accidents normalized through the number of operations or the total flight hours. Differences arise in definition of terms and filtering criteria are used for data counting. So in this part, we will introduce some KPIs for evaluating the management level and going further to improve the safety performance. Indicators are divided into lagging indicators and leading indicators. Lagging indicators are some statistics about aviation safety accident and potential accident, which reflect the aviation safety condition directly; leading indicators is safety predication indicator which could analysis flight operation situation through civil aviation big data to predict pressure point and ensure the aviation safety in strategy and pre-tactical phase.

Accident occurrences only provide a limited insight into flight operations safety, in part because they represent a very narrow range from which to draw conclusions. Traditional accident or serious incident reports may only reveal the tip of the pyramid. Therefore, as illustrated in Figure 2-1, the SRC intends to adopt progressively a more thorough approach to safety performance measurement.

The role of ATM safety is to ensure adequate separation of aircraft from one another, from other objects and from the ground. The principal basis of the SRC assessment of safety performance therefore reflects this role, and mainly consists of measurement of the ATM contribution to aircraft accidents and incidents, for all types of operations occurring in all classes of airspace, categorized according to the level of risk and expressed in terms of air to air, air to ground or ground to ground safety occurrences.

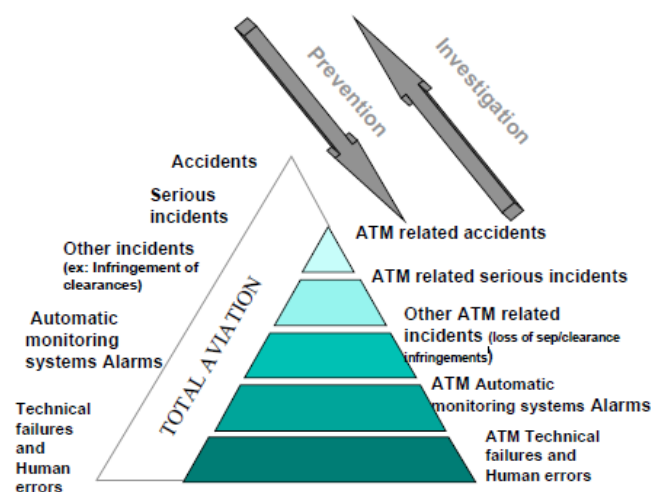


Figure 2-1 Safety triangle

Environment

According to the development plan of Asia-Pacific Seamless ATM plan, environment is one of the requisite performance objective areas for meeting the expectation of stakeholders. Considering the technical aspect of Asia-Pacific region, many countries can't meet the requirement of data statistics. In the view of PRU, the performance of environment could be expressed by inefficiency in terms of time, fuel and emission. But in Asia-Pacific region, inappropriate city planning makes noise of flight during the operation phase of approaching and

climbing a serious problem. Those KPIs are expected to help Asia-Pacific region to abate the adverse impact on environment in the future. So in the first implement stage which has been defined in this report, we will use some efficiency KPIs as alternatives.

Cost-efficiency

There is a high level of heterogeneity in the Air Navigation Services (ANS) industry. The relationship between inputs and outputs of provision of ATM/CNS services is obviously displayed in Figure 2-2 below. [ANSPs econometric cost-efficiency benchmarking]

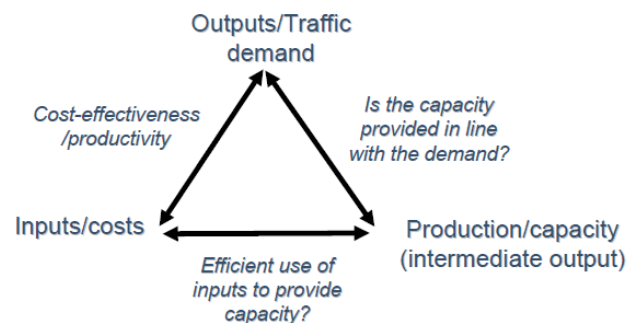


Figure 2-2 Relationship between costs and outputs

An ANSP provides a specific level of ATC capacity which is determined by the number of airspace sectors that can be opened in its airspace for a given duration. This ATC capacity is used to cope with a specific and exogenous traffic demand (number of aircraft/flights that are planned to cross the ANSP's airspace). One could consider that the capacity provided by the ANSP corresponds to an "intermediate" output while the "final" output would be measured in terms of traffic volumes controlled in the ANSP's airspace. The relationship between inputs/costs and final output/traffic demand depends on the ANSP's ability to efficiently use its resources to provide a certain level of ATC capacity and on the extent to which the capacity provided is in line with the traffic demand. The overall "outcome" of this process is the extent to which the flight (final output) has been safely controlled in a swift and timely manner.

According to the development plan of Asia-Pacific Seamless ATM plan, the cost efficiency is one of the four requisite performance objectives. And the implementation of ABSU Block upgrades will require investment decision to be made by ANSPs. However, Asia-Pacific ANSPs operate in operational and economic conditions that vary significantly from country to country. So, in our opinions, we need a lot of time to implement some KPIs and most of cost KPIs are placed in the second stage.

2.1.2 Key Performance Indicators

Indicator is a unit or a method of performance measurement. Driven by data, it is based on the expectation of performance improvement to select key performance indicators. Divided by the way of function of KPI in each key performance area and differences in Dimensions of Statistics, it systematically displays the hierarchical construction of indicator framework. Some indicators that get more attention are separately defined to highlight its importance. Description

of each key performance indicator includes Measurement Units, Variants, Parameters, Data Requirement and References. Relevantly, indicators need to correctly express the intention of the associated performance objective. Since indicators support objectives, they should be defined to have a specific performance objective in mind. Indicators are not often directly measured. They are calculated from supporting metrics according to clearly calculation procedure.

Display forms of indicator value

As one of attributes of indicators, indicator value should have different display forms in response to different analysis objects and assessment objectives. For example, totality highlights the overall workload of air traffic system in statistics of flight time, which is applied to publication of national statistics; average reflects the general operating state of aircraft in designated airspace; standard deviation examines the deviation of operating state of the aircraft groups. Therefore, in this framework, there appear no specific descriptions for display forms of such indicators, but gives available categories to select from when facing different situations.

Induced factors of indicator value

Air traffic system is a complex system. The index value whose performance is a result of both external and internal factors is used to determine main direction of optimization by division of main responsibilities. Therefore, descriptions of induced factors of indicator value are added in this framework when describing the display forms of indicators. For instance, we give different causes according to different types of delays: en-route flight delays are subdivided into capacity constraints, traffic control, weather, military training, pre-departure delay distribution and some other common factors; causes of off-block delays include air traffic control, airport capacity constraints, weather, turnover, pre-departure delay.

2.1.3 Supporting metrics

Supporting metrics are used to calculate the values of performance indicators and determine which data need to be collected to calculate values for the performance indicators. The supporting metrics define which data need to be collected and/or forecasted to calculate values for the performance indicators. Alternatively, the need for supporting metrics (such as the number of flights) lasts much longer because metrics are seldom indicator-specific, i.e. they are typically used to calculate a variety of indicators. When deciding which data to collect, a sufficiently broad spectrum of supporting metrics will have to be considered.

2.2 Implement stage

In fact, different countries in Asia-Pacific region have different methods and standards of data collection and definition, but the calculation and application of KPIs need uniform standard. With regard to the choice of performance indicators and implementation phase partition, we fully consulted 2016 version of GANP indicators suggestion (Core KPIs and Additional KPIs), and break the indicators down into different stages of implementation with the actual condition of these Asia-Pacific countries are taken into account,

At last, we set up 3 implement stages of KPIs (described in Table 2-1 in detail) to insure that each country could make it standardized and have time to join the revision of standard. The first stage starts from now and lasts to the year of 2019, the Stage 2 will continue until the year of 2021 , and the last stage is expected to continue through 2023.

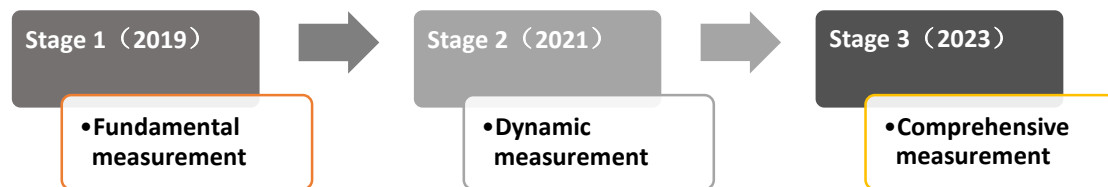


Figure 2-3 Implement stages of framework

KPIs in the first stage are easy to calculate because their rough definitions at time point within large statistical range. And the second stage needs us to set detailed distinction in each phase of flight operation as to different characteristics. Finally we need show more concern about flight dynamic information and the impact of non-operation elements in the third stage. It is not only for improving the development of Asia-Pacific Seamless ATM plan but also for the advancement of civil aviation in Asia-Pacific region. The foundation of parting the implement stage is the flight phase. For example, indicators in the first stage mean that the implement of indicators should both start and finish in this stage.

In the first stage, there are 10 indicators containing some fundamental and coarse-grain statistic and simple calculation on basis of those statistics. Corresponding flight phases have been divided into two main phases i.e. ground operation phase and runway-to-runway flight phase by the differentiation between airport and airspace. In order to make those indicators unified and comparable under now situation, the flight phase of runway-to-runway is defined from take-off to land of flights (as is shown in Figure 2-4). The second stage is up to 13 indicators. In this stage, the flight phase partition is more detailed and runway-to-runway flight phase is split into terminal departure, en-route, terminal arrival, and phase. Corresponding discontinuous points is the time of take-off, passing terminal departure fix, passing terminal arrival fix, landing. The ground operation phase is divided into turnaround, taxi-in and taxi out phases, and adding off-block and in-block time as discontinuous points. The data collection and performance evaluation need flight plan and actual time information such as FPL, ADS-B and radar data. Finally, the third stage cares more about flight dynamic information and some nonoperation factors (i.e. climbing, cruising and descending).

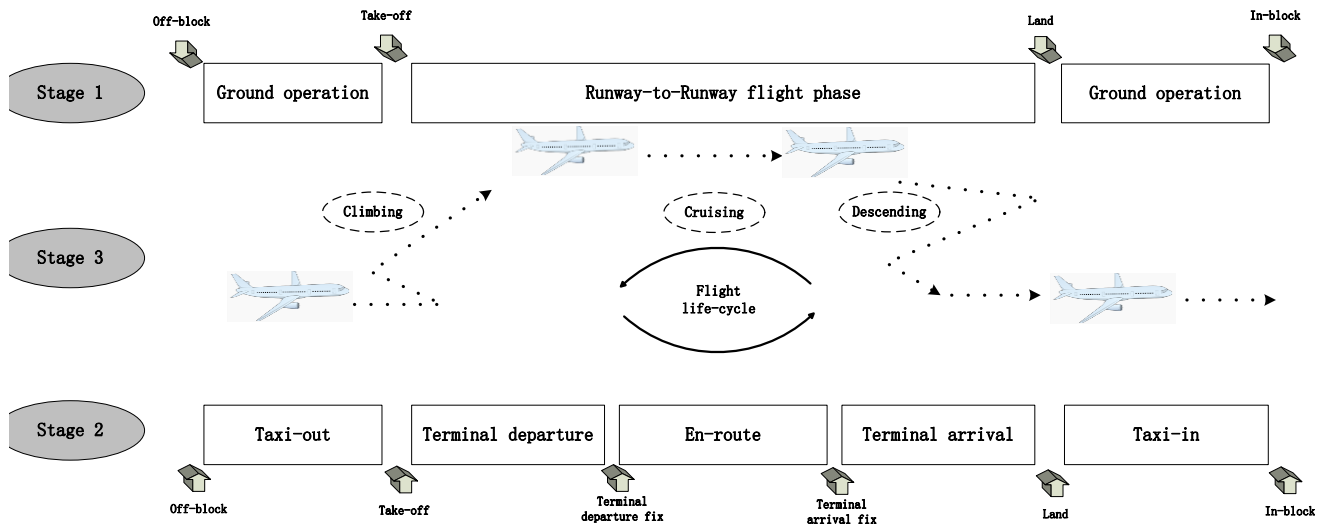


Figure 2-4 Flight life cycle in different implement stages

The specific indicator framework is shown below. Between KPAs and KPIs, we set some categories to make KPIs more regular. Furthermore, we introduce the level of KPIs in order to increase the engagement and participation of this plan. So, in this column ‘SR’ means those indicators are strongly recommended to complete to meet the need of performance measurement and ‘R’ shows they are recommended to finish in this stage. More detailed introduction will be discussed in the following section.

2.3 Indicator Measurement Roadmap

As Asia-Pacific is a region with so many diversified countries, we do need some strategic plan in carrying out the relative indicator measurement.

As for the first phase, the framework has already set, we could offer some technical support to all the countries, such as the way of collecting data, the computation algorithm, and some guidelines as to how to implement the measurement work. The idea is to encourage more and more participants to voluntarily take part in the work and adopt the KPIs we have set to kickoff their own work. However, we would state clearly the work is optional, and not for everyone to follow.

In the second phase, we could build a platform on which we can sharing tool for the measurement as well as a demonstration of how we are now doing with these tools and what are the current outcomes of the measurement work by some of the participants in the field. We would also emphasis, sharing is also optional and have to get every participant’s official approval.

In the third phase, probably a data sharing platform will be built under every participants’ consensus.

Table 2-1 KPIs in different stages

KPAs	Categories	ID	KPIs	Stage1		Stage2		Stage3	
Capacity	Capacity value	KPI01	Airport peak arrival capacity (GANP)	SR	1				
		KPI02	Airport peak departure capacity	SR	1				
		KPI03	En-route sector capacity (GANP)			R	2		
	Capacity utilization	KPI04	Airport arrival capacity utilization (GANP)			R	2	SR	3
		KPI05	Airport departure capacity utilization			R	2	SR	3
		KPI06	En-route sector capacity utilization					R	3
Efficiency	Additionalflight time	KPI07	Additional runway-to-runway time	R	1	R	2		
		KPI08	Additional en-route flight time					R	3
		KPI09	Additional taxi-in time (GANP)	R	1	SR	2		
		KPI10	Additional taxi-out time (GANP)	R	1	SR	2		
		KPI11	Additional runway occupation time					R	3
		KPI12	Additional terminal area arrival flight time (GANP)			R	2		
	Delay	KPI13	Arrival delay	R	1				
		KPI14	Departure delay	R	1				
		KPI15	En-route airspace ATFM delay(GANP)					R	3
		KPI16	Airport/Terminal ATFM delay(GANP)					R	3
		KPI17	Delay on board (newly added)					R	3
		KPI18	Filed flight plan en-route extension rate(GANP)					R	3

	Level flight efficiency	KPI19	Actual en-route extension rate(GANP)					R	3
	Flow	KPI20	Airport arrival throughput (GANP)	R	1	SR	2		
		KPI21	Airport departure throughput	R	1	SR	2		
Predictability	Flight time	KPI22	Flight arrival punctuality (GANP)	R	1	SR	2		
		KPI23	Flight departure punctuality (GANP)	R	1	SR	2		
		KPI24	Flight time variability (GANP)			R	2		
		KPI25	Flight plan variation (newly added)					R	3
		KPI26	ATFM slot adherence (GANP) (newly added)			R	2		
	Flight distance	KPI18	Filed flight plan en-route extension rate (GANP)					R	3
	Flow demand	KPI04	Airport arrival capacity utilization (GANP)	R	1	SR	2		
		KPI05	Airport departure capacity utilization	R	1	SR	2		
		KPI06	En-route sector capacity utilization			R	2		
Environment	Indirect environment influence	KPI27	Additional fuel burn (GANP)					R	3
		KPI19	Actual en-route extension rate (GANP)					R	3
Cost-efficiency	Outputs	KPI28	ANSP's Cost of Per IFR hours (newly added)						

3. Key Performance Indicators Framework

3.1 Key Performance Indicators Framework in the First Implement Stage

According to the partition of implementing stage in the executive summary, we build the most fundamental indicators framework in this stage which data is easily to collect and don't need special definition of flight phase. Those indicators mostly reflect performance of the entire flight phase.

Table 3-1 KPIs in Stage1

ID	KPIs	Level	KPAs
KPI01	Airport peak arrival capacity	SR	Capacity, Cost-efficiency
KPI02	Airport peak departure capacity	SR	Capacity, Cost-efficiency
KPI09	Additional taxi-in time	R	Efficiency
KPI10	Additional taxi-out time	R	Efficiency
KPI13	Arrival delay	R	Efficiency
KPI14	Departure delay	R	Efficiency
KPI20	Airport arrival throughput	R	Efficiency, Cost-efficiency
KPI21	Airport departure throughput	R	Efficiency, Cost-efficiency
KPI22	Flight arrival punctuality	R	Predictability
KPI23	Flight departure punctuality	R	Predictability

3.1.1 Capacity

Capacity Value

Capacity could reflect an upper bound on the allowable throughput of an en-route facility or sector or indicates the highest landing or take-off rate that an airport will accept, using the most favorable runway configuration under optimum operational conditions.

KPI Name	Airport peak arrival capacity
ID	KPI01
Definition	The highest number of landings an airport can accept in a one-hour time frame.
Measurement Units	Number of landings / hour
Variants	None
Parameters	None
Data requirement	Scheduling parameters for slot controlled airports Airport Acceptance Rates (AAR)
Calculation procedure	At the level of an individual airport: 1. Select highest value from the set of declared arrival capacities

	2. Compute the KPI: convert the value to an hourly landing rate, if the declaration is at smaller time intervals
References	Comparison of ATM-Related Operational Performance: U.S./Europe (June 2014) CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015) 2016-2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition - 2016)

KPI Name	Airport peak departure capacity
ID	KPI02
Definition	The highest number of take-offs an airport can release to departure in a one-hour time frame.
Measurement Units	Number of take-offs / hour
Variants	None
Parameters	None
Data requirement	Scheduling parameters for slot controlled airports
Calculation procedure	At the level of an individual airport: 1. Select highest value from the set of declared departure capacities 2. Compute the KPI: convert the value to an hourly take-off rate, if the declaration is at smaller time intervals
Reference	Comparison of ATM-Related Operational Performance: U.S./Europe (June 2014) CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015) 2016–2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition – 2016)

3.1.2 Efficiency

Additional Flight Time

Those KPIs are intended to give an indication of the efficiency of each flight phase operations on the surface or en-route.

KPI Name	Additional taxi-in time
ID	KPI09
Definition	Actual taxi-in time compared to an unimpeded/reference taxi-in time
Measurement Units	Minutes/flight

Variants	Variant 1 – basic (computed without landing runway and arrival gate data) Variant 2 – advanced (computed with landing runway and arrival gate data)
Parameters	Unimpeded/reference taxi-in time: -Recommended approach for the basic variant of the KPI: a single value at airport level, e.g. the 20th percentile of actual taxi times recorded at an airport, sorted from the shortest to the longest -Recommended approach for the advanced variant of the KPI: a separate value for each runway/gate combination, e.g. 20th percentile of actual taxi-in time recorded.
Data requirement	For each arriving flight: - Actual landing time (ALDT) - Actual in-block time (AIBT) In addition for the advanced KPI variant: - Landing runway ID - Arrival gate ID
Calculation procedure	At the level of individual flights: 1. Select arrival flights, exclude helicopters 2. Compute actual taxi-in duration: AIBT minus ADLT 3. Compute additional taxi-out time: actual taxi-out duration minus unimpeded taxi-in time At aggregated level: 4. Compute the KPI: sum of additional taxi-in times divided by number of IFR arrivals
References	Comparison of ATM-Related Operational Performance: U.S./Europe (June 2014) PRC Performance Review Report (EUROCONTROL 2015) CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015) 2016-2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition-2016)

Notes: In order to stress the seasonal influences, data should be uploaded monthly refer to the statistical period of the additional runway-to-runway time.

KPI Name	Additional taxi-out time
ID	KPI10
Definition	Actual taxi-out time compared to an unimpeded/reference taxi-out time
Measurement Units	Minutes/flight
Variants	Variant 1 – basic (computed without departure gate and runway data)

	Variant 2 – advanced (computed with departure gate and runway data)
Parameters	Unimpeded/reference taxi-out time: - Recommended approach for the basic variant of the KPI: a single value at airport level, e.g. the 20th percentile of actual taxi times recorded at an airport, sorted from the shortest to the longest - Recommended approach for the advanced variant of the KPI: a separate value for each gate/runway combination, 20th percentile of actual taxi-out time recorded.
Data requirement	For each departing flight: - Actual off-block time (AOBT) - Actual take-off time (ATOT) In addition for the advanced KPI variant: - Departure gate ID - Take-off runway ID
Calculation procedure	At the level of individual flights: 1. Select departing flights, exclude helicopters 2. Compute actual taxi-out duration: ATOT minus AOBT 3. Compute additional taxi-out time: actual taxi-out duration minus unimpeded taxi-out time At aggregated level: 4. Compute the KPI: sum of additional taxi-out times divided by number of IFR departures
References	Comparison of ATM-Related Operational Performance: U.S./Europe (June 2014) PRC Performance Review Report (EUROCONTROL 2015) CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015) 2016-2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition-2016)

Notes: In order to stress the seasonal influences, data should be uploaded monthly refer to the statistical period of the additional runway-to-runway time.

Delay

This part gives lots of forms of delay, which could be used as average value and standard deviation to meet different demand of statistics in macroscopic scale and parallel comparison.(i.e. average delay contains the average delay of all flights or all delayed flights.) Many KPIs of delay that may be implemented for the different phases of flight cycle compare an actual time against a scheduled time for the purpose of determining a delay. However, there are often two additional conditions that are met before an event is determined to be inefficient.

These include meeting a minimum threshold for delay as well as information on causal factors. Typical minimum thresholds include 5, 10 or 15 minutes.

KPI Name	Arrival delay
ID	KPI13
Definition	Actual in-block time compared to a schedule time of arrival [avg. per airport or per cluster of airports]
Measurement Units	Minutes/flight
Variants	Variant 1 – basic (computed for all flights) ~~Variant 2 – advanced (computed for delayed flights)~~
Parameters	Threshold of delayed flights: ~~Recommended value: 15 minutes~~
Data requirement	For each arriving flight: - Schedule Time of Arrival (STA) - Actual In-block Time (AIBT)
Calculation Procedure	For Variant 1: At the level of individual flights: 1.Select arriving flights 2.Compute arrival delay: AIBT minus STA At aggregated level: 3.Compute the KPI: sum of arrival delays divided by number of arrivals ~~For Variant 2: At the level of individual flights: 1.Select arriving flights 2.Compute arrival delay: AIBT minus STA 3.Use parameters to determine which flight is delayed~~ At aggregated level: 1.Compute the KPI: sum of arrival delays divided by number of delayed arrivals
References	Manual on Global Performance of the Air Navigation System(Doc.9883 First Edition — 2009)

Notes: Referring to the indication of delay, KPIs of delay will show different statistical characteristics in distinct uploading or statistical periods. If just handing in the results of calculation, it would be better to upload the data by month to show the seasonal influence.

KPI Name	Departure delay
ID	KPI14
Definition	Actual off-block time compared to schedule time of departure [avg. per airport or per cluster of airports]

Measurement Units	Minutes/flight
Variants	Variant 1 – basic (computed for all flights) ~~Variant 2 – advanced (computed for delayed flights)~~
Parameters	Threshold of delayed flights: ~~Recommended value: 15 minutes~~
Data requirement	For each departing flight: - Scheduled time of departure (STD) - Actual off-block time (AOBT)
Calculation Procedure	For Variant 1: At the level of individual flights: 1.Select departure flights 2.Compute departure delay: AOBT minus STD At aggregated level: 3.Compute the KPI: sum of departure delays divided by number of departures ~~For Variant 2: At the level of individual flights: 1.Select departure flights 2.Compute arrival delay: AOBT minus STD 3.Use parameters to determine which flight is delayed~~ At aggregated level: 1.Compute the KPI: sum of departure delays divided by number of delayed departures
References	Manual on Global Performance of the Air Navigation System(Doc.9883 First Edition — 2009)

Notes: Similarly, KPIs of delay will show different statistical characteristics in distinct uploading or statistical periods. If just handing in the results of calculation, it should be uploaded by month to show the seasonal influence.

Flow

Traffic flow means the number of flights served by airport or airspace. Average value reflects the common demand and peak value tells the effectively realized capacity.

KPI Name	Airport arrival throughput
ID	KPI20
Definition	The number of landings recorded at an airport under normal conditions in a given time period
Measurement Units	Flights/hr

Variants	Variant 1: average Variant 2: peak throughput
Parameters	For variant2: The 95th percentile of the hourly number of landings recorded at an airport, in the “rolling” hours sorted from the least busy to the busiest hour. Time interval for “rolling” hours. Recommended value: 15 minutes. The percentile chosen to exclude outliers. Recommended value: 95th percentile.
Data requirement	For each arriving flight: - Actual landing time (ALDT)
Calculation Procedure	For Variant 1: 1.Select arrival flights 2.Compute the throughput: count the number of actual landings in a given period based on ALDT 3.Compute the KPI: throughput divided by number of the selected hours For Variant 2: 1. Select arrival flights 2. Convert the set of landings to hourly landing rates by “rolling” hour 3. Sort the “rolling” hours from the least busy to the busiest hour 4. Compute the KPI: it equals the landing rate value of the 95th percentile of the “rolling” hours
Reference	Manual on Global Performance of the Air Navigation System(Doc.9883 First Edition — 2009) 2016-2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition-2016)

KPI Name	Airport departure throughput
ID	KPI21
Definition	The number of take-offs recorded at an airport under normal conditions in a given time period
Measurement Units	Flights/hr
Variants	Variant 1: average Variant 2: peak throughput
Parameters	For variant1: ...

	For variant2: The 95th percentile of the hourly number of landings recorded at an airport, in the “rolling” hours sorted from the least busy to the busiest hour. Time interval for “rolling” hours. Recommended value: 15 minutes. The percentile chosen to exclude outliers. Recommended value: 95th percentile.
Data requirement	For each departing flight: - Actual take-off time (ATOT)
Calculation Procedure	For Variant 1: 1. Select departing flights 2. Compute the throughput: count the number of actual take-offs in a given period based on ALDT 3. Compute the KPI: throughput divided by number of the selected hours For Variant 2: 1. Select departing flights 2. Convert the set of take-offs to hourly departing rates by “rolling” hour 3. Sort the “rolling” hours from the least busy to the busiest hour 4. Compute the KPI: it equals the departing rate value of the 95th percentile of the “rolling” hours
Reference	Manual on Global Performance of the Air Navigation System(Doc.9883 First Edition — 2009) 2016-2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition-2016)

3.1.3 Predictability

Flight time

KPI Name	Flight arrival punctuality
ID	KPI22
Definition	Percentage of flights arriving at the gate on-time (compared to schedule)
Measurement Units	Percentage(%)
Variants	Variant1 – arrival punctuality after 15 minutes of Scheduled time(SOBT) of arrival
Parameters	On-time threshold (maximum delay from Scheduled time of arrival) which defines whether a flight is counted as on-time or not. Recommended values: 15 minutes.
Data requirement	For each arriving scheduled flight: - Scheduled time of arrival (STA)

	- Actual in-block time (AIBT)
Calculation Procedure	At the level of individual flights: 1.Exclude non-scheduled arrivals 2.Categorize each scheduled arrival as on-time or not (flights arriving ahead of schedule defaulted to be on time) At aggregated level: 1.Compute the KPI: number of on-time arrivals divided by total number of scheduled arrivals
References	Comparison of ATM-Related Operational Performance: U.S./Europe (June 2014) 2016-2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition-2016)

KPI Name	Flight departure punctuality
ID	KPI23
Definition	Percentage of flights departing from the gate on-time (compared to schedule)
Measurement Units	Percentage(%)
Variants	Variant 1 – departure punctuality after 15 minutes of Scheduled time(SOBT) of departure
Parameters	On-time threshold (maximum delay from Scheduled time of departure) which defines whether a flight is counted as on-time or not. Recommended values: 15 minutes.
Data requirement	For each departing scheduled flight: - Scheduled time of departure (STD) - Actual off-block time (AOBT)
Calculation Procedure	At the level of individual flights: 1.Exclude non-scheduled departures 2.Categorize each scheduled departure as on-time or not At aggregated level: 3.Compute the KPI: number of on-time departures divided by total number of scheduled departures
References	Comparison of ATM-Related Operational Performance: U.S./Europe (June 2014) 2016-2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition-2016)

3.1.4 Environment

All indicators will be introduced in following stages.

3.1.5 Cost-efficiency

Intermediate outputs

KPI01 Airport peak arrival capacity (Refer to 3.1.1)

KPI02 Airport peak departure capacity (Refer to 3.1.1)

Outputs

KPI20 Airport arrival throughput (Refer to 3.1.2)

KPI21 Airport departure throughput (Refer to 3.1.2)

3.2 Key Performance Indicators Framework in the Second Implement Stage

In the second stage, we will introduce more detailed information of flight life cycle to design indicators.

Table 3-2 KPIs in Stage2

ID	KPIs	Level	KPAs
KPI03	En-route sector capacity	R	Capacity, Cost-efficiency
KPI04	Airport arrival capacity utilization	R	Capacity, Predictability
KPI05	Airport departure capacity utilization	R	Capacity, Predictability
KPI07	Additional runway-to-runway time	R	Efficiency
KPI09	Additional taxi-in time	SR	Efficiency
KPI10	Additional taxi-out time	SR	Efficiency
KPI12	Additional terminal area arrival flight time	R	Efficiency
KPI20	Airport arrival throughput	SR	Efficiency, Cost-efficiency
KPI21	Airport departure throughput	SR	Efficiency, Cost-efficiency
KPI22	Flight arrival punctuality	SR	Predictability
KPI23	Flight departure punctuality	SR	Predictability
KPI24	Flight time variability	R	Predictability
KPI26	ATFM slot adherence	R	Predictability

3.2.1 Capacity

KPI Name	En-route sector capacity
ID	KPI03
Definition	The maximum number of movements an airspace volume will accept under normal conditions in a given time period (also called declared capacity)
Measurement Units	Movements/quarter
Variants	None
Parameters	Time interval at which to perform the most granular calculations. Recommended value: 15 minutes.
Data requirement	Declared capacities are determined by the ANSP, and are dependent on traffic pattern and sector configuration.
Calculation procedure	At the level of an individual en-route airspace unit: 1. Select highest value from the set of declared capacities (the maximum configuration capacity) 2. Compute the KPI: convert the value to movement rate in a quarter, if the declaration is at smaller or larger time intervals

References	CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015) 2016–2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition – 2016)

Capacity Utilization

Capacity utilization can directly reflect the Capacity utilization which helps push for the further improvement of capacity management.

KPI Name	Airport arrival capacity utilization
ID	KPI04
Definition	Airport arrival throughput (accommodated demand) compared to arrival capacity. The arrival capacity refer to the declared capacity at present, in later stages, it could be replaced by dynamic capacity. KPI should be strongly recommended if the airport runs near capacity.
Measurement Units	Percentage(%)
Variants	None
Parameters	Time interval at which to perform the most granular calculations. Recommended value: 1 hour.
Data requirement	For each arriving flight: - Actual landing time (ALDT) For each time interval: - Declared landing capacity of the airport
Calculation procedure	For each time interval: 1. Compute the throughput: count the number of actual landings based on ALDT 2. Compute the utilization = throughput / capacity At the level of an individual airport: 3. Compute the KPI: $\text{sum}(\text{utilization} * \text{capacity}) / \text{sum}(\text{capacity})$
References	CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015) 2016–2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition – 2016) Airspace management Handbook Version 2.2 December 2005

KPI Name	Airport departure capacity utilization
ID	KPI05
Definition	Airport departure throughput compared to departure capacity. The departure capacity refer to the declared capacity at present, in later stages, it could be replaced by dynamic capacity. KPI should be strongly recommended if the airport runs near capacity.

Measurement Units	Percentage(%)
Variants	None
Parameters	Time interval at which to perform the most granular calculations. Recommended value: 1 hour.
Data requirement	For each arriving flight: - Actual take-off time (ATOT) For each time interval: - Declared take-off capacity of the airport
Calculation procedure	For each time interval: 1. Compute the throughput: count the number of actual take-offs based on ATOT 2. Compute the utilization = throughput / capacity At the level of an individual airport: 3. Compute the KPI: $\text{sum}(\text{utilization} * \text{capacity}) / \text{sum}(\text{capacity})$
References	CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015) 2016–2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition – 2016) Airspace management Handbook Version 2.2 December 2005

3.2.2 Efficiency

Additional Flight Time

Those KPIs are intended to give an indication of the efficiency of each flight phase operations on the surface or en-route.

KPI Name	Additional runway-to-runway time
ID	KPI08
Definition	Actual runway-to-runway time compared to an unimpeded/reference operation time.
Measurement Units	Minutes/flight
Variants	~~Variant 1 – basic (computed without take-off and landing airport)~~ Variant 1 – advanced (computed with take-off and landing airport)
Parameters	Unimpeded/reference runway-to-runway time: - Recommended approach for the KPI: a value from a single-flight perspective, e.g. the 20th percentile of actual operation times recorded at airlines which have the same route, sorted from the shortest to the longest

Data requirement	For each departing scheduled flight: - Location indicator for take-off airport - Actual take-off time (ATOT) For each arriving scheduled flight: - Location indicator for landing airport - Actual landing time (ALDT)
Calculation procedure	At the level of individual flights: 1. Select the flights, exclude those with departure and arrival airport out of the region or specific states. 2. Compute actual duration: ALDT minus ATOT 3. Compute additional flight time: actual duration minus unimpeded flight time At aggregated level: 1. Compute the KPI: sum of additional flight times divided by number of IFR flights
References	None

Notes: The calculation of the additional operation time needs to consider the influence of performance evaluation from different statistical periods. For example, the performance evaluation by month should reflect the seasonal impact more efficiently, and may focus on running characteristics of the flow both in peak and normal period by hour. However, considering the transmission standard and methods haven't been united, if just handing in the results of calculation, it should be uploaded by month to show the seasonal influence.

KPI09 Additional taxi-in time (Refer to 3.1.2)

KPI10 Additional taxi-out time (Refer to 3.1.2)

KPI Name	Additional terminal area arrival flight time
ID	KPI12
Definition	Actual terminal arrival time compared to a unimpeded time [avg. per airport or per cluster of airports]
Measurement Units	Minutes/flight
Variants	Variants are possible depending on the chosen size of terminal airspace (40 NM or 100 NM cylinder) and the richness of the data feed: basic (without arrival runway ID) or advanced (with arrival runway ID) Variants with 100 NM cylinder are useful if airports have holding patterns outside the 40 NM cylinder The use of generic cylinders abstracts local specifics in terms of approach airspace design (e.g. TMA) and ensures comparability across different airports.

Parameters	Unimpeded terminal area arrival flight time: - Recommended approach for the basic variants of the KPI: a single value at airport level = the 20th percentile of actual terminal airspace arrival times recorded at an airport, sorted from the shortest to the longest - Recommended approach for the advanced variants of the KPI: a separate value for each entry segment/landing runway combination = the 20th percentile of actual terminal airspace arrival times recorded..during periods of non-congestion (needs to be periodically reassessed)
Data requirement	For each arriving flight: - Terminal airspace entry time, computed from surveillance data (radar, ADS-B...) - Actual landing time (ALDT) In addition for the advanced KPI variants: - Terminal airspace entry segment, computed from surveillance data (radar, ADS-B...) - Landing runway ID
Calculation procedure	At the level of individual flights: 1. Select arrivals, exclude helicopters 2. Compute actual terminal airspace transit time: ALDT minus terminal airspace entry time 3. Compute additional terminal airspace transit time: actual terminal airspace transit time minus unimpeded terminal airspace transit time At aggregated level: 4. Compute the KPI: sum of additional terminal airspace transit times divided by number of IFR arrivals
References	Comparison of ATM-Related Operational Performance: U.S./Europe (June 2014) PRC Performance Review Report (EUROCONTROL 2015) Single European Sky Performance Scheme CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015) 2016-2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition-2016)

Notes: In order to stress the seasonal influences, data should be uploaded monthly refer to the statistical period of the additional runway-to-runway time.

Flow

KPI20 Airport arrival throughput (Refer to 3.1.5)

KPI21 Flight departure punctuality (Refer to 3.1.5)

3.2.3 Predictability

Flight time

KPI22 Flight arrival punctuality (Refer to 3.1.3)

KPI23 Flight departure punctuality (Refer to 3.1.3)

KPI Name	Flight time variability
ID	KPI34
Definition	Distribution of the flight (phase) duration around the average value
Measurement Units	Minutes/flight
Variants	None
Parameters	Minimum monthly flight frequency filter: flights with a frequency less than 20 times per month are not included in the indicator. 70% of the (remaining) flights are considered in the indicator, i.e. the 15th percentile (percentile 1) is used to determine the shortest duration, the 85 th percentile (percentile 2) is used to determine the longest duration, and the remaining parts is used to calculate average duration.
Data requirement	For each flight: - Actual off-block time (AOBT) - Actual take-off time (ATOT) - Terminal airspace depart time - Terminal airspace entry time - Actual landing time (ALDT) - Actual in-block time (AIBT)
Calculation Procedure	1. Exclude flights with frequency less than 20 times per month At the level of individual flights: 2. Compute the flight time of certain flight phase At aggregated level: 3. Sort the flight time from the shortest to the longest to form a flights time sequence 4. Choose values from percentile 15th to 85th of the flight time sequence to compute the average flight duration For each flight: 5. Compute the KPI: Variance of total flight time based on the average flight duration

Reference	Comparison of ATM-Related Operational Performance: U.S./Europe (June 2014) PRC Performance Review Report (EUROCONTROL 2015) CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

Capacity utilization

KPI04 Airport arrival capacity utilization (Refer to 3.2.1)

KPI05 Airport departure capacity utilization (Refer to 3.2.1)

3.2.4 Environment

All indicators will be introduced in following stages.

3.2.5 Cost-efficiency

Intermediate outputs

KPI03 En-route airspace capacity (Refer to 3.2.1)

Outputs

KPI20 Airport arrival throughput (Refer to 3.1.2)

KPI21 Airport departure throughput (Refer to 3.1.2)

3.3 Key Performance Indicators Framework in the Third Implement Stage

The third implement stage needs unified identification of flight phase and a certain number of data storage during the stages before. And this stage may require to use some technique& equipment.

Table 3-3 KPIs in Stage3

ID	KPIs	Level	KPAs
KPI04	Airport arrival capacity utilization	SR	Capacity, Predictability
KPI05	Airport departure capacity utilization	SR	Capacity, Predictability
KPI06	En-route sector capacity utilization	R	Capacity, Predictability
KPI08	Additional en-route flight time	R	Efficiency
KPI11	Additional runway occupation time	R	Efficiency
KPI15	En-route airspace ATFM delay	R	Efficiency
KPI16	Airport/Terminal ATFM delay	R	Efficiency
KPI17	Delay on board	R	Efficiency
KPI18	Filed flight plan en-route extension rate	R	Efficiency, Predictability
KPI19	Actual en-route extension rate	R	Efficiency, Environment
KPI25	Flight plan variation	R	Predictability
KPI27	Additional fuel burn	R	Environment
KPI28	ANSP's Cost of Per IFR hours	R	Cost-efficiency

3.3.1 Capacity

KPI04 Airport arrival capacity utilization (Refer to 3.2.1)

KPI05 Airport departure capacity utilization (Refer to 3.2.1)

KPI Name	En-route sector capacity utilization
ID	KPI06
Definition	Actual airspace throughput compared to the declared airspace capacity.
Measurement Units	Percentage(%)
Variants	None
Parameters	Time interval at which to perform the most granular calculations. Recommended value: 15 minutes.
Data requirement	Declared capacities are determined by the ANSP, and are dependent on traffic pattern and sector configuration.

Calculation procedure	For each time interval: 1. Compute the throughput: count the number of actual flights based on ANSPs 2. Compute the utilization = throughput / capacity At aggregated level (longer time periods): 3. Compute the KPI: $\text{sum}(\text{utilization} * \text{capacity}) / \text{sum}(\text{capacity})$
References	CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015) 2016–2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition – 2016)

3.3.2 Efficiency

Additional flight time

KPI Name	Additional en-route flight time
ID	KPI08
Definition	Actual en-route time flown compared to a unimpeded time
Measurement Units	Minutes/flight
Variants	None
Parameters	Unimpeded/reference en-route flight time: - Recommended approach for the the KPI: a value from a single-flight perspective, e.g. the 20th percentile of actual en-route flight times recorded at airlines have similar routes, sorted from the shortest to the longest
Data requirement	For each IFR flight with same terminal fix: - En-route airspace entry time - En-route airspace exit time - Airspace volume associated with the flow restriction
Calculation procedure	At the level of individual flights: 1. Select the flights crossing the volume of en-route airspace, ~~exclude helicopters~~ 2. Compute actual crossing duration: airspace exit time –airspace entry time 3. Compute additional en-route flight time: actual en-route airspace flight time minus unimpeded en-route airspace flight time At aggregated level: 4. Compute the KPI: sum of additional en-route flight time divided by number of IFR flights

References	PRC Performance Review Report (EUROCONTROL 2015)

Notes: In order to stress the seasonal influences, data should be uploaded monthly refer to the statistical period of the additional runway-to-runway time.

be uploaded monthly refer to the statistical period of the additional runway-to-runway time.

KPI Name	Additional runway occupation time
ID	KPI11
Definition	Actual runway occupation time compared to a unimpeded time [avg. per airport or per cluster of airports]
Measurement Units	Minutes/flight
Variants	Variant 1 – basic (computed without landing or departure runway data) Variant 2 – advanced (computed with landing or departure runway data)
Parameters	Unimpeded/reference runway occupation time: - Recommended approach for the KPI: a single value at airport level, e.g. the 20th percentile of actual runway occupation recorded at an airport, sorted from the shortest to the longest
Data requirement	For each landing flight: - Actual landing time (ALDT) - The time leaving the runway For each departing flight: - Actual take-off time (ATOT) - The time entering the runway In addition for the advanced KPI variant: - Landing runway ID - Take-off runway ID
Calculation procedure	- At the level of individual flights 1. Select arrival flights, exclude helicopters 2. Compute actual duration: the time leaving the runway minus ALDT 3. Compute additional runway occupation time: actual duration minus unimpeded runway occupation time 4. Select departing flights, exclude helicopters 5. Compute additional runway occupation time: ATOT minus the time entering the runway 6. Compute additional runway occupation time: actual duration minus unimpeded runway occupation time - At aggregated level: 7. Compute the KPI: sum of additional runway occupation times divided by number of IFR departures
References	None

Notes: In order to stress the seasonal impacts, data should be uploaded monthly refer to the statistical period of the additional runway-to-runway time.

Delay

KPI Name	En-route airspace ATFM delay
ID	KPI15
Definition	ATFM delay attributed to flow restrictions in a given airspace volume. Delay means the different between estimated and actual time.
Measurement Units	Minutes/flight
Variants	Variant 1: calculated with all flights. Variant 2 calculated with delayed flights.
Parameters	None
Data requirement	For each IFR flight: - Schedule Time of departure (STD) - Actual Off-block Time (AOBT) - ID of the flow restriction generating the ATFM delay - Airspace volume associated with the flow restriction - Delay code associated with the flow restriction
Calculation Procedure	At the level of individual flights: 1.Select delayed flights attributed to flow restrictions in a given airspace volume 2.Compute en-route ATFM delay: AOBT minus STD At aggregated level: 3.Compute the KPI: sum of en-route ATFM delays divided by number of flights(all flights for Variant 1 or delayed flights for Variant 2)
References	ICAO EUR Doc 030 EUR Region Performance Framework Document (July 2013) PRC Performance Review Report (EUROCONTROL 2015) Single European Sky Performance Scheme CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015) 2016-2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition-2016)

Notes: Similarly, KPIs of delay will show different statistical characteristics in distinct uploading or statistical periods. If just handing in the results of calculation, it would be better to upload the data by month to show the seasonal influence.

KPI Name	Airport/Terminal ATFM delay
ID	KPI16
Definition	ATFM delay attributed to arrival flow restrictions at a given

	airport and/or associated terminal airspace volume. Delay means the different between estimated and actual time.
Measurement Units	Minutes/flight
Variants	Variant 1: calculated with all flights. Variant 2 calculated with delayed flights.
Parameters	None
Data requirement	For each IFR flight: - Schedule Time of Arrival (STA) - Actual In-block Time (AIBT) - ID of the flow restriction generating the ATFM delay - Airport/terminal volume associated with the flow restriction - Delay code associated with the flow restriction
Calculation Procedure	At the level of individual flights: 1.Select delayed flights attributed to arrival flow restrictions at a given airport and/or associated terminal airspace volume. 2.Compute airport/terminal ATFM delay: AIBT minus STA At aggregated level: 3.Compute the KPI: sum of airport/terminal ATFM delays divided by number of flights(all flights for Variant 1 or delayed flights for Variant 2)
References	ICAO EUR Doc 030 EUR Region Performance Framework Document (July 2013) PRC Performance Review Report (EUROCONTROL 2015) Single European Sky Performance Scheme CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015) 2016-2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition-2016)

Notes: Similarly, KPIs of delay will show different statistical characteristics in distinct uploading or statistical periods. If just handing in the results of calculation, it would be better to upload the data by month to show the seasonal influence.

KPI Name	Delay on board
ID	KPI17
Definition	Time range between take-off(landing) and boarding-completed (disembarking-completed) exceeds the specified taxing time. [avg. per airport or per cluster of airports]
Measurement Units	Minutes/flight
Variants	Variant 1 – basic (computed without take-off/landing runway ID)

	Variant 2 – advanced (computed with take-off/landing runway ID)
Parameters	None
Data requirement	For each departing flight: - Actual take-off time (ATOT) - Actual boarding completed time - Specified taxing time For each arriving flight: - Actual landing time (ALDT) - Actual disembarking completed time - Specified taxing time In addition for the advanced KPI variants: - Take-off runway ID
Calculation Procedure	For Variant 1: At the level of individual flights: 1. Select departure flights. 2. Compute departure onboard time: ATOT minus actual boarding completed time. 3. Compute departure onboard delay: departure onboard time minus specified taxing time. 4. Select arrival flights 5. Compute arrival onboard time: Actual disembarking completed time minus ALDT. 6. Compute arrival onboard delay: arrival onboard time minus specified taxing time At aggregated level: 7. Compute the KPI: sum of arrival delays divided by number of arrivals or sum of departure delays divided by number of departures For Variant 2: 1. Select departure flights using specified runway. 2. Compute departure onboard time: ATOT minus actual boarding completed time. 3. Compute departure onboard delay: departure onboard time minus specified taxing time. 4. Select arrival flights using specified runway. 5. Compute arrival onboard time: Actual disembarking completed time minus ALDT. 6. Compute arrival onboard delay: arrival onboard time minus specified taxing time At aggregated level:

	7. Compute the KPI: sum of arrival delays divided by number of arrivals or sum of departure delays divided by number of departures
References	Normal flight management method (2016)

Level flight efficiency

Those KPIs measures the en-route horizontal flight (in) efficiency contained in a set of filed flight plans or actual flight trace crossing an airspace volume. Its value is influenced by route network design, route & airspace availability, airspace user choice (e.g. to ensure safety, to minimize cost and to take into account wind and weather) and airspace user constraints (e.g. overflight permits, aircraft limitations).

KPI Name	Filed flight plan en-route extension rate
ID	KPI18
Definition	Filed flight planned en-route distance compared to a reference ideal distance
Measurement Units	Percentage(%)
Variants	Variant 1: Filed flight plan en-route extension rate under the influence of en-route condition. Variant 2: Filed flight plan en-route extension rate under the influence of terminal area condition.
Parameters	Departure terminal area proxy: a cylinder with 40 NM radius around the departure airport. Destination terminal area proxy: a cylinder with 100 NM radius around the destination airport
Data requirement	For each flight plan: - Departure airport (Point A) - Destination airport (Point B) - Exit point of the Departure terminal area proxy (Point C) - Entry points of the Destination terminal area proxy (Points D) - Planned distance for each AB portion of the flight
Calculation Procedure	Detailed calculation procedure is shown in the third appendix. However, flights with starting and destination points out of the range should be excluded.
Reference	ICAO EUR Doc 030 EUR Region Performance Framework Document (July 2013) Comparison of ATM-Related Operational Performance: U.S./Europe (June 2014) PRC Performance Review Report (EUROCONTROL 2015) Single European Sky Performance Scheme

	CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015) 2016-2030 Global Air Navigation Plan(Doc 9750-AN/963 Fifth Edition-2016)

Notes: The calculation of the level flight efficiency needs to consider the influence of performance evaluation from different statistical periods. For example, the performance evaluation by month should reflect the seasonal impact more efficiently, and may focus on running characteristics of the flow both in peak and normal period by hour. However, considering the transmission standard and methods haven't been united, if just handing in the results of calculation, it should be uploaded by month to show the seasonal influence.

KPI Name	Actual en-route extension rate
ID	KPI19
Definition	Actual en-route distance flown compared to a reference ideal distance
Measurement Units	Percentage(%)
Variants	Variant 1: Actual en-route extension rate under the influence of en-route condition. Variant 2: Actual en-route extension rate under the influence of terminal area condition.
Parameters	Departure terminal area proxy: a cylinder with 40 NM radius around the departure airport. Destination terminal area proxy: a cylinder with 100 NM radius around the destination airport.
Data requirement	For each actual flight trajectory: - Departure airport (Point A) - Destination airport (Point B) - Exit point of the Departure terminal area proxy (Point C) - Entry points of the Destination terminal area proxy (Points D) - Distance flown for each NX portion of the actual flight trajectory, derived from surveillance data (radar, ADS-B...).
Calculation Procedure	Identical to the formula/algorithm of the 'Filed Flight Plan en-Route Extension Rate' KPI.
Reference	ICAO EUR Doc 030 EUR Region Performance Framework Document (July 2013) Comparison of ATM-Related Operational Performance: U.S./Europe (June 2014) PRC Performance Review Report (EUROCONTROL 2015) Single European Sky Performance Scheme CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

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Notes: The calculation of the level flight efficiency needs to consider the influence of performance evaluation from different statistical periods. For example, the performance evaluation by month should reflect the seasonal impact more efficiently, and may focus on running characteristics of the flow both in peak and normal period by hour. However, considering the transmission standard and methods haven't been united, if just handing in the results of calculation, it should be uploaded by month to show the seasonal influence.

3.3.3 Predictability

Flight time

KPI Name	Flight plan variation
ID	KPI25
Definition	Difference between the 85th and 15th percentile flight plan distance or time for a city pair.
Measurement Units	Kilometers or minutes
Variants	Variant 1 – flight time Variant 2 – flight distance
Parameters	None
Data requirement	For each departing flight: -Planned flight distance and time for certain city pairs.
Calculation Procedure	For variant 1: For each flight's flight plan in certain city pair: 1. Select all the flight plan belong to one flight. 2. Order those flight time from biggest to smallest. 3. Compute the variation= 85 th flight time minus 15 th flight time. At aggregated level: 1.Compute the KPI: sum of variations divided by number of flights. For variant 2: For each flight's flight plan in certain city pair: 1. Select all the flight plan belong to one flight. 2. Order those flight distance from biggest to smallest. 3. Compute the variation= 85 th flight distance minus 15 th flight distance. At aggregated level: 1.Compute the KPI: sum of variations divided by number of flights.

References	CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

Flight distance

KPI18 Filed flight plan en-route extension rate (Refer to 3.3.2)

3.3.4 Environment

Indirect environment influence

KPI19 Actual en-route extension rate (Refer to 3.3.2)

KPI Name	Additional fuel burn
ID	KPI27
Definition	The full extent of fuel combustion.
Measurement Units	kg fuel/flight
Variants	None
Parameters	Average fuel flow (kg/min) during taxi Average fuel flow (kg/min) during arrival in terminal airspace Average fuel flow (kg/km) in en-route airspace
Data requirement	Indicator values to be converted to estimated additional fuel burn: Additional Taxi-Out Time (min/flight) Additional Taxi-In Time (min/flight) Actual en-Route Extension (km/flight) Additional time in terminal airspace (min/flight)
Calculation procedure	Compute the KPI: sum of average fuel flow * addition operation time of different flight phases(i.e. taxi-out, taxi-in, en-route, and terminal airspace)
Reference	Comparison of ATM-Related Operational Performance: U.S./Europe (June 2014)

3.3.5 Cost-efficiency

Outputs

KPI Name	ANSP's Cost of Per IFR hour
ID	KPI28

Definition	Actual ANSP's cost of per IFR hour
Measurement Units	\$/hour
Variants	None
Parameters	Costs IFR hours
Calculation procedure	Compute the KPI: $\frac{Costs}{IFR\ hours}$ The Costs consists of ATCOs in OPS costs and other costs. ATCOs in OPS costs is composed of 'ATCOs in OPS employment cost per ATCO hour' (Compute it: $\frac{ATCOs\ in\ OPS\ employment\ costs}{ATCOs\ in\ OPS\ hours}$) and 'ATCOs in OPS hour productivity' (Compute it: $\frac{IFR\ hours}{ATCOs\ in\ OPS\ hours}$).
Data requirement	For each ANSP: ATCOs in OPS costs Other costs, including frontline staff costs, ATCOs in non-OPS, remaining employment costs, remaining operational costs, depreciation costs, capital costs, etc IFR hours For each country: ATCOs in OPS costs of the country Other costs of the country IFR hours of the corresponding country
Reference	CANSO Global Air Navigation Services Performance Report 2016 (2011-2015 ANSP Performance Results Executive Summary)

3.4 Key Performance Indicators for Safety

For safety performance metrics, there is specific working group to study and promote the performance indicators. In the construction of our framework, safety is taken as an individual section which will not be focused on. But we still provide relevant indicators suggestion as reference. The specific indicators for safety are shown below.

Table 3-4 KPIs for Safety

ID	KPIs	Stage1		Stage2		Stage3	
KPI36	Rate of flights under safety control	R	1				
KPI37	Growth rate of safety level			R	2		
KPI38	Rate of various types of aircraft accidents	R	1				
KPI39	Rate of aircraft incidents and errors	R	1				
KPI40	Rate of aircraft surface accidents			R	2		
KPI41	Rate of airspace infringements			R	2		

Statistics of safety operation

KPI Name	Rate of flights under safety control
ID	KPI36
Definition	This KPI measures the rate of flights encountering no occurrences associated with the operation of an aircraft which take place between the time any person boards the aircraft with the intention of flight until all such persons have disembarked, where a person is fatally or seriously injured, the aircraft sustains damage or structural failure or the aircraft is missing or is completely inaccessible under the protection and supervision of ATC, airline and so on.
Measurement Units	Percentage(%)
Variants	Variant 1 – number of flights (computed by number of flights) Variant 2 – flight time (computed by flight time of flights)
Parameters	Statistical Period Recommended value: 1 month or calendar quarter.
Data requirement	Number of safety controlled flights. Number of controlled flights.
Calculation procedure	1. Get total number of flights in such area. 2. Select and get number of the flights under safety control in the same statistical range of step1. 3. Compute the KPI: number of safety flight divide total number of flights.
References	None

KPI Name	Growth rate of safety level
ID	KPI37
Definition	This KPI measures the rate of change on increasing level of safety in given time
Measurement Units	Percentage(%)
Variants	Variant 1 – number of flights (computed by number of flights) Variant 2 – flight time (computed by flight time of flights)
Parameters	Statistical Period: Recommended value: 1 year.
Data requirement	Rate of flights under safety control
Calculation procedure	1. Get Rate of flights under safety control in such area both a year and a month. 2a. Compute the year-on-year KPI: growth rate= rate of flights under safety control of this year/ rate of flights under safety control last year 2b. Compute the month-on-month KPI: growth rate= rate of flights under safety control of this month/ rate of flights under safety control of this month last year
References	None

Aircraft unsafe Incidents

KPI Name	Rate of various types of aircraft accidents
ID	KPI38
Definition	The rate of occurrences associated with the operation of an aircraft, which take place between the time any person boards the aircraft with the intention of flight until all such persons have disembarked, where a person is fatally or seriously injured, the aircraft sustains damage or structural failure or the aircraft is missing or is completely inaccessible.
Measurement Units	Percentage(%)
Variants	Variant 1 –extremely large accidents Variant 2 –serious accidents Variant 3–accidents
Parameters	Statistical Period Recommended value: 1 year.
Data requirement	Number of controlled flights. For variant 1 : Number of extremely large accidents.

	For variant 2: Number of serious accidents. For variant 3: Number of accidents.
Calculation procedure	1. Get total number of flights in such area. 2. Select and get number of the flights suffer different kinds of accidents in the same statistical range of step1. For variant 1: 3a. Compute the KPI: number of flights suffer extremely large accidents divide total number of flights. For variant 2: 3b. Compute the KPI: number of flights suffer serious accidents divide total number of flights. For variant 3: 3c. Compute the KPI: number of flights accidents divide total number of flights.
References	PRC Performance Review Report (EUROCONTROL 2015)

KPI Name	Rate of aircraft incidents and errors
ID	KPI39
Definition	Rate of flight incidents and errors .Aircraft incident is an occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation; Error averages that something has been done that was not intended by the actor; not desired by a set of rules or an external observer; or that led the task or system outside its acceptable limits. In short, it is a deviation from intention, expectation or desirability.
Measurement Units	Percentage(%)
Variants	Variant 1 –incidents Variant 2 –errors
Parameters	Statistical Period Recommended value: 1 year.
Data requirement	Number of controlled flights. For variant 1:

	Number of flight incidents. For variant 2: Number of flight errors.
Calculation procedure	1. Get total number of flights in such area. 2. Select and get number of the flights suffer incidents and errors in the same statistical range of step1. For variant 1: 3a. Compute the KPI: number of flights suffer incidents divide total number of flights. For variant 2: 3b. Compute the KPI: number of flights suffer flight errors divide total number of flights.
References	PRC Performance Review Report (EUROCONTROL 2015)

Aircraft accidents and incidents

KPI Name	Rate of aircraft surface accidents
ID	KPI40
Definition	This KPI is the rate of aircraft accidents and incidents occur on the ground(including runway, taxiway and apron)
Measurement Units	Percentage(%)
Variants	None
Parameters	Statistical Period Recommended value: 1 year.
Data requirement	Number of controlled flights. Number of flights suffer surface accidents.
Calculation procedure	1. Get total number of flights in such area. 2. Select and get number of the flights suffer surface accidents in the same statistical range of step1. 3. Compute the KPI: number of flights suffer surface accidents divide total number of flights.
References	EUROCONTROL. Cognitive Complexity in Air Traffic Control: A Literature Review, 2004.

KPI Name	Rate of aircraft airspace infringements
ID	KPI41

Definition	Rate of a flight into a notified airspace that has not been subject to approval by the designated controlling authority of that airspace in accordance with international and national regulations.
Measurement Units	Percentage(%)
Variants	None
Parameters	Statistical Period Recommended value: 1 year.
Data requirement	Number of controlled flights. Number of flights cause airspace infringements.
Calculation procedure	1. Get total number of flights in such area. 2. Select and get number of the flights cause airspace infringement in the same statistical range of step1. 3. Compute the KPI: number of flights cause airspace infringement divide total number of flights.
References	PRC Performance Review Report (EUROCONTROL 2015)

4. The Performance-Based Approach Step-By-Step

4.1. Introduction

The performance-based approach is a way of organizing the performance management process. This approach can be broken down into manageable, easy-to-understand steps. By systematically following these steps, ATM community members will gain confidence in their ability to apply the approach in a successful manner, and benefit from participating in a globally harmonized approach.

Figure 4-1 outlines the general sequence of steps in the performance management process. It serves as general guidance.

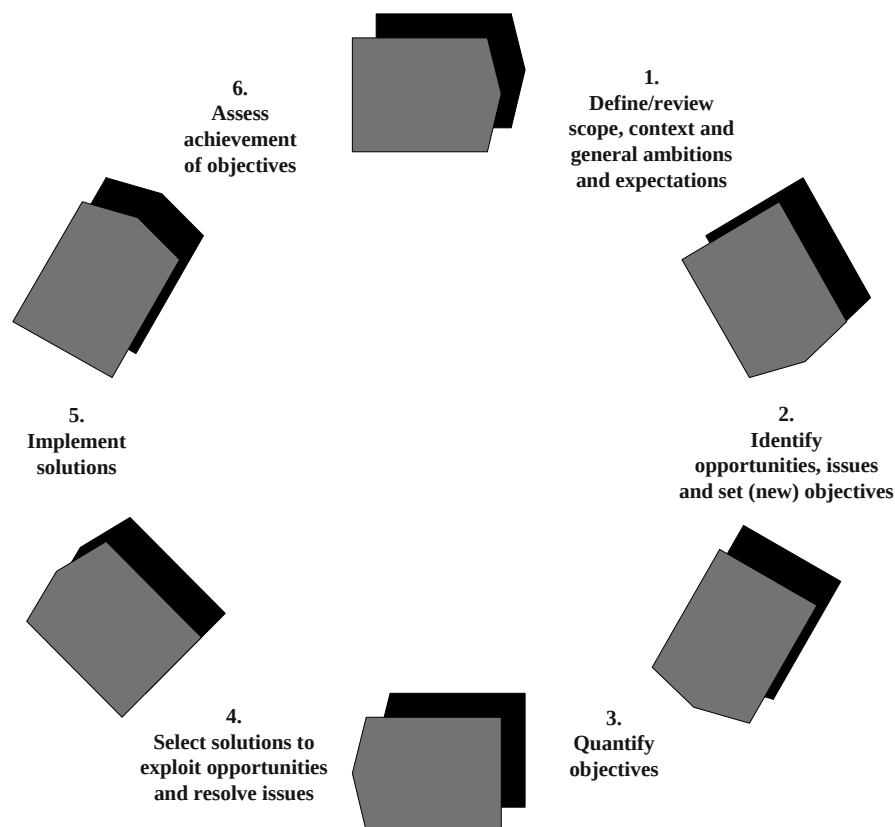


Figure 4-1. General performance management process

The steps cover the following activities:

Step 1: Define/review scope, context and general ambitions/expectations.

- ☐ Step 1.1: Define scope;
- ☐ Step 1.2: Define context;
- ☐ Step 1.3: Identify ambitions and expectations.

Step 2: Identify opportunities, issues and set (new) objectives.

- ☐ Step 2.1: Develop a list of present and future opportunities and issues that require performance management attention;

- ☐ Step 2.2: Focus efforts by defining and prioritizing performance objectives as needed.

Step 3: Quantify objectives.

- ☐ Step 3.1: Define how progress in achieving performance objectives will be measured and which data are required to do so;
- ☐ Step 3.2: Define the desired speed of progress in terms of baseline and target performance.

Step 4: Select solutions to exploit opportunities and resolve issues.

- ☐ Step 4.1: Select the decisive factors to reach the target performance;
- ☐ Step 4.2: Identify solutions to exploit opportunities and mitigate the effects of the selected drivers and blocking factors;
- ☐ Step 4.3: Select a sufficient set of solutions.

Step 5: Implement solutions.

Step 6: Assess achievement of objectives.

4.2 step 1: Define/Review Scope, Context and General Ambitions/Expectations

The purpose of Step 1 is to reach a common agreement on the scope and (assumed) context of the “system” on which the performance management process will be applied, as well as a common view on the general nature of the expected performance improvements.

Step 1.1: Define scope

There is not just one global application of the performance management process, but many simultaneous — and often interrelated — applications at more specialized and localized levels. Scope definition is important to avoid misunderstandings, in particular about the performance (improvement) which can be expected within the given scope. For example, the possibilities for managing safety or environmental impact vary depending on whether one considers only the role of ATM or approaches the subject at the level of the entire air transport system. By defining the scope of the performance management activity, the limits of responsibility and accountability are also defined.

Step 1.2: Define context

Once the scope is defined, it is necessary to make clear assumptions on what is “surrounding” the performance management activity. This includes clarifying what the strategic fit is within a larger (parent scope) performance management activity, with whom there is a need to coordinate and collaborate, and what the external drivers and constraints are for the scope.

Step 1.3: Identify ambitions and expectations

Within a given scope, the purpose of identifying general ambitions and expectations is to develop a strategic view on the (performance) results that are expected. The term “expectation” refers to desired results from an external perspective. The term “ambition” indicates that the desired results refer to an internal initiative. For example, in ATM, the

performance-based approach can be used to better meet society's aviation expectations, as well as improve the business performance of airlines, service providers, etc. To achieve this, one could identify ambitions and expectations with regard to the performance of flight operations, airspace/airport usage and air navigation services in areas such as:

- ☐ safety;
- ☐ security;
- ☐ environmental impact;
- ☐ cost effectiveness;
- ☐ capacity;
- ☐ flight efficiency;
- ☐ flexibility;
- ☐ predictability;
- ☐ access and equity;
- ☐ participation and collaboration;
- ☐ interoperability.

These are the eleven key performance areas (KPA's) as identified in the Global Air Traffic Management Operational Concept (Doc 9854). Achievable performance is made possible by the following enabler levels:

- ☐ services and procedures;
- ☐ human resources;
- ☐ physical infrastructure;
- ☐ systems and technology;
- ☐ regulation and standardization.

The performance-based approach (PBA) can be applied at each of these enabler levels for the purposes of understanding the impact on the eleven KPAs. For example, for the systems and technology level, the focus includes technical performance characteristics such as service/system availability, continuity, reliability, integrity, resilience, maintainability, scalability etc. An important part of the PBA is the development of cause-effect relationships between these technical performance characteristics and the higher level 11 KPAs.

4.3 Step 2: Identify Opportunities, Issues and Set (New) Objectives

The purpose of Step 2 is to develop a detailed understanding of the performance behavior of the system (this includes producing a list of opportunities and issues), and to decide which specific performance aspects are essential for meeting the general expectations. The essential performance aspects are those which need to be actively managed (and perhaps improved) by setting performance objectives.

Step 2.1: Develop a list of present and future opportunities and issues that require performance management attention. Based on the scope, context and general ambitions/expectations which were agreed to during the previous step, the system should be analyzed in order to develop an inventory of present and future opportunities and issues

(weaknesses, threats) that may require performance management attention. This part of the process is generally known as the SWOT (strengths, weaknesses, opportunities and threats) analysis. Strengths are (internal) attributes of a system or an organization that help in the realization of ambitions or in meeting expectations. Weaknesses are (internal) attributes of a system or an organization that are a detriment to realizing ambitions or meeting expectations. Opportunities are external conditions that help in the realization of ambitions or in meeting expectations. Threats are external conditions that are a detriment or harmful to realizing ambitions or meeting expectations.

Note that what may represent strengths with respect to one ambition or expectation may be weaknesses for another one. The term “issues” is used in this document to refer to weaknesses as well as threats. A good understanding of the opportunities and issues should be developed early in the process, to provide background information for deciding which performance objectives to set, what to measure and how/where to change the system. When possible (second or later iteration in the process), advantage should be taken of the results of Step 6: Assess achievement of objectives. In general, this activity should take place as part of the forecasting and performance review.

Once the strengths, weaknesses, opportunities and threats are identified, action can be taken to target and exploit or remove these factors, thereby leading to performance improvements directly related to meeting the expectations.

Step 2.2: Focus efforts by defining and prioritizing performance objectives as needed

The purpose of this activity is to focus and prioritize the application of the performance-based approach:

- ☐ Focus is necessary to aim general expectations into specific performance objectives, which in turn will be the basis for deciding on improvement actions.
- ☐ Prioritization is required because, even though the scope of the process has already been limited, in practice, not everything can and/or needs to be performance managed.
- ☐ Prioritization is supported by risk management which helps identify the risks that are most urgent or must be avoided, those that should be transferred or reduced, and those that are reasonable to retain.

Focusing the performance-based approach is a two-stage process:

- ☐ Within each KPA, identify a number of specific areas — focus areas — in which there are potential intentions to establish performance management. Focus areas are typically needed where issues have been identified (see Step 2.1). For example, within the capacity KPA one can identify airport capacity, runway capacity and apron capacity as focus areas. Within the safety KPA, the list of focus areas might include: accidents, incidents, runway incursions, safety management system maturity, etc. There may be a need to define hierarchical groupings of focus areas.
- ☐ Within focus areas, the potential intention to establish performance management is “activated” by defining one or more performance objectives. These define a desired trend in a qualitative and focused way in today’s performance; they specifically focus on what has to be achieved, but do not make statements about the when, where, who or how

much. These objectives may be developed iteratively with the development of indicators. Significant analysis of historical data, performance modeling or simulation may be required to understand the necessary objectives. For example, “improve safety” is not specific enough to be an objective, but represents a starting point. Further analysis would reveal that “reduce the total number of accidents” and even more specifically “reduce the number of CFIT accidents” would qualify as performance objectives. Because at this level of detail no mention is made about the when, where and who, it does not make sense to try to associate numbers (indicator values or targets) at this level. That is done during the next step of the process.

Prioritizing the performance-based approach averages that performance objectives will only be defined in those focus areas where a real (present or anticipated) need for action and improvement has been identified (preferably through analysis of historical or projected performance data).

4.4 Step 3: Quantify Objectives

The principle of “reliance on facts and data for decision-making” implies that objectives should be specific, measurable, achievable, relevant and time-bound (SMART). The purpose of Step 3 in the process is to ensure that these aspects are properly addressed.

Step 3.1: Define how progress in achieving performance objectives will be measured and which data are required. This section explains briefly that as part of the performance-based approach there is a need for defining: indicators; the metrics underpinning those indicators; and common definitions for data aggregation and event classification. It also addresses the measurement granularity and the need for harmonization. Current/past performance, expected future performance (estimated as part of forecasting and performance modeling), as well as actual progress in achieving performance objectives is quantitatively expressed by averages of indicators (sometimes called Key Performance Indicators, or KPIs).

Indicators are not often directly measured. They are calculated from supporting metrics according to clearly defined formulas, e.g. $\text{cost-per-flight-indicator} = \text{Sum}(\text{cost}) / \text{Sum}(\text{flights})$. Performance measurement is therefore done through the collection of data for the supporting metrics (e.g. leads to a requirement for cost data collection and flight data collection).

Indicators need to be defined carefully:

- ☐ To be relevant, they need to correctly express the intention of the performance objective. Since indicators support objectives, they should not be defined without having a specific performance objective in mind.
- ☐ They need to be expressed in terms of supporting metrics for which there is adequate data availability.

When there is a problem with data availability, there are two possibilities:

- ☐ Set up the appropriate data reporting flows and/or modeling activities, to ensure all supporting metrics are populated with data as required to calculate the indicator(s) associated with the objective;
- ☐ If this is not possible, aim for a different kind of performance improvement, by choosing

a different performance objective, as constrained by data availability.

Note that the need for an indicator lasts only as long as the corresponding performance objective exists. Alternatively, the need for supporting metrics (such as the number of flights) lasts much longer because metrics are seldom indicator-specific, i.e. they are typically used to calculate a variety of indicators. When deciding which data to collect, a sufficiently broad spectrum of supporting metrics will have to be considered.

Data collection should take place at the most detailed level of granularity that can be afforded because the availability of detailed data greatly increases the effectiveness of the performance-based approach.

Common aggregation hierarchies and classification schemes (taxonomies) are then used to condense the detailed supporting metrics into clearly scoped summary indicators.

To conclude: in a collaborative environment in which many stakeholders contribute to the achievement of objectives and/or have performance reporting obligations, it is important to harmonize not only the definition of indicators and supporting metrics, but also the scope definitions, e.g. aggregation hierarchies and classification schemes (taxonomies).

Step 3.2: Define the desired speed of progress in terms of baseline and target performance

The above-mentioned performance indicators are the quantifiers for how well performance objectives have been achieved. Performance targets are closely associated with performance indicators: they represent the values of performance indicators that need to be reached or exceeded to consider a performance objective as being fully achieved. Note that performance targets can be set as a function of time (e.g. to plan yearly improvement); they can also vary by geographic area, stakeholder, etc. In addition, targets can be set at different levels: local, regional or global.

Once the scope of a target has been agreed, it becomes clear where and at which level performance management will need to be applied, between which stakeholders the achievement of the objective needs to be coordinated, and who will need to be involved in trade-off decisions. The term target is used with different meanings:

- ☐ current versus future: when the aim of the objective is to improve current performance over time, the term “target” refers to a future desired or required performance level;
- ☐ real versus design specifications: when the aim of the objective is to manage real performance so as to stay within pre-defined limits, the term “target” refers to design specifications.

Performance targets may be set with different intentions, for example:

- ☐ as a strategic design target, to support transition planning;
- ☐ as a recommendation or incentive to promote the need for action and accelerate improvements;
- ☐ as a legal requirement;
- ☐ as a performance level which needs to be achieved to enable other performance improvements;
- ☐ as a mandatory performance requirement which is necessary for safety reasons;
- ☐ to gain access to certain airspace or receive certain levels of service.

To understand how challenging it is to reach a target, one should know the baseline performance. The difference between the baseline and the target is called the performance gap. In a “current versus future” application, the size of the gap is often expressed as a percentage of the baseline performance (e.g. 10 per cent improvement needed to reach the target). For “real versus design specifications” applications, targets are usually expressed as absolute values, without reference to a baseline.

The determination of the baseline performance (calculation of baseline indicator values) is done during the previous iteration of the process. It is one of the results of Step 6: Assess achievement of objectives. This is part of the performance review.

The time available to achieve performance objectives is always limited. Therefore, targets should always be time-bound.

The target and the time available to reach the target determine the required speed of progress for the performance objective. Care should be taken to set targets so that the required speed of progress is realistic. Target setting is used as a tool by managers, policymakers, regulatory bodies and standardization organizations. Targets can have far reaching consequences depending on how challenging they are and how serious they are taken.

In the air navigation system, appropriate decision-making/policymaking processes need to be in place to collaboratively agree on performance objectives, performance indicators and the values of performance targets at the local, regional and, where required, global levels.

4.5 Step 4: Select Solutions to Exploit Opportunities and Resolve Issues

The purpose of this step is to apply the principle of “informed decision-making, driven by the desired/required results”.

It combines the knowledge of baseline performance, opportunities and issues with the performance objectives and targets, in order to make decisions in terms of priorities, trade-offs, selection of solutions and resource allocation. The aim is to optimize the decisions to maximize the achievement of the desired/required (performance) results.

Step 4.1: Select the decisive factors to reach the target performance

This part of the process is sometimes called performance gap analysis. As a result of Step 2, a qualitative inventory of present and future opportunities and issues that may require performance management attention is already available. When analyzing blocking factors for runway capacity improvement for example, it may turn out that for a given airport (example: single runway without parallel taxiway), the dominant blocking factor is runway occupancy time, rather than wake vortex separation minima. Knowing this, it is clear that solutions that reduce runway occupancy time will contribute to runway capacity enhancement, whereas solutions which reduce wake vortex separation minima will not contribute to the achievement of the objective in this particular example. Likewise, at some airports the dominant constraining factor may be runway capacity, but elsewhere it may be gate and apron capacity. In order to make progress in reaching an objective, the dominant factors first need to be undertaken. So the outcome of this activity is a selection and prioritization of opportunities

and issues. This can be seen as the development of a “performance strategy” for the achievement of a given objective: working “backwards” from expectation related objectives, it cascades performance requirements down to a selection of subordinate, enabling objectives and targets (e.g. to improve airport capacity, we first need to improve runway capacity, for which we first need to reduce runway occupancy time). This part of the process:

- eliminates/defers issues that do not immediately or significantly affect the achievement of objective(s);
- helps to maximize effectiveness if performance improvements have to be realized with limited resources (e.g. budget, manpower);
- creates a “traceability chain”, and/or a “performance case” which explains what will be improved and how much, prior to the selection of solutions;
- progresses the decision-making to the point where it is appropriate to start thinking in terms of available solutions (options).

Step 4.2: Identify solutions to exploit opportunities and mitigate the effects of the selected drivers and blocking factors

At this stage, decision-makers need to know their options for mitigating pre-identified issues and therefore to exploit available opportunities. This part of the process is about establishing the list of options, i.e. defining the “solution space” which is at the disposal of decision-makers for optimizing the achievement of performance objectives.

In the above example, for the objective “reducing runway occupancy time”, the list of possible solutions/options may include: building extra taxiways to avoid the need for backtracking or to eliminate the need for runway crossings; building high speed runway exits to give more options for vacating the runway, thereby reducing runway occupancy time; and equipping aircraft with “brake-to-vacate” technology, which enables pilots to select a runway exit while the aircraft is making its landing approach. This increases the predictability of runway occupancy time, which in turn allows reducing the separation minima on final approach. The latter will lead to increased capacity if runway occupancy time is the dominating blocking factor. The list of solutions relates to the list of issues. In this example, each solution addresses a different issue (which may or may not be present at a given airport), but they all contribute to the same performance objective.

When the task is to improve the effectiveness of the day-to-day economic and operational management, the list of options will most likely be populated with off-the-shelf solutions and best practices, i.e. solutions which are readily available.

When working with longer time horizons (during transition planning), a number of the options or operational improvements may still be in their research, development and trials phases, averaging that decision-makers will have to work with a “living” list of options, which are still surrounded by a certain degree of uncertainty.

In any case, decision-makers need to gain a good understanding of the strategic fit, the benefits, cost and feasibility of each option for operational improvement. Therefore, the description of the operational improvements in the list needs to show that they have been

developed from different complementary perspectives. To produce this list of options, the performance-based approach should be applied at each level.

In those cases where a list of options/operational improvements was already developed during a previous planning cycle, the task consists of updating the list to take the latest developments into account. In the case of transition planning-where the process may be executed only once every five years-“updating the list” averages significantly “refining the list”.

Step 4.3: Select a sufficient set of solutions

This is the part of the process where decisions are made based on which solution(s) to implement. The following information is available to support decision-making:

- 1) definition of system/expectation scope and context;
- 2) the required results in terms of performance objectives and targets (in some cases, for a certain date, in other cases, as an evolution through time, specifying a “required speed of progress”, e.g. four percent improvement per year);
- 3) prioritized issues and opportunities, and their impact on performance; and
- 4) an overview of candidate solutions and their capability to resolve issues and exploit opportunities, in terms of:

- ☐ list of operational improvements;
- ☐ associated enablers (services and procedures, human resources, systems and technology, and regulation and standardization).

It is within this framework that decisions have to be taken. The nature of the decision and the method best applied depend on the situation, as explained below. Assume an example in which one has identified a number of candidate solutions to increase runway capacity. The requirement is to exceed a certain capacity target while staying below a certain cost target. This is illustrated in Figure 4-2. For each candidate solution, the expected runway capacity and associated cost have been assessed during the previous step. With this information, the various candidate solutions can be positioned in the capacity/cost diagram of Figure 4-2.

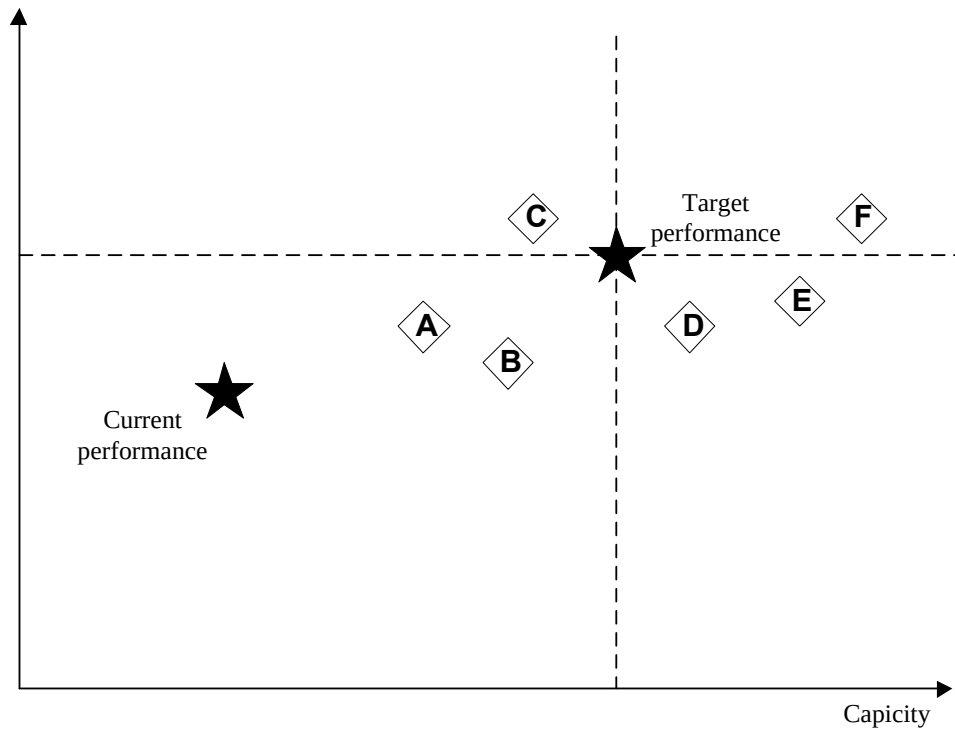


Figure 4-2 Expected performance of candidate solutions (example)

What is the decision to be taken and which method is to be used? Depending on which subset of the solutions is available, the answer will vary. Your project may be faced with any combination of the situations described in Table 4-1.

Table 4-1. Selection of solutions (example)

Case	Solutions	Decision
1	Only A, B, C, and F are available. None of these solutions meets both targets.	None of the proposed solutions is satisfactory. Decide whether to: — continue searching for solutions which address the selected issues and opportunities and meet all targets; — focus on different issues and opportunities (this assumes that the objectives can be achieved using a different method or by setting different priorities); — relax the target(s) (which makes it easier to achieve the objective(s), but the impact of this would need to be assessed); — abandon the performance objective(s) altogether (this also requires an impact assessment).
2	D and E are under development and not yet available when needed.	Decide what can be done to advance the availability date of D and E. In many cases, availability constraints are imposed by enabler deployment and this would imply a need to accelerate the deployment of certain enablers.
3	Only D is available and/or meets	There are no alternatives to choose from. Accept

	all targets.	solution D.
4	Only D and E are available. They are mutually exclusive.	Both candidate solutions exceed the targets. Select the “best buy”. Is it worth choosing E instead of D? A commonly used method for making the decision is multi-criteria decision analysis (MCDA).
5	Only D and E are available. They can be applied simultaneously.	D and E may be complementary in delivering performance benefits (improving performance in different places, at different times of the day, under different conditions). Decide whether to combine them into one “implementation package”.
6	Only D and E are available.	It may make sense to first use solution D, and after a while (some years) to replace D by E to achieve better performance. Decide how to include D and E in the “road map” or “deployment sequence”.
7	D is available, but its capacity will suffer if solution G is also applied.	This is the case where D and G interfere with each other from a performance perspective. Trade-off considerations will need to be part of the decision process. The aim is to take a balanced decision. See Appendix A for more information about trade-offs.

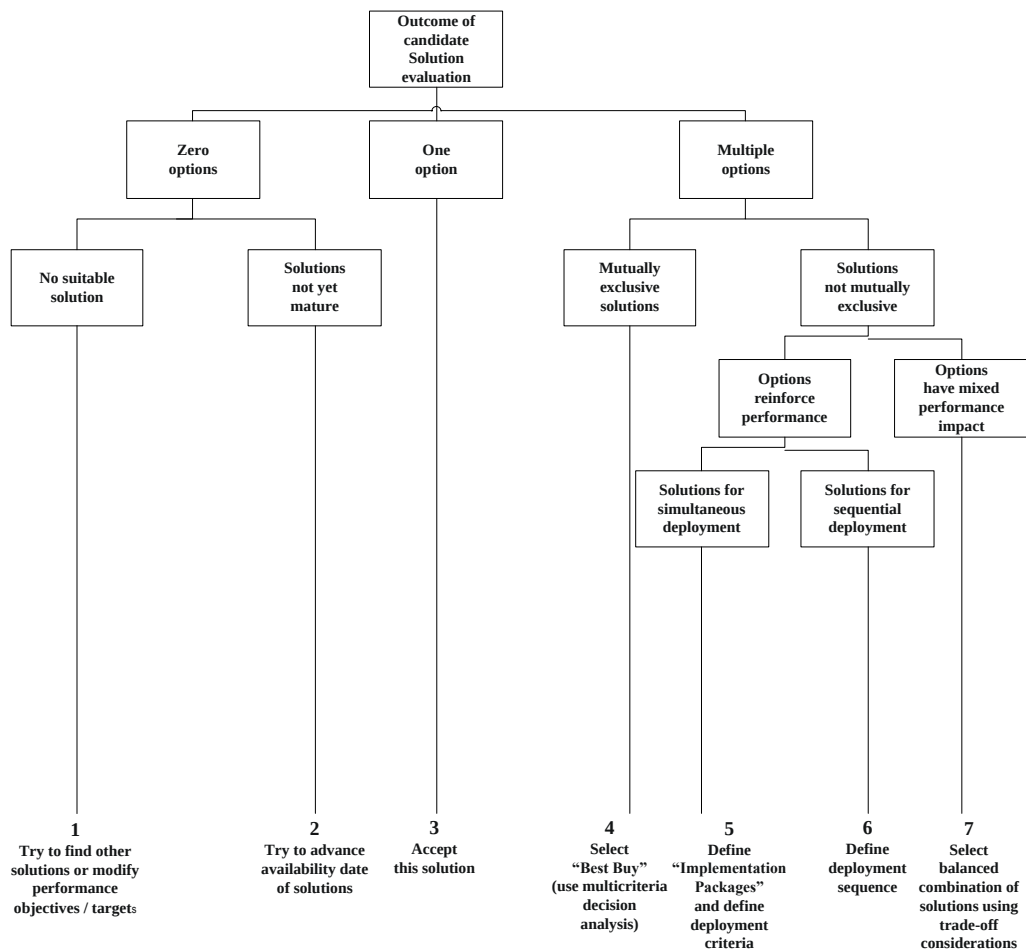


Figure 4-3. Selection of solutions

Depending on the nature of the project, the output of this process step is either a single preferred solution, or a road map of selected solutions (combined into implementation packages and sequenced into a deployment sequence), accompanied by an initial performance case that describes those issues which are resolved and opportunities exploited, together with the expected costs and benefits in terms of performance improvement towards the specified targets.

4.6 Step 5: Implement Solutions

This step is the execution phase of the performance management process. This is where the changes and improvements that were decided upon during the previous step are organized into detailed plans, implemented, and begin delivering benefits. Depending on the nature and magnitude of the change, this could average:

1) In the case of small-scale changes or day-to-day management:

- ☐ Assigning management responsibility for the implementation to an individual;
- ☐ Assigning responsibility and accountability for reaching a performance target to an individual or organization.

2) In the case of major or multi-year changes:

- ☐ Refining the road map of selected solutions into a detailed implementation plan, followed by the launching of implementation projects.
- ☐ Ensure that each individual implementation project is operated in accordance with the performance-based approach. This averages launching and executing the performance management process at the level of individual projects. Each project derives its scope, context and expectations (see Step 1 of the process) from the overall implementation plan.

4.7 Step 6: Assess Achievement of Objectives

The purpose of Step 6 is to continuously keep track of performance and monitor whether performance gaps are being closed as planned and expected. This implies data collection to populate the supporting metrics with the data needed to calculate the performance indicators. The indicators are then compared with the targets defined during Step 3 to draw conclusions on the speed of progress in achieving the objectives. This step includes monitoring progress of the implementation projects, particularly in those cases where the implementation of solutions takes several years (as in our example), as well as checking periodically whether all assumptions are still valid and the planned performance of the solutions is still meeting the (perhaps changed) requirements. With regard to the review of actually achieved performance, the output of Step 6 is simply an updated list of performance gaps and their causes. In practice, the scope of the activity is often interpreted as being much wider and includes

recommendations to mitigate the gaps. This is then called performance monitoring and review, which in addition to Step 6 includes Steps 1, 2 and 3 of the performance management process.

For the purpose of organizing performance monitoring and review, the task can be broken down into five separate activities:

- ☐ Data collection;
- ☐ Data publication;
- ☐ Data analysis;
- ☐ Formulation of conclusions;
- ☐ Formulation of recommendations.

1) Data collection

There are essentially two major categories of data feeds that performance monitoring and review will deal with:

- ☐ data which are captured by automatic averages and forwarded in electronic form with little or no human intervention. This type of data feed is typical for high volume streaming measurement data and automated database-to-database exchanges;
- ☐ manual reporting of information (electronically or on paper). This requires human effort to collect, interpret, analyze, structure and otherwise prepare the data for reporting. Typical for low-frequency, complex information data feeds in which the performance monitoring organization receives processed information (forms, reports) instead of raw data feeds.

To establish data feeds in each KPA, the following steps need to be undertaken:

- ☐ identify information needs;
- ☐ identify potential suppliers of data;
- ☐ ensure information disclosure by candidate data suppliers;
- ☐ manage the data feeds on an ongoing basis.

2) Data access and publication

The performance review can begin once the required data (performance targets and current/anticipated values for performance indicators) are available. The first activity in this process is data publication. With proper ATM community participation in place, ATM performance will be evaluated by two different groups: performance specialists (e.g. analysts from designated ATM performance review organizations); and people with a generally high level of interest in ATM performance. Each group has its own specific need for access to ATM performance data, which should be satisfied by appropriate data access and publication averages.

People with a general interest in ATM performance will wish to see executive level, quality-controlled data and draw their own conclusions, at which point, the need arises to make certain performance data publicly available in the interest of transparency. A capability is therefore required which enables them to monitor the current situation against the performance targets, and to provide them with the general trends, the “big picture” and their

own performance in comparison with others. This need can be satisfied by publishing high-level performance indicator indices. These indices are periodically updated and generally allow limited or no interactivity by the user.

In addition, analysts from designated ATM performance review organizations are tasked with gaining an in-depth understanding of ATM performance and finding causes and effects. Their work is an integral part of the performance management process described earlier. Their data needs can be satisfied by publishing selected data in performance assessment databases which are designed to suit the analysts' needs. These databases should allow high levels of interactivity (querying and analysis).

3) Data analysis

At the data analysis stage, the performance review organization should ensure that the data are already quality-checked. Rather than struggling with data quality issues, analysts should be able to focus on their main task: performance review. Analysts need to examine the reasons for (good/poor) performance, and explain these to decision-makers, while gaining a better insight into past, current and future ATM performances. To that effect, analysts will compare performance indicators against performance targets, identify performance evolution trends, analyze historical evolution of performance, and find relationships (correlations) between performance indicators, supporting metrics, etc. They will look at the "big picture" (annual totals and averages, performance indicators summarized during the planning cycle) and break down the data into very detailed levels to find the causes of performance gaps and the reasons for trade-offs. Analysts will also make use of various modeling techniques to increase their understanding of system performance. As a side effect of data analysis, analysts will be able to propose performance objectives, define new performance indicators and identify data needs.

4) Formulation of conclusions

After completing the data analysis, analysts are expected to document the conclusions for each KPA. Normally, these conclusions contain an assessment of the current and expected future performance for each performance objective. Typically, the conclusions are published in a performance review report.

5) Formulation of recommendations

An integral part of the performance review process is the formulation of recommendations. These should be derived from the conclusions and also be included in the performance review report. Recommendations should focus on how to meet ATM community expectations through agreed upon performance objectives, performance indicators and performance targets. When an evaluation indicates inconsistency between ATM community expectations and performance objectives, performance indicators and performance targets, recommendations may include: the need to set or change performance objectives; the need to (re-)define performance indicators; the need to set or change performance targets. Recommendations will typically fall into the following categories (non-exhaustive list):

- ☐ the need to improve performance data collection;
- ☐ suggested initiatives aimed at closing identified performance gaps;
- ☐ suggestions to accelerate or delay performance improvements based on anticipated evolution of traffic demand and predicted performance indicator trends;
- ☐ setting up task forces, defining action plans, etc., with a view to beginning the implementation process.

6) Positioning of performance review within the overall process

It is recommended that the performance monitoring and review activity is sufficiently integrated into the overall performance planning process to ensure that the conclusions and recommendations serve as direct input for Step 4 of the process, while simultaneously maintaining a degree of independence from the other parts of the process in order to ensure a sufficient level of objectivity and impartiality.

4.8 Repeat the process

Performance management is a closed loop process. The performance management process is intended to be a closed-loop process. Step 6 has identified deficiencies, i.e. cases where performance is not as expected, despite the implementation of changes designed to achieve performance improvements. These deficiencies are to be acted upon by starting the next iteration of the process.

One may be surprised to note that this implies revisiting Step 1: Define/review scope, context and general ambitions/expectations. It is strongly recommended not to skip this because the performance management scope, context and general expectations may be subject to continuous change.

The periodicity of the process greatly depends on where in the air navigation system and lifecycle it is applied. Depending on the nature of your project/activity you could be responsible for any of the following:

1) Ensuring performance of concepts and systems:

- ☐ during concept validation;
- ☐ during and/or after implementation.

2) Application of regulatory methods to organizations, people and systems:

- ☐ legal requirements, rules and regulations;
- ☐ certification and licensing;
- ☐ inspection and oversight.

3) Annual performance review:

- ☐ performance is evaluated in annual cycles, in a reactive way;
- ☐ followed by actions in subsequent years to correct performance deficiencies.

4) Proactive, collaborative performance planning:

- ☐ medium-term planning processes (annual cycles);
- ☐ strategic planning/seasonal scheduling (seasonal cycles); and

- pre-tactical planning (e.g. daily cycles).

Appendix 1 ICAO and GANP performance indicators frameworks

Table 1 Key Performance Area

Key Performance Area	ICAO Key Performance Indicators
Access and Equity	Unsatisfied demand versus overall demand
Capacity	Number of flights or flight hours that may be accommodated. Separate measures for airspace and airport either through models or through actual values. Values may be specific for a weather condition.
Cost Effectiveness	Average cost per flight at a system-wide annual level. Total operating cost plus cost of capital divided by IFR flights. Total labour obligations to deliver one forecast IFR flight in the system, measured monthly and year-to-date.
Efficiency	Percentage of flights departing on-time. Percentage of flights with on-time arrival. Average departure delay per delayed flight Percentage of flights with normal flight duration. Average flight duration extension of flights with extended flight duration. Total number of minutes to actual gate arrival time exceeding planned arrival time. For all of the above consider 1) ATM caused delay, 2) target time for delay (filed or schedule) and 3) delay threshold value (i.e. 15 minutes)
Environment	Amount of emissions attributable to ATM inefficiency Number of people exposed to significant noise Fuel efficiency per revenue plane-mile
Flexibility	Number of rejected changes to the number of proposed changes to the number of flight plans initially filed each year Proportion of rejected changes for which an alternative was offered and taken.
Global Interoperability	Number of filed differences with ICAO Standards and Recommended Practices. Level of compliance of ATM operations with ICAO CNS/ATM plans and global Interoperability requirements.
Participation by ATM Community	Number of yearly meetings covering planning, implementation and operations.
Predictability	Closely related to delay measures under efficiency Possible refinement to delay measures by phase of flight.

Safety	Number of accidents normalized to either number of operations or number of flight hours
Security	Number of acts of unlawful interference to ATC Number of incidents involving direct unlawful interference to aircraft that require air traffic service provider response Number of incidents due to unintentional factors such as human error, natural disasters, etc., that have led to unacceptable reduction in air navigation system capacity

Table 2 Core Indicators in GANP

Key Performance Area	GANP Key Performance Indicators
Capacity	Airport peak arrival capacity.
Efficiency	Additional taxi-in time. Additional taxi-out time. Airport arrival throughput.
Predictability	Flight arrival punctuality. Flight departure punctuality. Flight time deviation.
Cost Efficiency	Airport arrival throughput.

Appendix 2 ASBU Block 0

There are eighteen ASBU Block 0 modules defined in the Global Air Navigation Plan:

Airport Operations

APTA: Optimizations of Approach Procedures including Vertical Guidance

WAKE: Increased Runway Throughput through Optimized Wake Turbulence Separation

SURF: Safety and Efficiency of Surface Operations

ADCM: Improved airport Operations through Airport Collaborative Decision Making

RSEQ: Improved Traffic Flow through Sequencing

Globally Interoperable Systems & Data

FICE: Increased Interoperability, Efficiency and Capacity through Ground –Ground integration

DATM: Service Improvement through Digital Aeronautical Information Management (Note: DATM integrates all digital ATM information in Block 1.)

AMET: Meteorological Information Supporting Enhanced Operational Efficiency and Safety

Optimum Capacity & Flexible Flights

FRTO: Improved Operations through Enhanced EnRoute Trajectories

NOPS: Improved Flow Performance through Planning based on a Network-wide View

ASUR: Initial Capacity for Ground Surveillance

ASEP: Air Traffic Situational Awareness (ATSA)

OPFL: Improved Access to Optimum Flight Levels through Climb/Descent Procedures using ADS-B

ACAS: Airborne Collision Avoidance Systems (ACAS) Improvements

SNET: Increased Effectiveness of Ground-Based Safety Nets

Efficient Flight Paths

CDO: Improved Flexibility and Efficiency in Descent Profiles using Continuous Descent Operations (CDOs)

TBO: Improved Safety and Efficiency through the Initial Application of Data Link En-route

CCO: Improved Flexibility and Efficiency Departure Profiles using Continuous Climb Operations (CCOs)

The Global Air Navigation Plan indicates the relationship between ASBU Modules and KPAs. The Table 3 shows ASBU Block 0 modules and their supporting KPAs. The Air Navigation Report Form has selected five (5) KPAs namely, access and equity, capacity, cost effectiveness, efficiency and safety to be reported. These 5 KPAs are highlighted in bold letters in Table 3 on the next page.

Table 3 ASBU Block 0 modules and supporting KPAs

	Airport Operation				Global Interoperable Systems and Data				Optimum Capacity and Flexible Flights							Efficient Flight Paths		
Key Performance Area	APTA	WAKE	SURF	ACDM	RSEQ	FICE	DATM	AMET	FRTO	NOPS	ASUR	ASEP	OPFL	ACAS	SNET	CDO	TBO	CCO
Access & Equity	√	√	√						√	√								
Capacity	√	√	√	√	√	√		√	√	√	√		√				√	
Cost	√	√	√	√	√	√	√	√	√	√	√	√			√	√	√	√
Efficiency	√		√	√	√	√		√	√	√	√	√	√	√		√	√	√
Environment	√		√	√			√	√	√	√			√					√
Flexibility		√			√	√		√	√								√	
Interoperability						√	√	√										
Participation								√		√								
Predictability					√			√	√	√								
Safety	√		√				√	√		√	√	√	√	√	√	√	√	√

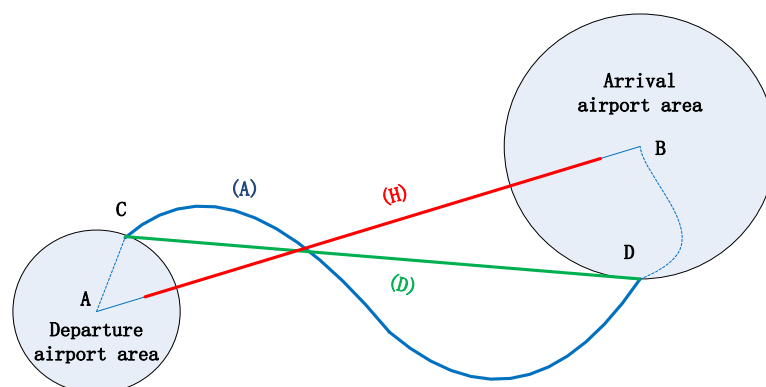
Appendix 3 Filed flight plan en-route extension rate/Actual en-route extension rate

Those indicators of filed flight plan en-route extension and actual en-route extension are defined by previous studies (E.g. Kettunen, et al. 2005; Boeing & CANSO, 2012; Eurocontrol & FAA, 2012). Trajectory based performance evaluation is mostly used to estimate the operational performance of efficiency and influence of environment due to the inefficiency operation.

Eurocontrol has further utilized the air route extension rate to estimate the level flight efficiency in PRR. In the main body of this report, we select two KPIs of air route extension rate which are respectively effected by terminal and en-route condition. As is shown in the picture below: (A) is the actual flight trajectory of s flight, (D) is the great circle between the departure airport area fix and the arrival airport area fix and (H) is the projection of (A) or (D) on the connection between two airports. So we could get the calculation function:

Air route extension rate (affected by route condition) = $((A) - (D)) / (D)$

Air route extension rate(affected by terminal condition)= $((D) - (H)) / (H)$

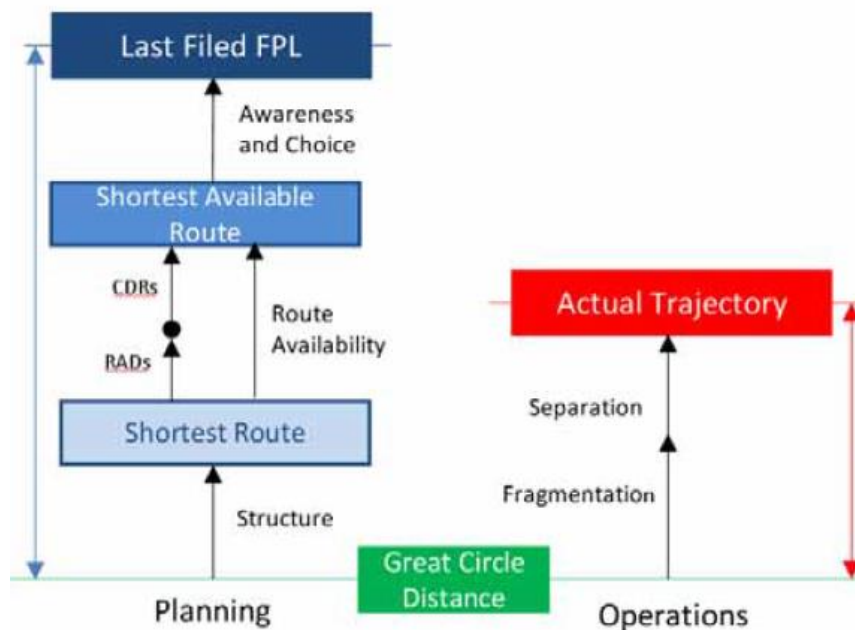


Filed flight plan en-route extension, compares the length of the en-route section of the last filed flight plan with the corresponding great circle distance. Similarly, actual en-route extension compares the length of the en-route section of the actual trajectory with the corresponding achieved distance. The indicator is calculated as the ratio of the two sums (length of trajectories and achieved distances), over all flights considered.

Filed flight plan en-route extension compares the filed flight plan to the great circle. While the filed, flight plan is the ultimate output of the planning process, this indicator would be possible to measure the inefficiency at intermediate stages by considering the shortest possible route on the route network and the shortest available route for the specific flight. The shortest possible route is constrained by the design of the route network. Historically, the route network was structured in reference to aircraft navigational limitations and to enable air traffic control to provide separation with the tools available. As performance of both aircraft and ATC has improved, the need for such a rigid en-route structure has diminished, to the extent that free route airspace would now be possible throughout the entire area. This would have positive

effects both on the Filed flight plan en-route extension and the actual en-route extension. The shortest available route is specific to a flight and takes into account the additional constraints introduced by the Route Availability Document (RAD) and Conditional Routes (CDRs). The RAD has the effect of modifying the route network available to specific flows of traffic, while CDRs have the effect of modifying the route network available at specific times. Both of them reduce the set of available routes. Differences between the shortest available route and the route in the filed flight plan can arise because the airspace user might not be aware that the route is available, or just choose an alternative route for operational or business reasons.

The actual en-route extension, on the other hand, reflects the actual environmental performance. In this case a distinction can be made between two separate components: “separation” and “fragmentation”. “Separation” relates to the need to safely manage the flow of traffic and has to be considered as a hard constraint. It is important to bear in mind that the level of inefficiencies cannot be reduced to zero. “Fragmentation” refers to operational inefficiencies created by non-homogenous processes and systems and airspace and sector design due to non-operational factors.



It is recognized that actual en-route extension can be a representation for fuel efficiency as the most fuel efficient route depends on wind. However, the wind optimal route might not necessarily correspond to the choice of the airspace users because they might use different measures, such as total cost (which would be dependent on the airspace users).

Appendix 4 Abbreviations

AAR	Airport Acceptance Rates
ADS-B	Automatic Dependent Surveillance - Broadcast
AIBT	Actual in-block time
ALDT	Actual landing time
ANSP	Air navigation service provider
AOBT	Actual off-block time
ATC	Air traffic control
ATCOs	Air Traffic Control Officers
ATFM	Air traffic flow management
ATM	Air traffic management
ATOT	Actual take-off time
ELDT	Estimated landing time
ETOT	Estimated take-off time
KPI	Key Performance Indicator
ICAO	International Civil Aviation Organization
STA	Scheduled time of arrival
STD	Scheduled time of departure
TMA	Terminal area

AIRARD/TF — TASK LIST

(Last update August 2019, amendments are shown in highlight)

ACTION ITEM	DESCRIPTION	TARGET DATE	RESPONSIBLE PARTY	STATUS	REMARKS
1/2	IATA advised the meeting that they would study the PBN Highway concept and provide data and analysis to the AIRARD/TF/2	AIRARD/TF/4	IATA	OPEN	
1/3	The draft TOR would be circulated among the Secretariat and the Co-Chairs, then presented to the ATM Groups in the EUR/NAT, MID and APAC Regions for consideration	TF/4	ICAO EUR/NAT/MID/APAC, Co-Chairs, ATM Groups	OPEN	MIDANPIRG and APANPIRG approved.
2/2	AIRARD/TF to review the MID proposals from AIRARD/TF/2/WP04	TF/4	ICAO APAC, EUR	~~OPEN~~ CLOSED	
2/3	Special Coordination Meetings (SCMs) should be held between EUR/NAT and MID States, and between MID and APAC States to discuss MID trans-regional ATS route proposals	AIRARD/TF/4	ICAO APAC, ICAO EUR/NAT, ICAO MID, IATA States concerned	~~OPEN~~ CLOSED	Egypt-Cyprus-Lebanon meeting held in 2019.
2/5	ICAO Regional Offices coordinate with the States concerned the resolving of 5LNCs duplicates and present progress reports	AIRARD/TF/3 and 4	ICAO APAC, ICAO EUR/NAT, ICAO MID	~~OPEN~~ CLOSED	On-going.

.....

Attachment F: Amendment to the Asia/Pacific Regional ATM Contingency Plan

SECTION 5 – BACKGROUND INFORMATION

Insert new paragraphs:

Coordinated Recovery from ATS Contingency Operations

5.13 The recovery from any contingency operation can be just as difficult to safely manage as the initial onset of the contingency situation, particularly when involving multiple ANSPs/FIRs. To avoid ad hoc recovery actions that place aircraft and/or the service provided by adjacent ATS units in an unsafe or unmanageable situation, it is important to consider, coordinate and agree on recovery actions.

5.14 States coordinating the recovery from contingency operations should:

1. establish, in coordination with the ANSPs responsible for the identified *Core Contingency FIRs* (i.e. those FIRs that have responded to the contingency situation by making changes to traffic flows, use of ATS routes, Flight Level Allocation Schemes (FLAS) and separation minima or spacing, or other procedures) an agreed time of resumption of normal operations or *agreed resumption time* (i.e. the common time on any day when the traffic situation is most suitable for contingency recovery);
2. provide prior notification of resumption of normal operations at the agreed resumption time via NOTAMs promulgated not less than 6-12 hours (or longer agreed prior notification time, where necessary) before the resumption time, noting that aircraft operators are normally flight planning six hours or more before flight, although there is a need to take into account any long haul and ultra-long haul flights that may be already airborne).
3. specify, through coordinated contingency recovery planning and associated NOTAMS that:
 - a) the only that may plan via non-contingency routes are those flights that:
 - i. with Expected Off-Block Times (EOBT) after the *agreed resumption time*;
or
 - ii. that will enter the first of any of the *Core Contingency FIRs* at or after the agreed resumption time;
 - b) no re-filing of FPL routes or requests for direct tracking are to be made by airborne flights within the *Core Contingency FIRs* at the time of resumption to normal operations, although ATC may tactically offer improved tracking; and
4. ensure the ATC service in each *Core Contingency FIR* is prepared for any ‘mixed mode’ (contingency route/level and non-contingency route/level) operations in the same airspace during the transition to full normal operations.

ATS Emergency and Contingency Response Planning

5.15 An essential component of the capability of ATS units to respond to in-flight emergencies and contingency events is the provision of appropriate checklists and guidance that are readily available to ATS personnel, at their operational positions.

5.16 States should ensure through regulatory oversight mechanisms that quick-reference emergency checklists are made available at all operational ATS positions, and that they are reviewed and updated in accordance with the processes established for all operational procedure, instructions and related documents. The knowledge and use of quick-reference emergency checklists should also be included in all ATS training and performance assessment.

5.17 Quick Reference Emergency Templates are provided in **Appendices X and X.**

Re-number subsequent paragraphs.

Insert new paragraphs:

Promulgation of Information supporting Natural Disaster Humanitarian Aid Operations

5.32 Aircraft operators supporting humanitarian aid organizations responding to natural disasters and other incidents requiring their intervention require ready access to up-to-date operational information. In many cases, NOTAMs referring to ATS units, aerodromes, communications and navigations facilities and infrastructure may be domestically distributed only.

5.33 There is also a need to ensure that contact details for the ATS unit or organization providing the AOCG function (paragraph 5.10 iv) are provided to enable ready access to information necessary to plan humanitarian aid operations.

5.34 States should ensure that NOTAM relating to the contingency situation are temporarily included in the international NOTAM distribution for the FIR/s concerned. NOTAM providing contact details for the ATS unit or other organization providing the AOCG function should also be promulgated,

Re-number subsequent paragraphs.

.....

ATM/SG/7
Appendix X to the Report

ATS EMERGENCY RESPONSE CHECKLISTS

PAGE CHECKLIST

0-1 **DATE**
0-2 **DATE**
0-3 **DATE**
0-4 **DATE**
0-5 **DATE**

General

GEN 1 **DATE**
GEN 2 **DATE**
GEN 3 **DATE**
GEN 4 **DATE**
GEN 5 **DATE**
GEN 6 **DATE**

ELT Signals

ELT 1 **DATE**
ELT 2 **DATE**

VFR Above Cloud

CLD 1 **DATE**
CLD 2 **DATE**
CLD 3 **DATE**

VFR in IMC

IMC 1 **DATE**
IMC 2 **DATE**
IMC 3 **DATE**
IMC 4 **DATE**

VFR Uncertain of Position

UPO 1 **DATE**
UPO 2 **DATE**

Aircraft Malfunction

MAL 1 **DATE**
MAL 2 **DATE**
MAL 3 **DATE**

Forced Landing or Ditching

FLD 1 **DATE**
FLD 2 **DATE**
FLD 3 **DATE**
FLD 4 **DATE**

Fuel Dumping

FDU 1 **DATE**
FDU 2 **DATE**

Aircraft Communications Failure

RCF 1 **DATE**
RCF 2 **DATE**
RCF 3 **DATE**
RCF 4 **DATE**
RCF 5 **DATE**
RCF 6 **DATE**
RCF 7 **DATE**
RCF 8 **DATE**
RCF 9 **DATE**

Bomb Threat

BOM 1 **DATE**
BOM 2 **DATE**
BOM 3 **DATE**
BOM 4 **DATE**
BOM 5 **DATE**
BOM 6 **DATE**

Hijack

HIJ 1 **DATE**
HIJ 2 **DATE**
HIJ 3 **DATE**
HIJ 4 **DATE**
HIJ 5 **DATE**

IN-FLIGHT EMERGENCY RESPONSE CHECKLISTS

AMENDMENT NR **XXX**

EFFECTIVE DATE: **DATE**
(Effective from **XXXX** UTC)

ADVISE RECEIPT OF THIS AMENDMENT BY
[Contact]

*The document holder is responsible for amending
their document on the effective date.*

Change Sheet

1.

General

This amendment contains the following significant changes:

Authorised by:

NAME
TITLE

GENERAL

- Specific procedures cannot be prescribed for all possible emergency situations. The actions listed are not intended to be used in a specific order, rather to be used in a sequence that is most appropriate to the situation at hand.
- When an emergency exists or is imminent, select and pursue a course of action which appears to be the most appropriate under the circumstances, and which most nearly conforms to the guidance contained in this document. Keep it simple!
- Initially the person declaring the emergency is responsible for advising **RCC**, however this may be delegated to the **ATC DUTY MANAGER/ACC SUPERVISOR**, an appropriate controller, or manager, during the declaration process.
- The person thus delegated should be the central point of contact.
- Normal critical initial actions –
 - **Acknowledge**
 - *Emergency*
 - *Alarms*
 - *Confirm aircraft's identity and location*
 - *Record time*
 - **Assess**
 - *Nature of the problem*
 - *Pilot's intentions*
 - *Pilot's requirements*
 - *Time available for response*
 - **Separate**
 - *Resolve immediate separation/conflict problems*
 - *Provide safety alerts on traffic, terrain or other hazards*
 - **Coordinate** *Immediate coordination requirements*
 - **Phase**
 - *Declare the appropriate phase*
 - *Notify supervisor*

1. Acknowledge declaration of emergency

- Advice from aircraft of an emergency state Distress (MAYDAY) or Urgency (PAN PAN) shall be read back by the ATS unit receiving the advice.
- When an aircraft already in a state of emergency advised to ATS comes onto a sector or unit frequency, on first contact with the aircraft the sector/unit shall acknowledge the emergency state, either in response to the pilot's advice or proactively.
- If the pilot has not declared an emergency obtain as much information as possible from the pilot without increasing cockpit workload.
- If you are unable to obtain the information and you are in doubt that a situation constitutes an emergency or a potential emergency, handle it as though it were an emergency.
- Take control of the communications, or specifically and clearly transfer that responsibility to another unit or operating position better suited to assist the aircraft, and advise the aircraft when the transfer is made.
- Impose radio silence as and when required - "ALL STATIONS [or specific aircraft] STOP TRANSMITTING, MAYDAY OUT".

2. Assign traffic priorities

Continued...

3. Provide maximum assistance

- Obtain enough information to handle the emergency. Restrict RTF enquiries as the pilot may have a high cockpit workload.
- If RTF enquiries indicate that the pilot is not capable of decision making, assess the risks of taking control, and provide instructions appropriate to the circumstances:
 - if available, seek assistance from a qualified pilot/instructor.
- Seek assistance from within the unit, and seek surveillance assistance where available.
- Establish or Update the aircraft's last known position.
- Use other aircraft to locate, relay, listen for ELT signals, as appropriate.

4. Limit your workload

- Where necessary and possible, coordinate and transfer control of other aircraft to another unit or operating position.

5. Declare appropriate emergency phase:

- INCERFA **except** when no doubt exists as to the safety of the aircraft and its occupants.
- ALERFA **except**, in cases other than HIJACK, when evidence exists that would allay apprehension as to the safety of the aircraft and its occupants.
- DETRESFA **except** when there is reasonable certainty that the aircraft and its occupants are not threatened by grave and imminent danger and do not require immediate assistance.

Notifying the RCC by phone transfers the responsibility for SAR action to the RCC. It is then the responsibility of the RCC to amend or cancel the alerting action when appropriate.

6. Record information and action taken

Continued...

DATE

7. Notify

- ATC DUTY MANAGER/ACC SUPERVISOR

Some or all of the following may be delegated to the ATC DUTY MANAGER/ACC SUPERVISOR or other sector/unit if they are able to assist

- aircraft operator
- advise RCC of the emergency phase declared:
 - ☎ XXXX direct line; or
 - ☎ [Contact]; or
 - ☎ [Contact] (RCC).

The advice shall include such information as is available in the order listed:

- your name, company and appointment;
- emergency phase declared;
- aircraft registration and identification;
- aircraft type;
- nature of the emergency;
- DEP and DEST aerodromes plus, if appropriate, advice on which aerodromes have been checked;
- other significant information from the flight plan;
- unit that made last contact, time, and radio frequency used;
- last position report and how determined;
- colour and distinctive marks of aircraft;
- dangerous goods carried as cargo;
- any other information relating to the state of emergency; and
- any action taken by Airways.

Follow the verbal notification with details via [COMMUNICATION SYSTEM], unless the RCC requests otherwise.

Continued...

-
- advise the [STATE REGULATOR] Emergency Operations Centre if the emergency is Bomb Warning or HiJack ☎ [CONTACT].
 - your name, company and appointment;
 - emergency phase declared;
 - nature of the emergency;
 - relevant flight plan details;
 - unit that made last contact, time, and means used;
 - last position report and how determined;
 - intended or assumed route;
 - colour and distinctive marks of aircraft;
 - dangerous goods carried as cargo; and
 - any action taken by Airways.
 - Follow the verbal notification with details via AFTN message unless the RCC or [STATE REGULATOR] requests otherwise.
 - ALR
 - ELT
 - Hijack
 - Bomb

8. Establish a single point of contact as appropriate with:

- the aircraft operator;
- RCC;
- Police;
- [STATE REGULATOR].

9. Advise RCC / aircraft operator / State Regulator of any useful information via central point of contact or direct if necessary.

Continued...

- 10. Refer to Aerodrome Emergency Plan for activation of aerodrome emergency services for emergencies on the aerodrome and within the area of jurisdiction of the plan.**
- 11. Refer to Unit Emergency Plan for non-aircraft emergencies on the ground which affects Airways personnel and property.**
- 12. Refer all media enquiries to the Head of Public Affairs**
 - See Manual of ATS GEN and/or Unit Emergency Plan.
 - If applicable, ring the Head of Public Affairs.

ELT SIGNALS

The **AIP** GEN section permits operational testing of aircraft ELT as follows:

- **ELT self test is authorised on 121.5 MHz/406 MHz as follows:**
 - **Tests should be no longer than three audio sweeps and NOT exceed 20 seconds; and**
 - **Tests may be conducted ONLY within the time period made up of the first five minutes after each hour.**
 - **Emergency tests outside the specified time period must be coordinated with both the nearest ATS unit and RCC. Advise the person making the request to contact the RCC ☎ [CONTACT].**
- **Airborne ELT tests are NOT permitted.**

1. **If an ELT signal whose source cannot be identified is heard or reported, and does not conform to the duration and time for testing, take the following action:**
2. **Request the aircraft or person to report:**
 - Position, altitude and time when the signal was first received; and
 - Frequency of signal [121.5/406 MHz]; and
 - If the signal is continuous or intermittent; and
 - Was the signal received:
 - while monitoring the distress frequency; or
 - on selection of the distress frequency?
 - gradually or abruptly?
 - with squelch in or out?
3. **Request the aircraft or person:**
 - Not to adjust squelch; and
 - To continue to listen out; and
 - To report position, altitude and time when the signal is last received.

Continued...

4. Declare DETRESFA

- Notify
 - ATC DUTY MANAGER/ACC SUPERVISOR
 - by phone; or
 - by XXXX message followed by phone advice.

Some or all of the following may be delegated to the ATC DUTY MANAGER/ACC SUPERVISOR or other sector/unit if they are able to assist

- aircraft operator
- advise DETRESFA to RCC:
 - ☎ XXXX direct line; or
 - ☎ [Contact]; or
 - ☎ [Contact] (RCC).

Pass all known information including that of unaccounted aircraft in your area.
- send appropriate AFTN messages:
 - RCC / ELT Check - Request for check of ELT source.
 - RCC / ELT Report - Aircraft report of ELT reception details including cessation reports.
- Establish a central point of contact with the operator and RCC
- Update RCC / operator / ATC DUTY MANAGER/ACC SUPERVISOR with new information
- Notify RCC / ATC DUTY MANAGER/ACC SUPERVISOR if the ELT signals cease.
- Respond to RCC requests.
- Request other aircraft in the area to listen out
- Request DF capable aircraft to advise bearing of signal
- If the signal strength indicates that it may be emanating from or in the vicinity of your aerodrome [or an aerodrome in your area of responsibility], request aircraft operators [through TWR/AFIS as appropriate] to check their aircraft to ensure that the ELT signal has not been inadvertently activated
- If a pilot reports inadvertent activation of an ELT, notify the ATC DUTY MANAGER/ACC SUPERVISOR and/or RCC immediately in order that any SAR action commenced as a result of the transmission may be terminated.
- Pass all available information to assist the RCC:
 - name of person reporting, aircraft callsign/ident, time of activation/cessation, location, why activated, etc.

-
- Account for all known aircraft in the area
 - Notify the **ATC DUTY MANAGER/ACC SUPERVISOR** and/or **RCC** if any known aircraft does not respond.

VFR ABOVE CLOUD

- **Keep instructions simple and distractions to a minimum.**
- **Keep regular contact without overloading.**
- **Instil confidence and reassurance.**

1. Establish:

- Position and time of last visual reference to the ground;
- Altitude;
- Heading;
- Pilot experience;
- Extent of cloud cover;
- Fuel endurance and **PERSONS/SOULS ON BOARD**;
- Whether the aircraft is equipped for instrument flight; and/or
- Whether the type of navigation equipment on board can be used by the pilot.

2. Advise pilot to remain:

- Clear of cloud;
- Straight and level where possible; and
- On frequency.

3. Notify the Surveillance controller serving the area, and transfer the aircraft if appropriate.

Continued...

4. Declare appropriate SAR phase

- Notify
 - ATC DUTY MANAGER/ACC SUPERVISOR
- Some or all of the following may be delegated to the ATC DUTY MANAGER/ACC SUPERVISOR or other sector/unit if they are able to assist*
- aircraft operator;
 - advise appropriate emergency phase to RCC:
 - ☎ XXXX direct line; or
 - ☎ [Contact]; or
 - ☎ [Contact] (RCC).
- Pass all known information.
- send appropriate ALR message;
 - Establish a central point of contact with the operator and RCC;
 - Update RCC / Operator / ATC DUTY MANAGER/ACC SUPERVISOR with new information.

5. Determine location

- Request the aircraft to squawk 7700 and identify if possible; or
- If no surveillance contact use:
 - bearing and distance from a navaid; and/or
 - last known position, direction and speed; and/or
 - latitude/longitude position from GPS or other such capable equipment; and/or
 - bearing from VDF/aircraft DF stations; and/or
 - information from ACAS equipped aircraft in vicinity; and/or
 - [STATE REGULATOR] ELT satellite tracking system.
- Advise the pilot once position is established.

6. Determine the weather in the area

- Establish areas clear of cloud or broken cloud from:
 - Pilot reports;
 - ATS units, including ATIS;
 - AWS reports;
 - METAR/SPECI;
 - METAR AUTO;
 - Basic Weather Reports.

7. Limit traffic

- Keep emergency aircraft on the frequency, or transfer to a discrete frequency.
- Retain other aircraft on the frequency as necessary for:
 - advice on or escort to a clear weather area;
 - technical advice;
 - terrain and local knowledge; and
 - relaying messages if required.

8. Remind the pilot to:

- Remain clear of cloud; and
- Keep the aircraft straight and level where possible.

9. Inform the pilot of:

- Actions you are taking; and
- Any other information as it comes to hand.

10. Remember to:

- Get/keep the aircraft within surveillance cover;
- Keep the aircraft within VHF coverage;
- Assist the aircraft to an area where ground sighting is possible; or
- Assist the aircraft to a suitable destination, if required.

11. Visual reference established with the ground:

- Assist the aircraft to the next position/destination.
- If position unknown, go to “**VFR UNCERTAIN OF POSITION**” section.

12. Visual reference NOT established with the ground:

- Follow instructions in “**VFR IN IMC**” section.

VFR In IMC

- **Keep instructions simple and distractions to a minimum.**
- **Keep regular contact without overloading.**
- **Instil confidence and reassurance.**
- **If available, seek assistance from a qualified pilot/instructor.**

1. Advise the pilot to:

- Relax and hold the controls lightly; and
- Concentrate on aircraft attitude:
 - trim the aircraft;
 - set cruise power;
 - keep wings level;
 - keep speed constant;
 - scan all instruments;
 - trust instruments;
 - maintain altitude.

2. Establish:

- Heading and altitude;
- Last known position;
- Weather conditions encountered by the pilot;
- Navigation equipment on board the aircraft;
- The pilot's instrument flight experience;
- If one is available on board, the pilot's ability to use the autopilot;
- **PERSONS/SOULS ON BOARD** - whether anyone else on board is able to assist; and
- Fuel remaining.

3. Determine terrain in the area

Continued...

DATE

4. If required, suggest that the pilot climb to a safe altitude

- Advise the pilot to make all manoeuvres smoothly;
- Avoid prolonged climbs; and
- Avoid turns during climbs.

5. Notify the Surveillance controller serving the area, and transfer the aircraft if appropriate.**6. Determine location**

- Request the aircraft to squawk 7700 and identify if possible; or
- If no surveillance contact use:
 - bearing and distance from a navaid; and/or
 - last known position, direction and speed; and/or
 - latitude/longitude position from GPS or other such capable equipment; and/or
 - bearings from VDF/aircraft DF stations; and/or
 - information from ACAS equipped aircraft in vicinity; and/or
 - [STATE REGULATOR] ELT satellite tracking system.
- Advise the pilot once position is established.

7. Declare ALERFA (any indication of likely or actual control problems should be DETRESFA).

- Notify
 - ATC DUTY MANAGER/ACC SUPERVISOR

Some or all of the following may be delegated to the ATC DUTY MANAGER/ACC SUPERVISOR or other sector/unit if they are able to assist

- aircraft operator;
- advise ALERFA emergency phase to RCC:
 - ☎ XXXX direct line; or
 - ☎ [Contact]; or
 - ☎ [Contact] (RCC).
- Pass all known information.
- send AFTN ALERFA message;
- Establish a central point of contact with the operator and RCC;
- Update RCC / operator / ATC DUTY MANAGER/ACC SUPERVISOR with new information.

8. Determine the weather in the area

- Establish areas clear of cloud or broken cloud from:
 - Pilot reports;
 - ATS units, ATIS;
 - AWS reports;
 - METAR/SPECI;
 - METAR AUTO;
 - Basic Weather Reports.

9. Limit traffic

- Keep emergency aircraft on the frequency, or transfer the aircraft to a discrete frequency.
- Retain other aircraft on the frequency as necessary for:
 - advice on or escort to a clear weather area;
 - technical advice;
 - terrain and local knowledge; and
 - relaying messages if required.

10. Remind the pilot to:

- Relax and hold controls lightly;
- Scan and trust the instruments; and
- Keep the aircraft straight and level.

11. Inform the pilot of:

- Actions you are taking; and
- Any other information as it comes to hand.

Continued...

12. Remember to:

- Get/keep the aircraft within surveillance cover;
- Keep the aircraft within VHF coverage;
- Keep any manoeuvring in IMC to a minimum when assisting aircraft to an area clear of cloud. Use:
 - a reciprocal track [return to the last VMC area]; or
 - another track to a clear area; or
 - descent below cloud base; or
 - climb above cloud tops and proceed to known clear area.
- Assist the aircraft to a suitable destination, if required.

13. Agree on a course of action

- Advise the ATC DUTY MANAGER/ACC SUPERVISOR; and
- Provide information or instructions to assist the pilot to an area clear of cloud; or
- If giving instructions for descent through cloud, use phraseologies such as:
 - “WHEN INSTRUCTED TO COMMENCE DESCENT, CONCENTRATE ON MAINTAINING WINGS LEVEL, AND MAINTAIN A CONSTANT RATE OF DESCENT. QNH IS [....].”
 - “FLY HEADING [...°] (preferably a **northerly** heading for a limited instrument panel). COMMENCE DESCENT AS SOON AS YOU ARE READY. DESCEND UNTIL VISUAL. AERODROME/GROUND ELEVATION IS [....] FT. REPORT COMMENCING DESCENT AND WHEN BELOW CLOUD.”

14. Visual reference established with the ground

- Assist the aircraft to the next position/destination.
- If position unknown, go to ‘**VFR UNCERTAIN OF POSITION**’ section.

VFR UNCERTAIN OF POSITION

1. Establish:

- Last known position and time;
- Altitude;
- Heading;
- Pilot experience;
- Extent of cloud cover and general MET conditions; and
- Endurance and **PERSONS/SOULS ON BOARD** - whether anyone else on board is able to assist.

2. Advise the pilot to remain:

- On the frequency; and
- Clear of cloud.

3. Notify the Surveillance controller serving the area, and transfer the aircraft if appropriate.

- Provide the Surveillance controller with the last known position and heading of the aircraft.

4. Declare appropriate SAR phase

- Notify
 - ATC DUTY MANAGER/ACC SUPERVISOR

Some or all of the following may be delegated to the ATC DUTY MANAGER/ACC SUPERVISOR or other sector/unit if they are able to assist

- aircraft operator;
- advise emergency phase to RCC:
 - ☎ **XXXX** direct line; or
 - ☎ **[Contact]**; or
 - ☎ **[Contact] (RCC)**.
- Pass all known information.
- Send appropriate ALR message:
- Establish a central point of contact with the operator and RCC;
- Update RCC / operator / ATC DUTY MANAGER/ACC SUPERVISOR with new information.

Continued...

5. Determine location

- Request the aircraft to squawk 7700 and identify if possible; or
- If no Surveillance contact use:
 - pilot report of distinctive geographical features; e.g. towns, lakes, rivers, etc; and/or
 - bearing and distance from a navaid; and/or
 - last known position, direction and speed; and/or
 - latitude/longitude position from GPS or other such capable equipment; and/or
 - bearings from VDF/aircraft DF stations; and/or
 - information from ACAS equipped aircraft in vicinity; and/or
 - [STATE REGULATOR] ELT satellite tracking system.
- Advise the pilot once position is established.

6. Limit traffic if necessary

- Keep emergency aircraft on the frequency, or transfer the aircraft to a discrete frequency.
- Retain other aircraft on the frequency as necessary for:
 - advice on or escort to a clear weather area; and
 - relaying messages if required.

7. Remember to:

- Get/keep the aircraft within surveillance cover;
- Keep the aircraft within VHF coverage; and
- Assist with navigation to the next landmark, feature or aerodrome; or
- If required, assist the aircraft to the nearest suitable aerodrome.

8. Inform the pilot of:

- Actions you are taking; and
- Any other information as it comes to hand.

AIRCRAFT MALFUNCTION

EMERGENCY DESCENTS

1. Clear the airspace below the aircraft

- Issue specific instructions if time available; or
- Broadcast: “EMERGENCY DESCENT AT [place]. ALL AIRCRAFT BELOW [level] WITHIN [distance] OF [place or aid] LEAVE IMMEDIATELY [specific directional information if applicable].”

- **Aircraft may not always advise prior to making an emergency descent.**
- **Descent could be in any direction.**
- **Pressurisation failure descent will normally be to approx. 10,000ft.**

2. Declare appropriate SAR phase

- Notify
 - **ATC DUTY MANAGER/ACC SUPERVISOR**

*Some or all of the following may be delegated to the **ATC DUTY MANAGER/ACC SUPERVISOR** or other sector/unit if they are able to assist*
 - aircraft operator;
 - advise emergency phase to RCC:
 - ☎ **XXXX** direct line; or
 - ☎ **[CONTACT]**; or
 - ☎ **[CONTACT]** (**RCC**).Pass all known information.
 - send appropriate ALR message:
- Establish a central point of contact with the operator and **RCC**;
- Update RCC / operator / **ATC DUTY MANAGER/ACC SUPERVISOR** with new information.

3. Provide:

- Assistance to the aircraft in emergency; and

-
- Separation between the aircraft in emergency and other controlled flights in your area.

AIRCRAFT MALFUNCTIONS **OTHER THAN EMERGENCY DESCENTS**

1. Establish:

- The nature of the problem:
 - effect on performance;
 - assistance required; and
 - degree of urgency.
- Destination; and
- Which aerodrome emergency phase is required. Ask the pilot to specify 'Full Emergency', 'Local Standby' or 'None'.

2. Increase separation if aircraft unable to maintain altitude or track.

3. Notify the Surveillance controller serving the area, and transfer the aircraft if appropriate.

4. Declare appropriate SAR phase

- Notify
 - **ATC DUTY MANAGER/ACC SUPERVISOR**

*Some or all of the following may be delegated to the
ATC DUTY MANAGER/ACC SUPERVISOR or other
sector/unit if they are able to assist*
 - aircraft operator;
 - advise emergency phase to RCC:
 - ☎ **XXXX** direct line; or
 - ☎ **[Contact]**; or
 - ☎ **[Contact]** (**RCC**).
 - Pass all known information.
 - send appropriate ALR message:
- Establish a central point of contact with the operator and **RCC**;
- Update **RCC** / operator / **ATC DUTY MANAGER/ACC SUPERVISOR** with new information.

Continued...

5. Determine location

- Request the aircraft to squawk 7700 and identify if possible; or
- If no surveillance contact use:
 - bearing and distance from a navaid; and/or
 - last known position, direction and speed; and/or
 - latitude/longitude position from GPS or other such capable equipment; and/or
 - bearings from VDF/aircraft DF stations; and/or
 - **[STATE REGULATOR]** ELT satellite tracking system.
- Advise the pilot once position is established.

6. Limit traffic if necessary.

- Keep emergency aircraft on the frequency, or transfer the aircraft to a discrete frequency.
- Retain other aircraft on the frequency as necessary for:
 - advice on or escort to the nearest suitable aerodrome;
 - technical advice;
 - advice on weather, terrain and local knowledge; and
 - relaying messages if required.

7. Remember to:

- Get/keep the aircraft within surveillance cover, where possible;
- Keep the aircraft within VHF coverage;
- Provide information and instructions to assist the aircraft; and
- If required, assist the aircraft to the nearest suitable aerodrome.

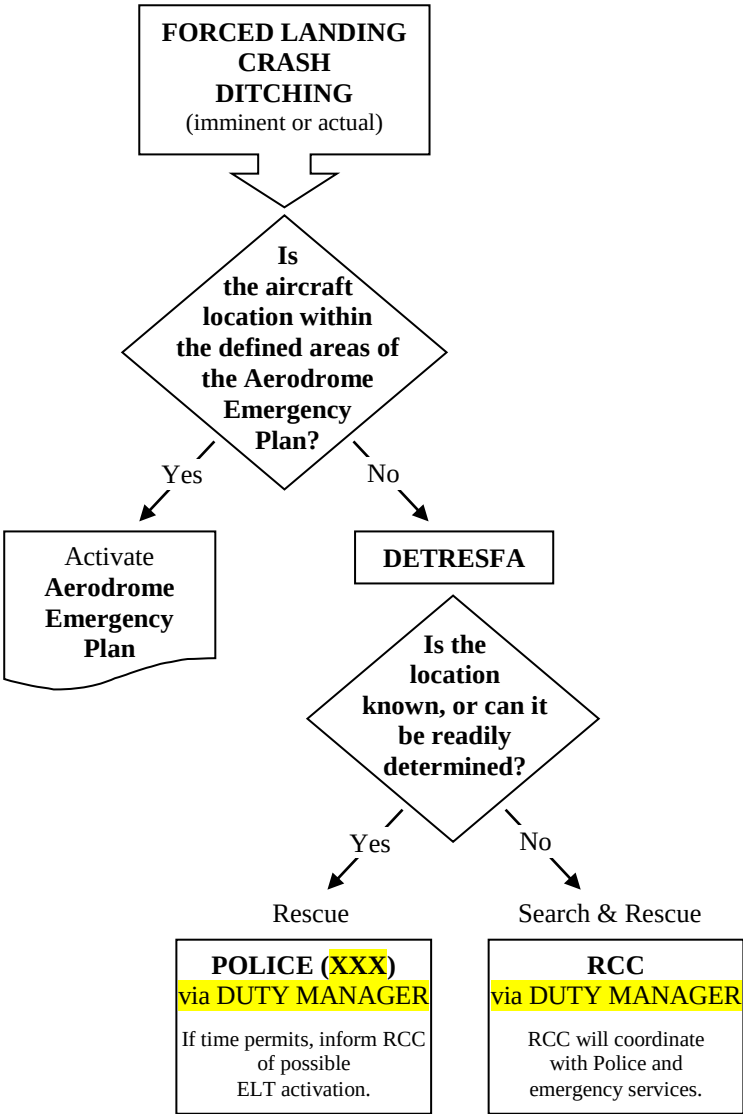
8. Agree on a course of action

- If the pilot plans to dump fuel, go to ‘**FUEL DUMPING**’ section.

9. Aircraft landing

- At your aerodrome:
 - Carry out actions in Aerodrome Emergency Plan applicable to the requested or determined emergency phase.
- Elsewhere:
 - Carry out actions as for forced landing or ditching.

ACTIVATION OF EMERGENCY SERVICES



FORCED LANDING OR DITCHING**1. Determine:**

- Suitable landing areas in the vicinity, and advise the pilot; and
- Whether VHF coverage is likely to remain adequate.

2. Notify the Surveillance controller serving the area, and transfer the aircraft if appropriate.**3. If not known and time permits, determine location**

- Request the aircraft to squawk 7700 and identify if possible; or
- If no surveillance contact, use any of the following without increasing pilot workload:
 - bearing and distance from a navaid; and/or
 - last known position, direction and speed; and/or
 - latitude/longitude position from GPS or other such capable equipment; and/or
 - bearings from VDF/aircraft DF stations; and/or
 - [STATE REGULATOR] ELT satellite tracking system.
- Advise the pilot once position is established.

4. Keep emergency aircraft on frequency, or if practical, transfer the aircraft to a discrete frequency.

- Retain other aircraft on the frequency as necessary for:
 - advice on weather, terrain and local knowledge;
 - advice on or escort to the nearest suitable aerodrome/landing area;
 - technical advice; and
 - relaying messages if required.

Continued...

5. If not known, obtain following information without increasing pilot workload:

- Reason for enforced descent;
- Level;
- In-flight conditions; and
- PERSONS/SOULS ON BOARD.

6. Aircraft landing at your aerodrome, or operating within the area of jurisdiction of your AEP

- Declare Aerodrome “Full Emergency” Phase.

7. If aircraft operating beyond the area of jurisdiction of an AEP, declare DETRESFA

- Notify
 - ATC DUTY MANAGER/ACC SUPERVISOR;

Some or all of the following may be delegated to the ATC DUTY MANAGER/ACC SUPERVISOR or other sector/unit if they are able to assist
 - aircraft operator;
 - if aircraft position **is** known and within the XXXX FIR (or approximately known):
 - Police on 111; provide all information that may assist them to identify suitable rescue resources
 - RCC of possible ELT activation, if time permits;
 - if aircraft position **is not** known, advise DETRESFA phase to RCC:
 - ☎ XXXX direct line; or
 - ☎ [CONTACT]; or
 - ☎ [CONTACT] (RCC).
 - pass all known information;
 - send appropriate ALR message;
- Establish a central point of contact with the operator / Police and/or RCC;
- Update Police / RCC / operator / ATC DUTY MANAGER/ACC SUPERVISOR with new information;
- Respond to Police / RCC requests;
- Notify RCC when the emergency situation no longer exists.

8. Aircraft landing/ditching at other than an attended aerodrome, either within or beyond the area of jurisdiction of an AEP

- Keep emergency aircraft on the frequency, or if possible, transfer the aircraft to an appropriate frequency.
- Determine survival gear carried.
- Divert other suitable aircraft; or retain other aircraft on the frequency as necessary to assist with visual observation of the aircraft and to provide advice on:
 - suitable landing areas;
 - accurate position of intended landing/ditching site;
 - people, buildings, boats, etc. in the vicinity of the landing area;
 - road access to the landing area; and
 - advice on weather and terrain; and/or
 - relay messages as required.
- Request pilot to activate ELT if possible.
- Request the pilot of the emergency aircraft to report on the ground if possible [radio, cellphone, telephone].

FUEL DUMPING

- Fuel dumping is normally carried out below the freezing level:
 - Preferably at least 2000ft above water; or
 - At least 6000ft above terrain, and clear of built up areas.

1. Reach agreement with the pilot on the fuel dump area

- The route and level;
- Weather conditions in which the operation will be conducted, preferably clear of thunderstorms, reported or expected;
- The duration of the fuel dumping; and
- The period of silence and frequency to be monitored by the flight if radio silence is to be observed by the aircraft.

Except where immediate dumping is required, the aircraft may be requested to select a different area or fly a different route, if the above area/route is likely to cause significant disruptions to other operations.

2. If dumping in Class A, C, or D airspace,

- Reserve the airspace:
 - from the commencement of dumping until fifteen minutes after completion.
 - ensure that other controlled flights remain at least:
 - 10 NM horizontally from, but not behind, the aircraft dumping fuel; or
 - 15 minutes flying time or a distance of 50 NM behind the aircraft dumping fuel;

AND

- 1000 ft vertically above (2000 ft above FL290); or
- 3000 ft vertically below.

Note: *The horizontal boundaries of the area within which other traffic requires appropriate vertical separation extend for 10 NM either side of the track flown by the aircraft which is dumping fuel, from 10 NM ahead, to 50 NM or 15 minutes along track behind it (including turns).*

Continued...

DATE

3. Notify ATC DUTY MANAGER/ACC SUPERVISOR**4. Inform other units/operating positions that may be affected****5. If dumping will occur in or affect Class G airspace, advise FIC****6. FIO RESPONSIBILITIES**

- Broadcast warnings:
 - if time permits, at least 10 minutes before commencement of dumping; and
 - at 3 minute intervals.
"ALL STATIONS [unit name] INFORMATION, [aircraft type] DUMPING FUEL AT [level] [description of fuel dumping area/track and levels affected]. AVOID FLIGHT WITHIN 10 NM OF FUEL DUMPING AREA [*or* TRACK], AND 50 NM OR 15 MINUTES BEHIND DUMPING AIRCRAFT"
- Broadcast advice when dumping is complete.
"ALL STATIONS [unit name] INFORMATION, FUEL DUMPING [BY (aircraft type)] COMPLETED"

AIRCRAFT COMMUNICATIONS FAILURE

These procedures relate to aircraft:

- **Operating within controlled airspace; or**
- **About to enter controlled airspace.**

- 1. Check own radio with other aircraft**
- 2. Continue attempts to contact the 'COM FAILURE' aircraft, use:**
 - Alternate transmitter;
 - Standby radio;
 - Secondary frequencies;
 - Flight information frequencies;
 - SELCAL and HF frequencies for international flights;
 - Cellphone;
 - Company frequencies;
 - Emergency frequencies; and/or
 - Data Link
- 3. Pass pertinent information as appropriate to:**
 - The destination/alternate aerodromes and adjacent units;
 - Aircraft in the vicinity; and
 - Request appropriate units/aircraft to attempt to contact and/or locate the aircraft.
- 4. Provide separation on the assumption that the aircraft will follow the 'COM FAILURE' procedures in the AIP, unless you can determine that:**
 - The aircraft is not following the "COM FAILURE" procedures prescribed in the AIP; or
 - The aircraft has landed.

Continued...

DATE

5. Increase separation to make allowance for unexpected manoeuvres.

- Restrict/suspend IFR operations on the cleared/acknowledged route below the level(s) of the “COM FAILURE” aircraft.

6. Notify the Surveillance controller serving the area of the last reported position of the aircraft, and request the controller to:

- Watch for an aircraft [at or near the extrapolated position] squawking 7600;
- Attempt to contact the aircraft; and
- Plot the aircraft’s track, and keep you informed of the progress.

7. Declare appropriate SAR phase

- Notify

- **ATC DUTY MANAGER/ACC SUPERVISOR**

*Some or all of the following may be delegated to the **ATC DUTY MANAGER/ACC SUPERVISOR** or other sector/unit if they are able to assist*

- advise appropriate emergency phase to RCC:

- ☎ **XXXX** direct line; or
- ☎ **[Contact]**; or
- ☎ **[Contact]** (**RCC**).

Pass all known information.

- send appropriate ALR message:

- Establish a central point of contact with the operator and **RCC**;
- Update **RCC** / operator / **ATC DUTY MANAGER/ACC SUPERVISOR** with new information
- Respond to **RCC** requests.
- Notify **RCC** when the emergency situation no longer exists.

Continued...

8. If being provided with a Surveillance service

- Maintain surveillance;
- Separate other aircraft from the “‘COM FAILURE’ aircraft based on:
 - its course of action observed on Surveillance; and
 - the assumption that it will maintain levels in accordance with the ‘COM FAILURE’ procedures in the AIP.
- Allow for the possibility that the aircraft under Surveillance vectors may not be able to use the specified approach aid;
- Watch for the use of squawk code 7600;
- Record last known position if surveillance contact is lost;
- Alert next sector.

9. Transmitter OK

- Expect the pilot to follow ‘COM FAILURE’ procedures in the AIP unless the pilot declares otherwise.
- Provide any assistance requested.

10. Determine if receiver is OK

- Instruct the aircraft to:
 - squawk ident or 7600; or
 - key the transmitter 3 times; or
 - make a 30 degree turn for 30 seconds and regain track.
- If the aircraft responds to any of the above, use this method to continue communications with the aircraft; or
- Ask the pilot to communicate through any mobile telephone on board.

Continued...

11. If the receiver is OK, and no mobile telephone is carried

- Continue to pass instructions, giving the flight priority to landing;
- Provide weather information on anticipated ADES and alternates;
- Frame questions for YES/NO answers;
- Endeavour to find out:
 - if there is any other emergency;
 - the pilot's intentions.
- Use the following code for aircraft with unmodulated transmitter:

YES or ROGER	activate transmitter once
NO	activate transmitter twice
SAY AGAIN	activate transmitter three times
AT NOMINATED POSITION	activate transmitter four times

12. Transmitter and Receiver failure

- Transmit blind:
 - action taken by ATC; and
 - weather at suitable aerodromes.
- Expect the pilot to follow 'COM FAILURE' procedures in the AIP;
- Arrange ground station calls, aircraft calls and a listening watch on:
 - company frequency;
 - distress frequency [121.5];
- Check with company if there is a mobile phone or pager on board.

13. If communications failure occurs at night, request ATS units or airport management to switch on runway, approach and other lights from at least 30 minutes prior to ETA until the aircraft has been located or until 30 minutes after the aircraft's fuel supply is estimated to be exhausted.

Continued...

14. Inform appropriate units and aircraft when:

- Communications have been re-established; or
- The aircraft has landed.

15. ATC DUTY MANAGER/ACC SUPERVISOR RESPONSIBILITIES

- Advise operators of situation if RCF aircraft has not reported/landed or remains overdue or unreported, and:
- Restrict or suspend IFR traffic, unless Surveillance separation is being applied, for a period of 30 minutes following the applicable times:
 - the pilot/ATC estimated time [whichever is the later] or the actual time of arrival over the navaid or fix serving the destination aerodrome.
 - the approach clearance acknowledged by the pilot, and the time at which it is estimated that the aircraft would have commenced approach.
 - the expected approach time acknowledged by the pilot.
 - the pilot/ATC estimated time [whichever is the later] or the actual time of arrival at the enroute navaid or fix.
 - the release time, and if issued, the clearance expiry time.
- Following the expiry of the 30 minute period inform the aircraft operators and pilots of aircraft concerned, and resume normal operations at their discretion.
- Notify RCC when the emergency situation no longer exists.

Continued...

PILOT PROCEDURES [AIP ENR 1.15 (EMERGENCY) section]

In the event of an apparent aircraft communications failure, the pilot of the aircraft should adopt the following procedures:

- Maintain terrain clearance throughout all procedures
- Switch transponder to code **7600** or communication failure mode in the case of ADS-B equipped aircraft.
- Try alternate then secondary published ATS frequencies.
- Check aircraft communications equipment.
- Listen to ATIS if possible.
- Transmit position reports and intentions, assuming the aircraft transmitter is operating, and prefixing all transmissions with “TRANSMITTING BLIND”
- Turn on landing lights, beacons and strobe lighting.
- If a mobile phone is available in the aircraft, attempt to establish telephone communications with:
 - ATC CENTRES and CONTACTS;
 - the ATC unit you should be communicating with.
- Proceed as follows:

VFR - COM Failure

The pilot of an aircraft operating under VFR should:

- not enter controlled airspace, including control zones, unless complying with:
 - a clearance already received and acknowledged; or
 - published COM failure procedures for that aerodrome.
- divert to an unattended aerodrome and report arrival to ATS as soon as possible;

Continued...

- if unable to divert to an unattended aerodrome:
 - continue to operate transponder on code **7600**; and
 - enter the control zone via a published arrival procedure; or
 - approach the aerodrome side-on to the main runway or runway-in-use, and carry out a standard overhead circuit joining procedure; and
 - contact ATS as soon as possible after landing.
- If an emergency condition exists switch transponder to emergency code **7700**.

IFR - COM Failure

In VMC and certain of maintaining VMC

- If the pilot of the aircraft is in VMC, or encounters VMC after the failure, and is certain of maintaining VMC:
 - remain in VMC; and
 - continue the flight under VFR; and
 - proceed to a suitable aerodrome and land; and
 - report arrival by the most expeditious means to the appropriate ATS unit.

In IMC or uncertain of maintaining VMC

- The initial and subsequent actions of the pilot of an aircraft in IMC or uncertain of being able to maintain VMC will depend on the latest information available on the:
 - destination aids;
 - air traffic/airspace procedures; and
 - meteorological conditions enroute and at the destination.
- The provision of ATC to other flights will be based on the assumption that the pilot of an aircraft with communications difficulties will, unless strong reasons dictate otherwise, follow the appropriate procedures specified
- The pilot should proceed in accordance with the current flight plan as confirmed by the last acknowledged ATC clearance. ATC will assume that the aircraft will climb to the:
 - flight planned level; or
 - last level requested by the pilot and acknowledged by ATC.

Continued...

DATE

DEPARTURE

Level Restriction?

• Maintain the last assigned level(s) to the point(s) specified, then climb to maintain the level(s) in the current flight plan.	→ or →	• If no points are specified, maintain the last assigned level or minimum flight altitude if higher for five minutes, then climb to maintain the level(s) in the current flight plan.

Radar Vectors?

• Maintain the last assigned vector for two minutes. If necessary to maintain terrain clearance, climb to minimum safe altitude.	→ and →	• Proceed in accordance with route specified in the current flight plan.

ARRIVAL

- Track to destination **aid/fix** or, if none specified by ATC, the **selected aid/fix** for known or forecast RWY; and
- If in receipt of an arrival clearance (STAR or equivalent clearance/procedure), track via the clearance; and
- Commence descent to the initial approach altitude for the approach procedure in accordance with:
 - the last acknowledged ATC clearance; thence
 - the standard operating procedures (i.e. 3° profile) or flight plan

At or within 25 NM of destination

• Arrive over destination/selected aid/fix at the last assigned level at or as near to expected approach time given by ATC and commence approach.	→ →	• If too high, descend in the aid/fix holding pattern to a level convenient for approach.
• If on initial approach at the time of the communications failure but not cleared for the approach, continue via the procedure and maintain the last assigned level until established on final approach track, then commence approach.	→ →	If too high: • If a holding pattern is established on the final approach track, descend in the holding pattern to a level convenient for approach; or • If no holding pattern is established, carry out missed approach and position for another approach, if specified diversion allow.

Continued...

DATE

Radar Vectors on Arrival?

- Maintain the **last assigned vector** for two minutes, climbing if necessary to minimum safe altitude to maintain terrain clearance and **proceed** to the aid/fix **for an approach** as specified above. →
or
→
- If on initial/intermediate approach, **maintain the last assigned level** until established on final approach track, then **commence approach**.

DIVERSION

- If unable to achieve a landing following an approach, the pilot of an IFR aircraft that experiences communications failure should carry out a **missed approach**.
- A **second approach** may be made if desired, provided a landing can be accomplished **within 30 minutes** of the expected approach time or the ETA, whichever is the latter. If this approach is **unsuccessful**, the aircraft must **divert** to the alternate aerodrome.
- The pilot of an IFR aircraft that experiences communications failure while **holding** because of the closure of the destination aerodrome should hold until the divert time notified to ATC, and then depart for the alternate aerodrome.

NAVAID Failure

- If possible vacate or avoid controlled airspace and high density traffic areas.
- Establish navigation by visual reference.
- Proceed to a suitable aerodrome and land.
- Report your arrival to ATS as soon as possible.

RESUMPTION OF NORMAL OPERATIONS

If an aircraft with known or suspected communications failure has not reported within 30 minutes after:

- the ETA furnished by the pilot;
- the ETA calculated by the area control centre; or
- the last acknowledged EAT;

whichever is the latest, pertinent information regarding the aircraft will be passed to aircraft operators or their designated representative, and to pilots-in-command of other aircraft concerned. It is the responsibility of the aircraft operators or their designated representatives, and pilots-in-command, to determine whether they will resume normal operations under IFR or take other action.

BOMB THREAT

Be calm. Be courteous. Listen, do not interrupt the caller.

If possible, notify the ATC DUTY MANAGER/ACC SUPERVISOR or other staff member by pre-arranged signal while caller is on the line.

BOMB THREAT CHECKLIST			
EXACT WORDING OF THREAT: _____			
QUESTIONS TO ASK:			
1. When is the bomb going to explode?	7. Why did you place the bomb?		
2. Where did you put the bomb?	8. How do you know so much about the bomb?		
3. What does the bomb look like?	9. Why was the [place] chosen for such action?		
4. What kind of bomb is it?	10. What is your name?		
5. What will make the bomb explode?	11. Where are you?		
6. Did you place the bomb?	12. What is your address?		
CALLER'S VOICE & MANNER			
Loud	Distinct	Intoxicated	Ragged
Soft	Distorted	Lisp	Calm
High	Raspy	Stutter	Excited
Deep	Nasal	Coherent	Angry
Pleasant	Cracked Voice	Incoherent	Laughing
Rapid	Clearing Throat	Deliberate	Crying
Normal	Deep Breathing	Righteous	Disguised
Slow	Slurred	Emotional	Accent
• Did you recognise the voice? _____ • If so, who do you think it was? _____			
THREAT LANGUAGE			
Well spoken	Poor	Rational	Political
Fair	Foul	Irrational	Taped
• Did the caller appear familiar with: airport/building/aircraft/procedures/terminology? _____			
BACKGROUND NOISES			
Clear	Office machinery	Crockery	Motor
Static	Factory machinery	Radio	Aircraft
Street noises	Harbour/shipping	Music	Animal
Quiet	Trains	Party	Other [explain]
Voices	House noises	P. A. Systems	
CALLER'S OTHER INFORMATION			
Gender [M/F] _____	Estimated age _____	Ethnic group _____	
CALL RECEIVED			
DATE _____	Duration of call _____	Long distance _____	
Number called _____	Internal call _____	Call box _____	
Time _____	Local call _____	Cellphone _____	
RECIPIENT			
Name _____	Telephone number _____		

Continued...

Getting Information

Pretend difficulty with hearing - keep caller talking.

Inform caller that detonation could cause injury or death.

If the threat is to an:	Refer to:
• Aircraft on the ground at your aerodrome	⇒ ⇒ ⇒ Aerodrome Emergency Plan [AEP]
• Airways facility	⇒ ⇒ ⇒ Unit Emergency Plan [UEP]
• Airport building other than Airways facility	⇒ ⇒ ⇒ Aerodrome Emergency Plan [AEP]

The aircraft operator, or the Threat Assessment Team [at international and some regional airports], is responsible for assessing whether a Positive Threat Indication (PTI) exists, i.e. whether the threat is "SPECIFIC" or "NON-SPECIFIC"

- All available details, including the most precise wording of the threat, must be passed as soon as possible to the aircraft operator or the Threat Assessment Team as appropriate
 - Refer to the Aerodrome Emergency Plan where applicable

If the ATC DUTY MANAGER/ACC SUPERVISOR is not available, the person receiving the threat is responsible for ensuring that the information is passed on to the ATS unit, aircraft operator or Threat Assessment Team at the aerodrome where the aircraft is located or, if the aircraft is airborne, at the aerodrome of destination

Continued...

Do not advise the pilot of a threat in the first instance unless it is considered credible and of such extreme nature that an immediate danger to the flight exists

1. If the threat is to an aircraft on the ground at another aerodrome

- Notify ATC **DUTY MANAGER/ACC SUPERVISOR:**
 - accurate wording and detail is vital.

2. If the threat is to an airborne aircraft

- Notify the controller in contact with the pilot;
- Notify the **ATC DUTY MANAGER/ACC SUPERVISOR:**
 - accurate wording and detail is vital;
- Wait for threat assessment by the aircraft operator or the Threat Assessment Team;
- Increase separation if warranted;
- Notify the next sector/unit;
- If the aircraft is not under Surveillance control, notify the Surveillance controller serving the area;
- Surveillance controller actions:
 - maintain surveillance;
 - record last known position if Surveillance contact is lost;
 - alert next sector;
 - watch for the use of an emergency squawk code;
- Transfer aircraft to secondary frequency, if possible, or clear the frequency, if necessary;
- If the aircraft is inbound to your aerodrome, carry out actions in the Aerodrome Emergency Plan.

Continued...

3. "SPECIFIC" THREAT

- Notify the pilot:
 - use secondary frequency if possible;
 - obtain pilot decision and intentions and pass (through ATC **DUTY MANAGER/ACC SUPERVISOR**) to aircraft operator or Threat Assessment Team as appropriate;
- Provide the most expeditious handling possible;
- ALERFA declaration
 - if the aircraft concerned is within your area of responsibility declare ALERFA and carry out the ATC **DUTY MANAGER/ACC SUPERVISOR** responsibilities as specified in Section 6.
 - if the aircraft concerned is outside your area of responsibility advise ATC **DUTY MANAGER/ACC SUPERVISOR**;
- Continue with actions above.

4. "NON-SPECIFIC" THREAT

- Do not advise pilot unless specifically requested by the operator or Threat Assessment Team to do so;
- Cancel any previous alerting action;
- No further action required

5. If the aircraft operator or Threat Assessment Team cannot be contacted, or an assessment of the threat is not received (in a reasonable time)

- See under ATC **DUTY MANAGER/ACC SUPERVISOR** responsibilities in Section 6.

Continued...

6. ATC DUTY MANAGER/ACC SUPERVISOR RESPONSIBILITIES**PRIOR TO THREAT ASSESSMENT****AIRCRAFT ON GROUND**

If notification received from source other than ATS at aircraft location:

- Notify ATS at aircraft location.
- Ensure aircraft operator or Threat Assessment Team advised:
 - accurate wording and detail is vital.

AIRCRAFT IN AIR

- Advise destination tower and all units enroute.
- Ensure aircraft operator or Threat Assessment Team (at destination aerodrome) advised:
 - accurate wording and detail is vital.

AFTER THREAT ASSESSMENT**‘SPECIFIC’ THREAT ASSESSMENT**

- Advise controller in contact with aircraft.
- Obtain pilot's decision and intentions and ensure passed to aircraft operator or Threat Assessment Team.
- Notify threat to [STATE REGULATOR] ☎ [Contact].
Pass all known information.
- Declare ALERFA
- Notify SAR phase to RCC:
 - ☎ via direct line; or
 - ☎ telephone number; or
 - ☎ contact (RCC).
Pass all known information.
- Advise destination tower and all units enroute.
- Assist operational staff with actions above.
- Send AFTN RCC / ALR message.
- Update [STATE REGULATOR] and RCC with new information.
- Respond to [STATE REGULATOR] and RCC requests.

‘NON-SPECIFIC’ THREAT ASSESSMENT

- Advise controller in contact with aircraft.
- Advise destination tower and all units enroute.
- No further action required.

IF THE AIRCRAFT OPERATOR OR THREAT ASSESSMENT TEAM CANNOT BE CONTACTED, OR AN ASSESSMENT OF THE THREAT IS NOT RECEIVED (IN A REASONABLE TIME)

- Declare a "SPECIFIC" or "NON-SPECIFIC" threat using the following guidance:
 - if the information contained in the threat enables the target aircraft to be identified with reasonable certainty, e.g.
 - aircraft identification, departure or arrival time, location or destination, or includes,
 - specific information such as crew or passenger details, the exact location and/or a description of the device, the use of industry terminology or details about the aircraft or flight not generally known to the public, etc.,the threat is "SPECIFIC". The pilot must be notified as soon as possible.
 - if the threat is determined to be "NON-SPECIFIC", advise:
 - [STATE REGULATOR] of circumstances and that assessment has been made by ATS without external consultation.
- Carry out applicable AFTER THREAT ASSESSMENT action above.

WHEN ALL EMERGENCY ACTION COMPLETE

- Notify [STATE REGULATOR] and RCC when the emergency situation no longer exists.
- On all occasions, complete and send AFTN [Manual of ATS / Bomb Warning Report message] in association with person receiving threat and/or unit(s) involved.

HIJACK

- Keep instructions simple and distractions to a minimum.
- Maintain normal communications.
- Avoid reference to the situation unless the pilot does so first.

AN AIRCRAFT WHICH IS SUBJECT TO HIJACK IS EXPECTED TO NOTIFY ATC BY:

- Squawking SSR CODE 7500; or
 - Advising ATS of details in plain language if possible; or
 - Including the words: “CHANNEL SEVEN FIVE ZERO ZERO” in any RTF transmission.
1. If aircraft is observed transponding on Code 7500 or a plain language report suggests unlawful interference, confirm the situation
 - “[callsign] CONFIRM SQUAWKING SEVEN FIVE ZERO ZERO”; and/or
 - If the response is not clear or no response is given, do not question the pilot further. Assume that an emergency exists.
 2. Notify [STATE REGULATOR] **Emergency Operations Centre**
 - ☎ 0-4-566 5271
 - If possible, send AFTN MATS / HIJACK Notification message immediately:
 - do not delay message dispatch if all information not immediately available;
 - include appropriate addresses of ACC/FIC of FIR of states beyond [STATE] jurisdiction if aircraft is proceeding or could proceed beyond XXXX FIR.

Continued...

3. Declare ALERFA

- Notify

- ATC DUTY MANAGER/ACC SUPERVISOR

*Some or all of the following may be delegated to the
XXXX or other sector/unit if they are able to assist*

- aircraft operator;
 - [STATE REGULATOR] ☎ [Contact], if not already done.
 - ALERFA phase to RCC:
 - ☎ [Contact] direct line; or
 - ☎ [Contact]; or
 - ☎ [Contact] (RCC).
- Pass all known information.
- Send appropriate ALR message:
 - Send AFTN MATS / HIJACK Notification message immediately:
 - do not delay message dispatch if all information not immediately available;
 - include appropriate addresses of ACC/FIC of FIR of States beyond [STATE] jurisdiction if aircraft is proceeding or could proceed beyond XXXX FIR.
 - Advise ATS at all attended aerodromes to which there is a possibility of the flight proceeding.
- Establish a central point of contact with the operator / RCC / Police / [STATE REGULATOR] ;
 - Update / operator / RCC / Police / [STATE REGULATOR] / ATC DUTY MANAGER/ACC SUPERVISOR
 - with new information through the central point of contact.
 - Respond to RCC / Police / [STATE REGULATOR] requests.
 - Obtain all information required by form prior to declaring DETRESFA if there is a reasonable certainty that this phase will eventuate.
 - Coordinate between the sector/unit handling the emergency aircraft and both [STATE REGULATOR] and RCC.

Continued...

- Handover to **XXXX** senior controller or Supervisor/Duty Manager of other State as appropriate, if aircraft is or appears to be proceeding beyond **XXXX** FIR, or **XXXX** if entering the **XXXX** FIR from the **XXXX** FIR.
- Notify **[STATE REGULATOR]** and **RCC** of ATS release details to an ATS unit of another State.
- Send ARR message to DEP aerodrome and all other addressees on the ALR and HIJ messages when the aircraft arrives at its final destination and the act of hijack has been concluded.
- Notify **RCC** / **Police** / **[STATE REGULATOR]** when the emergency situation no longer exists.

4. Respond promptly to pilot request(s) or to anticipated needs of the aircraft

5. Increase separation

6. Notify the Surveillance controller serving the area of the last reported position of the aircraft, and request the controller to:

- Watch for an aircraft [at or near the extrapolated position] squawking 7500; and to
- Plot the aircraft's track, and keep you informed of the progress.

7. If being provided with a Surveillance service

- Maintain surveillance;
- Watch for the use of emergency squawk code 7700:
 - notify the **ATC DUTY MANAGER/ACC SUPERVISOR** / **RCC** / **[STATE REGULATOR]** immediately;
- Record last known position if Surveillance contact is lost;
- Alert next sector.

Continued...

8. Give the flight priority over other aircraft

- Transmit, and continue to transmit, information pertinent to the safe conduct of the flight, without expecting a reply from the aircraft.
- Monitor, and plot the progress of the flight with the means available, and coordinate transfer of control with adjacent ATS units without requiring transmissions or other responses from the aircraft unless communication remains normal.
“[callsign] AT [position/time] MONITOR [frequency] FOR [callsign of next ATS unit].”
- Keep appropriate ATS units informed as to the progress of the flight.
- Be mindful of fuel endurance and the possibility of sudden changes in route and destination.

9. If advice of a Hijack is received:

- Where the next point of landing is not known but may be at your aerodrome, initiate an Aerodrome Emergency Plan "Local Standby" for the possible arrival of the hijacked aircraft.
- If landing at your aerodrome, or your aerodrome appears to be the likely destination, carry out the actions in the Aerodrome Emergency Plan.

10. Relay messages as authorised by the [State Regulator]

Continued...

11. Observe the following principles if required to converse with the hijackers:

- Indicate you have no authority to provide other than operational assistance;
- Do not discuss other than operational matters;
- Ask that the crew be allowed to conduct operational communications;
- Maintain a neutral attitude;
- If you must hand over to a colleague, inform the aircraft prior to doing so. Do not specify why.

12. Handover to ATS unit of another State?

- Advise ATC DUTY MANAGER/ACC SUPERVISOR of release details.

13. Refer all media and casual enquiries to:

- Head of Public Affairs
- [STATE REGULATOR].
 - ☎ [CONTACT]

XXX Tower Emergency Plan

Version xx

DATE

Authorised by: _____

Name

Chief Controller XXXX Tower

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XXXX Tower Emergency Plan

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0 Document Administration

0.1 Distribution List

Hard copies of this document are held by the following:

Holder	Location	Copy
XXXX Tower	XXXX Emergency Bag	1
XXXX Tower	Cab	2

0.2 Electronic Notification List

The following recipients shall be emailed any changes to this document.

Recipient	Location

0.3 Record of Amendments

The Issuing and Amending Authority of this document is the Chief Controller XXXX Tower, Airways Corporation of New Zealand Limited.

Version	Amendment Date	Dated Entered	Entered By
1.0			
1.1			
1.2			
1.3			
1.4			

0.4 Page Checklist

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0.5 Summary of Changes

- Updated ATIS – AFTN with SMART ATIS
- Updated mains tap location
- Updated the NP Tower Emergency Phone List

1 Introduction

Follow these instructions and principles when an emergency involving XXXX Tower (facilities or staff) has occurred, or if information is received concerning an emergency at another ACNZ facility. Use this plan as a checklist and to make notes on during an emergency. It can be reprinted.

An emergency is an occurrence, or set of off-normal circumstances, or impending circumstances which causes or might cause:

- **Serious injury, damage, disruption of services or degradation of service**
- **Significant increase in costs, adverse publicity, or adverse commercial impact**

The person in charge of the emergency should always keep in mind the following key objectives;

- aircraft safety
- staff safety and welfare
- property protection
- company reputation
- notifications
- note keeping

Emergencies may produce consequential effects, create new hazards, or require changes to normal activities. Always keep in mind the possibility of hidden dangers or effects.

Do not take personal risks in attempting to carry out these instructions.

2 Immediate Action Summary

2.1 Immediate Actions – Duty controller

IF EVACUATING

- MAKE** a general broadcast to advise all traffic
- Suggested phraseology – “All stations this is XXXX Tower. All Air Traffic Services are suspended due (reason).
Contact XXXX Control XXXX for further information and instructions.”
- SEND** Evacuation ATIS – located under the ALTERNATE tab on the SMART ATIS form. If time does not permit this, select the yellow ATIS switch to ‘Inhibit ATIS’.
- NOTIFY** XXXX Duty Manager
- NOTIFY** all other personnel in the building
- AND** take the Emergency Bag, Icom Radio and charger, emergency cell phone, Tower Log Book, Lateral Separation and NP TOWER FLIP book.
- AND** account for all personnel
- AND** put on Emergency Coordinator jerkin (in emergency bag)

Leave The Tower Door Open

CONTINUED...

WHETHER EVACUATING OR NOT CONTINUE WITH THESE INSTRUCTIONS

IF the situation may in any way jeopardise the safe and orderly control of **airborne aircraft**

NOTIFY all relevant aircraft, **XXXX** controllers and **XXXX** Duty Manager.

AND take such action necessary to:

- ensure the separation of aircraft
- transfer IFR traffic communications to the relevant sector
- advise VFR traffic to continue with 'Unattended airfield procedures' or communicate with appropriate Sector where necessary
- hold aircraft on the ground

AND advise **XXXX** ACC that no further aircraft are permitted to enter the airspace

CONTINUED...

2.2 Further Actions – Duty controller

IF REQUIRED

NOTIFY	any external service needed
	• Rescue Fire Service pager • Fire Service XXXX • Police XXXX • Ambulance XXXX

AS SOON AS POSSIBLE

ALWAYS NOTIFY	the Unit Manager and XXXX Manager
AND	if appropriate
	• NOTAM office for NOTAM action to disestablish the ATS services and airspace, or notify facility unserviceability – see Contingency Plan XXXX Airport • Local operators • XXXX Airport Manager and Rescue Fire Service • XXXX Duty Manager • Technical Coordinator • Head of Service Delivery
RECORD	all actions taken on the Situation Summary Sheet and keep sheet updated at all times (Situation Summary Sheet is in Appendix B at rear of plan).
CONTROL	access to the tower (whether or not evacuating)

HANDOVER CONTROL OF THE SITUATION TO THE APPOINTED UNIT CRISIS MANAGER

IF THE **XXXX** CRISIS MANAGER IS NOT AVAILABLE THE DUTY CONTROLLER SHALL ASSUME THOSE RESPONSIBILITIES AND UNDERTAKE THE NECESSARY DUTIES AS DESCRIBED

CONTINUED...

XXXX Tower Emergency Plan

2.3 Further Actions – Unit Crisis Manager

IF	the Tower will be out of service for more than one hour
OR	there is significant damage to the Tower
OR	there is significant damage to the XXXX airfield or airfield lighting
OR	there is a total loss of VHF Voice Communications
OR	an event has occurred which has the potential to create adverse media attention
NOTIFY	Head of Service Delivery who will if necessary notify any member of the XXXX Executive Crisis Management Group (ECMG) • Head of Safety ... • Manager ...
PASS	details as per the Situation Summary Sheet (Appendix B)
NOTIFY	Head of Public Affairs Communications
IF	the Crisis Management Plan (CMP) is activated fulfill the CMP 'Unit Crisis Manager' functions as detailed in the CMP until relieved

The ECMG member notified may declare a 'Crisis' in accordance with the ACNZ Crisis Management Plan (CMP)

XXXX Tower Emergency Plan

MEDIA ENQUIRIES refer all enquiries to the **Head of Public Affairs Communications**

ADVISE

- the caller that you are unable to discuss the situation

AVOID

- conversation about the emergency with the caller
- confirming any information the caller may have heard
- confirming the nature of the problem

OFFICIAL ENQUIRIES

refer all requests / demands for documents, files, tapes, or information, to **XXXX** or a member of the **ECMG**.

3 Specific Emergency Situations

The following information and instructions supplement the specific instructions detailed in previous sections.

3.1 Bomb Threat

Do not attempt to move a suspected bomb or to ascertain its authenticity.

Phone Calls Refer to **ATS Emergency Response Checklist** – bomb threat section

Complete AFTN Form **MATS**, Bomb Warning

If the threat is to any airport building including an ACNZ facility, or an aircraft,

- THEN** immediately notify **XXXX** Airport Manager and Rescue Fire Service and then carry out the appropriate actions contained in the **XXXX** Airport Company - **XXXX** Airport Emergency Plan (airport building, or aircraft on the ground) and/or the In Flight Emergency Response Checklist (aircraft in the air)
- AND** evacuate the building concerned, and vicinity
- AND** assist the emergency services as necessary
- AND** follow relevant instructions in section 2 (Immediate Action Summary, Duty Controller)
- AND** notify the **XXXX** Security Service on **[CONTACT]**

If the threat is to ANOTHER ACNZ facility,

- THEN** notify the **Police**
- AND** notify the **Duty Controller / Unit Manager** of the tower nearest the facility concerned
- AND** notify the **Technical Coordinator**

3.2 Fire

A FIRE IN XXXX TOWER IS LIKELY TO SPREAD RAPIDLY. UPON CONFIRMING SUSPICIONS OF ANY FIRE, VACATE THE BUILDING IMMEDIATELY TAKING INTO ACCOUNT THE RELEVANT INSTRUCTIONS IN SECTION TWO (IMMEDIATE ACTION SUMMARY (DUTY CONTROLLER))

FOLLOW relevant instructions in section 2 (Immediate Action Summary, Duty Controller) and take notice of the following

Remember the following

FIRE SPREADS VERY QUICKLY

Remain Alert To The Spread Of Fire And Avoid Smoke Inhalation

KEEP YOURSELF between the fire and the door (keep your exit clear)

CLOSE DOORS as this will help to prevent the spread of fire

SMALL FIRES

IF the fire is known to be contained in a small area

ATTEMPT if you feel confident enough and are able, to contain the fire using the extinguishers available

SMOKEY CONDITIONS

STAY close to the floor

AFTER the fire is COMPLETELY out

OPEN windows and doors to clear the smoke

COORDINATE with management for further instructions

3.3 Earthquake – Severe Shaking

TAKE SHELTER	under the desk (YOUR BIGGEST DANGER IS BREAKING WINDOWS)
WARN	aircraft not to land
AFTER	the shaking stops, evacuate to a safe place outside
FOLLOW	relevant instructions in section 2 (Immediate Action Summary, Duty Controller)
CONFIRM	that all known persons in the building are safe and uninjured
FOLLOW	as per the instructions from the XXXX Airport Authority or the XXXX Airport Authority - Aerodrome Emergency Plan

PAPI alignment must be tested and confirmed by Systems Group staff prior to use following any earthquake if the parameters set out in MATS ADM48 demand such action to be taken

ONLY REOCCUPY	• when aftershock activity permits, and • the building has been inspected and judged to be sound and any internal damage made safe, and • damaged utilities restored, or temporary facilities provided

3.4 Flood / Pipe Burst

FLOOD/TSUNAMI/HEAVY RAIN WARNING IS RECEIVED

NOTIFY Technical Coordinator

AND XXXX Duty Manager

AND Unit Manager

AND Local Operators

AND XXXX Airport Manager

In the event of a **pipe burst** turn off water at mains tap (located between the Tower and the Rotorforce Hanger)

WHEN FLOODING HAS OCCURRED

FOLLOW relevant instructions in section 2 (Immediate Action Summary, Duty Controller)

DO NOT attempt to switch on mains circuits that have failed

STAY OUT of any water in equipment rooms

AFTER WATER SUBSIDES

COORDINATE with management for further instructions

XXXX Tower Emergency Plan

3.5 Staff Unavailability

IF	there are insufficient staff available to cover rostered periods and this will result in the closure of the unit
IMMEDIATELY	attempt to recall XXXX staff
IF NOT POSSIBLE	immediately notify the Unit Manager
IF NOT AVAILABLE	contact the XXXX Manager or XXXX (any contact for the above reason should be made in the order as above).
THEY WILL DECIDE	what action should be taken next
If service is reduced	
PROCEED	with NOTAM action
AND	send an AFTN message as per MATS ADM
AND	log all details
AND	advise XXXX Airport Company, applicable airlines and local operators

Note: If Service is not available continue in accordance with the **XXXX** Airport Contingency Plan.

XXXX Tower Emergency Plan

3.6 Storm / Wind / Tornado

IF	Severe Wind Warnings received
NOTIFY	Technical Coordinator
AND	XXXX Duty Manager
AND	Unit Manager
AND	Local Operators
AND	XXXX Airport Manager
AND	XXXX Manager
SECURE	any loose materials stored outside

If there is damage to ACNZ property

FOLLOW	relevant instructions in section 2 (Immediate Action Summary, Duty Controller)
ORGANISE	to board up or otherwise protect broken windows to make rain-proof (XXXX Airport Company may be able to assist with this)
REFER	Crisis Management Plan (CMP)

3.7 Intruder

SEEK ASSISTANCE	from other persons in the building
AND / OR	XXXX Airport Rescue Fire
AND / OR	from the Police by dialing [EMERGENCY CONTACT]
AND / OR	from other persons in the vicinity of the Tower
FOLLOW	relevant instructions in section 2 (Immediate Action Summary, Duty Controller)
SECURE	access to the operational area
NOTIFY	Unit Manager and Business Manager South

3.8 Civil Disturbances

NOTIFY	the Police by dialing 111
NOTIFY	XXXX Airport Manager and XXXX Airport Rescue Fire Service
FOLLOW	relevant instructions in section 2 (Immediate Action Summary, Duty Controller)
RESTRICT	access to the building unless certain of a visitor's identity
SECURE	access to the operational area

3.9 Runway Blockage

FOLLOW relevant instructions in section 2 (Immediate Action Summary, Duty Controller)

FOLLOW relevant instructions in Manual of ATS GEN and as received from the XXXX Airport Manager or the XXXX Airport Emergency Plan

3.10 Aviation Accidents

FOLLOW

relevant instructions in the Manual of Air Traffic Services (MATS)

4 Equipment Failure

ALL EQUIPMENT FAILURES SHOULD BE ADDRESSED AS PER RELEVANT INSTRUCTIONS CONTAINED IN

- Manual of Air Traffic Services (MATS)
- Local Unit Orders (LUO)
- Service level Agreements (SLA) with XXXX

5 Responsibilities Of The Unit Manager

ON BEING NOTIFIED	of any emergency the Unit Manager
SHALL	enquire regarding the immediate safety of aircraft operations and ACNZ personnel
AND	ensure all notifications required in the Emergency Plan have been, or will be made
AND	having regard to the time of the emergency and the shift timetable, determine whether extended hours or recall arrangements will be required, and ensure staff welfare refreshments, transport, and security
AND	proceed to the airfield and take immediate control of the emergency, unless this is inappropriate in the circumstances

If the [ANSP] Crisis Management Plan has been activated because of the emergency at XXXX

CONTACT the ECMG Coordinator and act in accordance with instructions.

If the [ANSP] Crisis Management Plan has been activated because of an emergency at another location

RETURN to duty as required by the ECMG Coordinator and act in accordance with instructions

For protracted emergencies, establish a roster to provide rest periods for all staff (including the Unit Manager)

REPORT DAILY to the XXXX Manager on:

- staff availability
- operational matters
- equipment failures / malfunctions
- personnel issues
- accommodation requirements

6 Restoration of ATS

IF	the Tower is evacuated and cannot be reoccupied within 24 hours
THEN	contact the Technical Coordinator
AND	request urgent transportation of the mobile control tower to XXXX airfield along with an appropriate shipping container to be used to raise the height of the mobile unit
AND	request that the Technical Coordinator organise any required equipment not available with the mobile control tower, to be sent immediately to XXXX Airport
LOCATE	the mobile control tower at the preferred location which is in [LOCATION]. Detailed instructions of how to set the mobile control tower up for use are stored with it
IF	the preferred location is unavailable then select another, taking into account the following list of considerations • close to a building which has power, telephone and ablution facilities • where there is a clear view of the runway, approach paths, and circuit • where it is free of excessive noise levels • where it does not interfere with approach and / or obstruction surfaces
DO NOT	resume Aerodrome/Approach Control until the following equipment has been provided and installed into the mobile control tower by Systems Group staff • one VHF Radio Frequency with standby capability • phone / Fax • recorder • meteorological equipment
AND	Systems Group has made arrangements to install the following equipment within 24 hours: • strip printer • ATIS • any other equipment necessary for operations

XXXX Tower Emergency Plan

NOTIFY the following when ready to begin operations from the mobile control tower

- the NOTAM office for NOTAM action
- **XXXX** ACC Duty Manager
- **Technical Coordinator**
- **XXXX** Manager
- the Unit Manager
- the **XXXX** Airport Manager
- the Unit Crisis Manager (Refer to the **CMP**)

INCLUDE details of hours of service

frequencies and telephone numbers available

any limitations to the service to be provided e.g. visibility, VHF coverage, clearance delivery

expected duration of operation from the mobile tower

Carry out normal opening watch actions prior to commencing operations

7 Restoration of Equipment

7.1 Airfield Equipment

All restoration of outages of airfield and non-airfield equipment are covered by the Service Level Agreement (SLA) between ANS Delivery and Systems Group.

In the event of multiple outages of equipment the following is a list of groups of priority for equipment restoration.

Group One	• Primary radio frequency • AFTN • Meteorological Equipment • Voice Recorders • Telephone / Fax • Emergency Lines
Group Two	• VOR/DME • Airfield Lighting in order of ○ Runway ○ Approach ○ PAPI ○ Apron edge ○ Tower lighting
Group Three	• Strip printer • Air –conditioning • Secondary radio frequency
Group Four	• Voice Switch System • Balance of airfield lighting

7.2 Administrative Accommodation

If the Emergency has rendered the administrative offices and / or storage facilities at XXXX unusable make appropriate arrangements as necessary to meet the needs of the operation.

8 General Information

8.1 Fire Fighting Equipment

Fire extinguishers in the control tower can be found at the following locations:

GROUND FLOOR	entrance way (fire hose)
	equipment room (extinguisher)
SECOND FLOOR	on the wall outside C.C office (extinguisher)
CAB	on the landing halfway up stairs (extinguisher)
TOWER BALCONY	on south western side of cab (domestic hose)

8.2 Emergency Exit

An EMERGENCY EXIT is available from the tower via the balcony and the fire escape on the south eastern side of the building to ground level.

8.3 Emergency Bag

The **Emergency Bag** is stored inside the Emergency Power Centre

- torch
- pens
- tape
- paper
- clip board
- first aid kit
- Emergency Coordinator Jerkin
- XXXX Tower Emergency Plan
- [ANSP] Crisis Management Plan

8.4 Emergency Coordinator Jerkin

The Emergency Coordinator Jerkin contained in the emergency bag can be used either to identify the person in charge or a person delegated to provide a 'first point of contact' or to identify the location of the person in charge (e.g. by taping to an office door).

Appendix A Emergency Phone List

The following Annexes are phone lists which may be useful in an emergency situation.

Annex 1 (XXXX Tower Emergency Phone List) is maintained internally within XXXX Tower.

Annex 2 (Emergency Contact List) is maintained by the Regional Administrator.

Both are maintained as separate documents to this Emergency Plan and must be inserted after this page accordingly.

Annex 1 XXXX Tower Emergency Phone List

Annex 2 [Emergency Contact List](#)

A.1 XXXX Tower Emergency Phone List

Emergency Services		
Fire Service	[PERSON]	[CONTACT]
Police	[PERSON]	[CONTACT]
Ambulance	[PERSON]	[CONTACT]
	[PERSON]	[CONTACT]
Hospital		[CONTACT]
Airport Rescue Fire	[PERSON]	[CONTACT]
XXXX Staff		
Chief Controller	[PERSON]	[CONTACT] [CONTACT]
Senior Controller	[PERSON]	[CONTACT] [CONTACT]
Controllers	[PERSON]	[CONTACT]
	[PERSON]	[CONTACT]
	[PERSON]	[CONTACT]
XXXX Airport Contacts		
Airport Chief Executive	[PERSON]	[CONTACT] [CONTACT]
Airport Operations Manager	[PERSON]	[CONTACT]
	[CONTACT]	
Airlines	(06) 755 2250 EXT 3	

A.2 Emergency Contact List

This list is maintained at [LINK](#)

Appendix B Situation Summary Sheet

Complete the details on this sheet **prior to notifying** the Management and **Communications** (refer to section 2) of the details surrounding an emergency.

Your Name:	Date/Time of completion of this form:
Describe what has happened:	
When did this event occur?	
Describe what you know of any damage to equipment/aircraft/property:	
State the registration/callsign/operating company of aircraft involved:	
Is there any injury to people, or loss of life?	
State what actions you have taken so far:	
State what number you can be contacted on by phone:	
State what you are going to do after this notification:	
Is there any assistance you could be given right now, if available?	

INTERNATIONAL CIVIL AVIATION ORGANIZATION



**ASIA/PACIFIC REGIONAL GUIDANCE FOR THE REGULATION AND SAFE
OPERATION OF UNMANNED AIRCRAFT SYSTEMS WITHIN NATIONAL
AIRSPACE**

Version 1.0, August 2019

This Plan was developed by the Asia/Pacific Unmanned Aircraft Systems
Task Force (APUAS/TF)

Approved by ATM/SG/7 and published by the
ICAO Asia and Pacific Office, Bangkok

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Appendix B: Example Process for Authorization or Exclusion of UAS - USA.....B-1

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SCOPE OF THE DOCUMENT

ICAO Global and Regional Developments in the Field of Unmanned Aircraft Systems

1.1 The 2nd High Level Safety Conference 2015 (HLSC 2015, Montreal, Canada, February 2015, recommended that:

- ICAO should expedite the development of provisions to be used by States to regulate Remotely-Piloted Aircraft Systems (RPAS) within their airspace and to educate users regarding the risks associated with their operations;
- States should address the risks of non-regulated use of Remotely Piloted Aircraft (RPA) in the vicinity of aerodromes to international flights; and
- ICAO should provide supporting material to assist States in the mitigation of risks posed to international flights from RPA operating in the vicinity of aerodromes.

1.2 The Fourth Meeting of the Air Traffic Management Sub-Group (ATM/SG/4) of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG), held in Bangkok, Thailand, in July 2016, was informed that ICAO was currently developing standards relating to RPAS, that were focused on international RPAS operations, to support the Aviation System Block Upgrade (ASBU)¹ Block 1 module B1-RPAS.

1.3 Noting the above and given the fact that UAS were easily transportable across national boundaries, ICAO recommended a specific UAS Block 1 element in the Asia/Pacific Seamless ATM Plan to promote more harmonized approach across the Asia/Pacific Region. Consequently, APANPIRG/27 (Bangkok, Thailand, September 2016) formed the Asia/Pacific Unmanned Aircraft Systems Task Force (APUAS/TF), to develop the Seamless ATM Plan element and associated guidance material on uniform regulatory expectations for regulators, Air Navigation Service Providers (ANSPs) and operators of small UAS on the Air Traffic Management (ATM) aspects of UAS.

1.4 The 39th Session of the Assembly of ICAO (Montreal, Canada, October 2016) noted the wide support for ICAO's work on RPAS, and agreed that development of a global baseline of provisions and guidance material for the proper harmonization of UAS regulations that remained outside the international instrument flight rules (IFR) framework was justified. In order to facilitate that expansion of ICAO's work programme, the ICAO Air Navigation Commission had agreed that an innovative and flexible approach should be adopted, taking into account ongoing developments at national, regional and international levels.

1.5 The Unmanned Aircraft Systems (UAS) Advisory Group (UAS-AG)² was subsequently established by ICAO Headquarters to develop guidance for the management of small UAS, as these aircraft were being produced in vast quantities to meet a public demand, with an increasing variety of uses, both commercial and recreational. However, progress on small UAS guidance material had been limited, with the focus mainly on RPAS; yet from feedback received by the ICAO Regional Office the greater urgency for most Asia/Pacific States was to try and manage the small UAS which appeared to be creating the highest risks.

¹ ASBU are incorporated in ICAO Doc 9750 – *Global Air Navigation Plan*

² Formerly the Small UAS Advisory Group – SUAS-AG

1.6 A global, informal body of regulators called the Joint Authorities for Rulemaking on Unmanned Systems (JARUS, <http://jarus-rpas.org/>) has also been formed. Participating Asia/Pacific States include Australia, China, India, Japan, Malaysia, and the Republic of Korea

1.7 Noting that the outcomes of HLCS 2015, the 39th Session of the Assembly of ICAO, and the ICAO RPAS/2 and DRONE ENABLE symposiums had led to the commencement of a global effort to be conducted under the UAS-AG in three streams of UAS Traffic Management (UTM), APANPIRG/29 (Bangkok, Thailand, September 2018) subsequently revised the APUAS/TF (TOR) to *inter alia*:

- extend the scope to include all UAS that were not considered within the scope of the RPAS Panel (i.e. RPAS operated by a licensed remote pilot using a remote pilot station, and operating generally under the IFR); and
- remove reference to systems, communications and surveillance that were included in three streams of work being undertaken by the UAS-AG;

Regional Guidance for the Regulation and Safe Operation of UAS

1.8 This document, the *Asia/Pacific Regional Guidance for the Regulation and Safe Operation of Unmanned Aircraft Systems within National Airspace*, provides background information, principles and regulatory considerations for the development of State regulations for the operation of UAS within ~~the national airspace system~~ national airspace systems.

1.9 The guidance supports the Asia/Pacific Seamless ATM Plan elements; *Regulation and Safe Operation of Unmanned Aircraft Systems* (Seamless ATM Plan Section 5 – Background Information), and Unmanned Aircraft Systems (Section 7 – Performance Improvement Plan).

1.10 The document does not provide guidance or information on non-ATM-related aspects of the regulation of UAS, such privacy, public safety and security, or commercial considerations, which fall outside the scope of the APUAS/TF Terms of Reference. States should take their own internal action to coordinate such matters with the relevant authorities.

Document Review

1.11 The document will be subject to ad-hoc review as needed, in response to relevant global or regional developments in the regulation of UAS operations.

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OBJECTIVES

2.1 The objective of this document is to provide guidance for Asia/Pacific States in the development of regulations for the safe operation of UAS within national airspace from an ATM perspective. The guidance is intended to include:

- Guidance on elements to be considered for inclusion in regulations for the operation of UAS, and any relevant technical performance requirements, that may also be applied or promulgated at the point of sale or the point of entry into the State;
- Consideration of regulations relating to UAS operation both within and beyond visual line of sight; and
- regulatory requirements for safety assessments of UAS operations

2.2 The information and guidance provided in this document forms part of a set of ongoing ICAO Asia/Pacific regional activities including:

- development of recommended methods of safety data collection and analysis for UAS accidents and incidents; and
- Coordination, where appropriate, with the ICAO RPAS Panel and UAS-AG, JARUS, or other specialist bodies.

2.3 The document does not include performance objectives, but supports background information and a performance expectation now included in the Asia/Pacific Seamless ATM Plan³. The relevant excerpt from the Seamless ATM Plan is provided in this document, in Section 5 – *Background Information*.

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³ Included in the 2019 review/update of the Asia/Pacific Seamless ATM Plan.

EXECUTIVE SUMMARY

3.1 The *Asia Pacific Regional Guidance for the Regulation and Safe Operation of Unmanned Aircraft Systems within National Airspace* was developed in response to the concerns expressed by the Asia/Pacific ATM community at the ATM/SG/4 and APANPIRG/27 meetings in 2016. Those concerns noted the rapid growth in the use of UAS, and the potential risks to conventional aviation posed by the operation of unmanned aircraft (UA) by a broad range of individuals and organizations, with varying degrees of aviation qualifications and experience, for diverse commercial and recreational purposes. It was also noted that ICAO global efforts in the area of UA had been largely confined to the development of Standards and Recommended Practices (SARPS) and guidance for the operation of Remotely-Piloted Aircraft operated by a licensed pilot located in a certified remote pilot station, and flown under the Instrument Flight Rules (IFR).

3.2 A guiding theme of the development of this regional document was that aviation regulations should take into account the considerable economic and societal benefits arising from the growth in the use and rapid technological development of UA, and should therefore facilitate engagement and participation by all operators of UA in the rules and procedures that would facilitate reasonable access to airspace, while ensuring the appropriate level of protection of conventional aviation, commensurate with the airspace classification.

3.3 The principles upon which this regulatory guidance is based may be found in Section 6 of the document. Section 7 provides a list of considerations that State aviation regulators in the Asia/Pacific Region may take into account when developing their rules and procedures for the safe integration of UA operations in ~~the national airspace system~~ national airspace systems. The regulatory considerations in this list were developed by APUAS/TF, and based on information from a number of sources including ICAO and JARUS, and on the experience of Asia/Pacific Administrations in managing developing their own rules and regulations for the management of UA operations.

3.4 The UA operations environment is evolving rapidly. Technical developments in UA purpose, navigation, detection and avoidance, surveillance and tracking for ATM purposes, and the development of UAS Traffic Management (UTM) systems and processes, continue apace. The reader is invited to note the considerable amount of information on UA operations that is publicly available, and in particular the information provided in the ICAO UAS Toolkit, as mentioned within this document.

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ABBREVIATIONS, ACRONYMS AND DEFINITIONS

APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
APUAS/TF	Asia/Pacific Unmanned Aircraft Systems Task Force
ASBU	Aviation System Block Upgrade
ATC	Air Traffic Control
ATM	Air Traffic Management
BVLOS	Beyond Visual Line-of-Sight
C2	Command and Control Link
CANSO	Civil Air Navigation Services Organization
FPV	First Person View
GANP	Global Air Navigation Plan
HLSC	ICAO High Level Safety Conference
IFR	Instrument Flight Rules
JARUS	Joint Authorities for Rulemaking on Unmanned Systems
RPA	Remotely-Piloted Aircraft
RPAS	Remotely-Piloted Aircraft System
RPASP	ICAO Remotely-Piloted Aircraft Systems Panel
SARPS	ICAO Standards and Recommended Practices
UA	Unmanned Aircraft
UAS	Unmanned Aircraft System
UAS-AG	ICAO Unmanned Aircraft Systems Advisory Group
UTM	UAS Traffic Management
VLOS	Visual Line-of-Sight

.....

BACKGROUND INFORMATION

Global and Regional Planning for Unmanned Aircraft Systems

ICAO Doc 9750 – Global Air Navigation Plan (GANP)

5.1 The ICAO Global Air Navigation Plan includes ASBUs, organized in non-overlapping six-year time increments starting in 2013 and continuing through 2013 and beyond, illustrated in **Figure 1:**

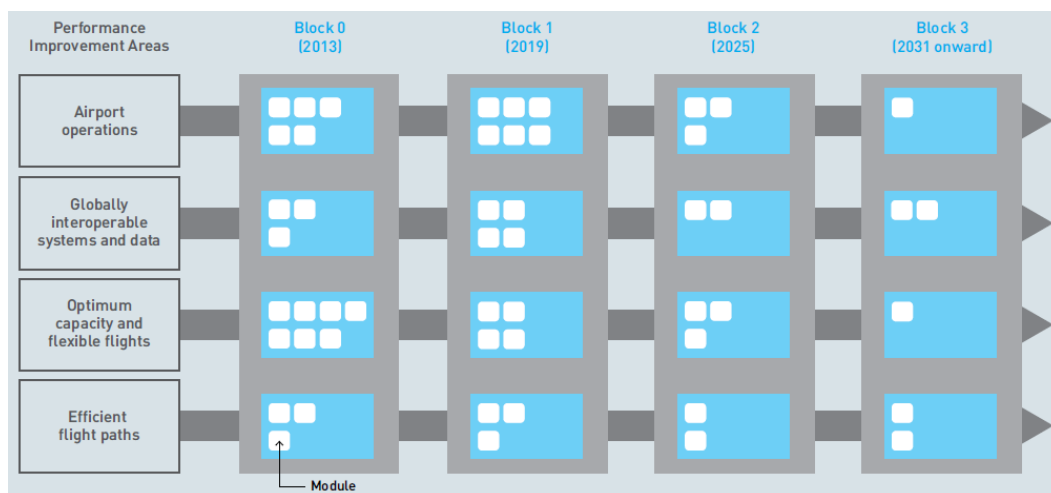


Figure 1: Aviation System Block Upgrade Structure

5.2 ASBU modules for RPAS are included in Performance Improvement Area (PIA) 4, as follows:

B1-RPAS *Initial integration of remotely piloted aircraft (RPA) into non-segregated airspace;*

B2-RPAS *Remotely piloted aircraft (RPA) integration in traffic; and*

B3-RPAS *Remotely piloted aircraft (RPA) transparent management.*

5.3 However, ICAO RPAS Panel is developing Standards and Recommended Practices (SARPS) for RPAS, for inclusion in the appropriate Annexes to the Convention on International Civil Aviation (The *Chicago Convention*).

5.4 A new scheme of ASBU, prepared by the ICAO Secretariat for endorsement by the 39th Session of the Assembly of ICAO in September 2019, removed or modified, as appropriate, ASBU modules that are the subject of SARPS in the Annexes to the Convention. As the ICAO RPAS Panel is developing Standards and Recommended Practices (SARPS) for RPAS, for inclusion in the appropriate Annexes, the modules B1-RPAS, B2-RPAS and B3-RPAS were among those removed from the next version of the GANP.

5.5 More information on the GANP and its ASBU modules is available through the ICAO GANP Portal at <https://www.icao.int/airnavigation/Pages/GANP-Resources.aspx>.

5.6 The development of the abovementioned SARPS relates to mandatory requirements for the operations of remotely piloted aircraft that, in general terms, may operate under the instrument flight rules (IFR), in airspace and to/from aerodromes used by conventional aircraft, across national boundaries, controlled by an appropriately licensed remote pilot. They do not make provision for the regulation of UAS that are the focus of this guidance document.

Asia/Pacific Seamless ATM Plan

5.7 Some information and global guidance relating to UAS that are not covered by the SARPS is being developed by the ICAO Secretariat, supported by the UAS Advisory Group (UAS-AG). However, the Terms of Reference (TOR) of Asia/Pacific APUAS/TF included the requirement for development of an Asia/Pacific Seamless ATM Plan element, supported by guidance material for the regulation of UAS that fall outside the scope of the international IFR framework, and therefore outside the scope of the RPAS Panel.

5.8 Accordingly, the following background information and performance expectation was developed for inclusion in the 2019 update of the Asia/Pacific Seamless ATM Plan:

Section 5: Background Information

Regulation and Safe Operation of Unmanned Aircraft Systems

The 27th Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/27, Bangkok, Thailand, 05 to 08 September 2016), noted that ICAO was developing standards for Remotely Piloted Aircraft Systems (RPAS, generally above 25 kg) that were focused on international IFR RPAS operations.

APANPIRG/27 noted the challenges from many thousands of Unmanned Aircraft Systems (UAS) that operate outside the scope of the developing ICAO standards, and agreed to a recommendation that a specific UAS element be incorporated within the Asia/Pacific Seamless ATM Plan to facilitate a harmonized approach.

The Asia/Pacific UAS Task Force (APUAS/TF) was therefore formed by APANPIRG to develop guidance material that supports an Asia/Pacific Seamless ATM Plan element, including regional expectations for the regulation and safe operation of UAS that fall outside the scope of the ICAO RPAS Panel, within non-segregated airspace and from an ATM perspective, by November 2019.

Asia/Pacific regional guidance material developed by APUAS/TF is expected to be available in the late 2019 - mid-2020 timeframe, and will be published in the ATM section of the ICAO Asia/Pacific Regional Office eDocuments web-page at:

<https://www.icao.int/APAC/Pages/new-eDocs.aspx>

The ICAO Headquarters Secretariat, supported by the Unmanned Aircraft Systems Advisory Group (UAS-AG), has also developed a global resource of information and guidance material, as including:

- *The UAS Toolkit, providing general guidance on such issues as UAS regulations and risk-based approaches to regulation, training and education needs and authorizations, and examples of, and links to, existing UAS regulations of 39 States; and*

- A UAS Traffic Management (UTM) framework, summarizing key principles, lessons learned and best practices in the establishment of requirements for approval of UTM service providers.

Note: the UTM framework is subject to ongoing development, in line with the growth of global knowledge and experience in UTM.

The UAS Toolkit, UTM framework and other relevant information is available on the ICAO Unmanned Aviation web pages at:

<https://www.icao.int/safety/UA/Pages/default.aspx>

Considering the rapid growth of the UAS industry, and the consequent economic and social benefits arising, there is an immediate need for an aviation regulatory response to facilitate access to non-segregated airspace while protecting the safety and access to airspace of conventional airspace users. For this purpose, an Asia/Pacific regional performance expectation for the regulation of UAS is included in PARS Phase II.

Section 7 – Performance Improvement Plan – PARS Phase II (expected implementation by 07 November 2019)

Unmanned Aircraft Systems

States should implement regulations supporting the integration of UAS operations in non-segregated airspace, using a risk-based approach and in accordance with the Asia/Pacific Regional Guidance for the Regulation of UAS, as a minimum.

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Typical Values for Distances, Heights, and UA Weight and Velocity

5.9 Regulations for the integration of UA in national airspace frequently include the specification of distances from, and heights above, ground, persons, structures and aerodromes, to define where UA may or may not operate, in order to provide a degree of segregation between UA and conventional aviation, persons not associated with the operation, and buildings and other infrastructure. Regulations may also include consideration of UA weight and velocity.

5.10 The guidance in this document includes *typical* values for distances, heights, and UA weight and velocity, drawn from existing regulations for UA operations in the Asia/Pacific Region. States should note that these are provided as a guide only, and do not constitute a recommendation by APUAS/TF. The determination of values to be included in State regulations is a matter for the State.

5.11 When specifying height and distance limitations, States should be aware of the human factors affecting the assessment of such distances by both the ~~unmanned aircraft operator~~ **person operating the controls of the UA** and the pilot of a conventional aircraft. The primary example of this is the potential for inaccuracy in the ~~UA operator's~~ **person on the ground's judgement** of the height above terrain, and in the judgement of the pilot of a conventional aircraft when operating at the lowest permissible height for Visual Flight Rules (VFR) operations (*Annex 2 – Rules of the Air - Section 4.6*), particularly over undulating terrain. **Similarly, UAS may be equipped with height measurement and reporting capability, but in many cases this only measures height above the take-off point, and not above the terrain over which the UA may operate.**

5.12 While the typical limitation of the operation of an UA to not more than 400 feet AGL may provide a degree of segregation from VFR aircraft operating not below 500 feet AGL, it should be noted that some States limit the operation of UA to not more than 200 feet AGL, except where a specific authorization applies.

5.13 ~~States should also take into account the generally low levels of aviation experience of many UA operators.~~ While conventional aviation regulations may specify units of measurement such as knots and feet, these may not be ~~widely understood~~ applicable or available in equipment in communities environments where, for instance, speeds are measured in kilometres per hour (km/h) and distances in metres. The typical values in this document, if considered for use by States, should be converted accordingly.

Classification of UA by Weight and Velocity

5.14 A risk-based approach to the regulation of UAS operations will usually include the categorization of UA according to weight. This approach takes into account the kinetic energy of the UA, and the consequent potential the UA operation may have for causing risk to aviation, or harm to people or property on the ground.

5.15 Section 7 of this document provides guidance for risk-based regulation of UAS operations, including typical weight and velocity considerations.

Registration of UA

5.16 Registration of *all* UA, including those intended for recreational purposes, provides significant safety, regulatory and educational benefit to the State, and to the operator. Benefits include the provision of points of contact for use in the event of accidents or incidents, the identification and education of UA operators, support for enforcement action where necessary, and the identification of UA in UAS Traffic Management (UTM) systems.

5.17 Experience of States in the Asia/Pacific Region indicates that conventional administrative processes for registration of aircraft, pilot licensing, etc., as typically used by State aviation regulators, are not sufficient to manage the number of UA registrations that must be processed, or effectively engage the UAS community. Delayed or complex registration processes may contribute to significant levels of non-compliance by UA operators, particularly recreational operators with little or no experience or knowledge of aviation whose primary aim is to simply buy and fly. Registration should therefore be achieved through a specific online, automated process, and should include the provision of educational material.

5.18 APAC State experience also suggests that charging of a nominal fee for online registration, paid by a valid credit card, facilitates the validation of UA operator identification.

5.19 Noting that the majority of States do not yet have an UA registration system or process in place, and the speed of evolution of the UA industry, ICAO informed the DRONE ENABLE/2 Symposium of the future development of the Aircraft Registration Network, through which States may be able to manage their UA registrations. Further information will be provided through ICAO APAC Regional Office in due course. In the meantime, States should implement their registration processes as discussed in the regulatory guidance in Section 7 of this document.

First Person View

5.20 First-person view (FPV), also known as remote-person view (RPV), or video piloting, is a method used to control an UA using a view point derived from an on-board camera or other visual information device. FPV may be used in a range of UA applications, most commonly for recreational purposes such as drone racing. While regulations may permit such operations, they should clearly specify that FPV is not suitable for the purposes of containing UA operations within Visual Line-of-Sight (VLOS) of the operator, or for conflict detection and/or collision avoidance.

Criteria for Segregation or Authorization of UA Operations in Certain Airspace

5.21 For UA operations in certain airspace, such as controlled airspace, or in the vicinity of aerodromes and any associated instrument flight procedures, criteria may be established determine whether an operation should be either excluded, or require specific authorization from a local ATC facility or other relevant authority. Examples of criteria and methodology used by two Asia/Pacific States are provided in **Appendixes A and B**.

Detection and Interception of Unauthorized UA Incursions

5.22 UA operations, when conducted without authorization in certain airspace and/or in the vicinity of aerodromes, pose a hazard to conventional aviation.

5.23 Issues related to unauthorized UA incursions include either intentional/malicious acts or inadvertent/unintentional incursions, the limited means of prevention, the limited ability of ANSPs to respond and the limited capability to ‘control’ the UA incursion or protect the airspace.

5.24 The risks noted by the Civil Air Navigation Services Organization (CANSO) include collision, disruption to scheduled flights and air navigation efficiency, and confusion and mis-identification during incidents which may have long duration.

5.25 There are limited means available to respond to incursions. Such means may include the holding or diversion of flights, closure of aerodromes, and engagement of law enforcement authorities, which may have limited success in the event that the UA cannot be identified or its operator located.

5.26 Apart from legislative and regulatory regimes, a variety of detection and interception technologies for the mitigation of such hazards are becoming available for States to consider. Globally, several States have either deployed, or are considering deploying, ‘drone defence’ equipment to identify, disable, and possibly destroy ‘rogue drones’, in response to recent, well-publicized UA incursion incidents.

5.27 While concern over UA incursions is shared globally, there are a number of safety issues related to their interception and/or disablement that are yet to be overcome. ICAO and its technical bodies are not yet in the position to draft guidance on detection and interception/disablement of unauthorized UA operations. The expectation that regulations are developed to require ATM contingency response procedures for unauthorized UA is included in Section 7 of the document.

5.28 A key activity in the prevention of unauthorized UA incursions is the development and availability of educational material at the point of sale and/or during the registration process. Noting the ease of portability of small UA across national boundaries, educational programs should include the provision of information on State UA regulations, and penalties for non-compliance, at points of entry into the State.

5.29 Close coordination, cooperation and planning with enforcement agencies is also essential to the safe management of unauthorized UA operations.

UAS Traffic Management (UTM)

5.30 The ICAO DRONE ENABLE/2 Symposium, held in September 2018, was informed of global progress in the field of UAS Traffic Management. The ICAO UTM Framework, under development by the UAS-AG, will provide States with high level guidance on the establishment and operation of industry-based cooperative traffic management UTM, and their integration with ~~the national airspace system~~ national airspace systems and ATM. Supporting the UTM Framework, the UAS-AG is also developing guidance for registration, identification and tracking systems, communications systems, geo-fencing-like systems, and UTM-ATM interoperability.

5.31 Asia/Pacific States will be further informed in due course on outcomes from the UAS-AG work programme.

The ICAO UAS Toolkit

5.32 The ICAO UAS Toolkit is a repository of information presenting background information and general recommendations, and best practices in the management of UAS operations. It includes information on UAS regulations, training and education and UAS authorization.

5.33 The Toolkit also includes current State regulations for UAS. Contributing States from the Asia/Pacific Region include Australia, Bangladesh, India, Japan, New Zealand, Philippines, Singapore, and Thailand.

5.34 The ICAO UAS Toolkit is available at:

<https://www.icao.int/safety/UA/UASToolkit/Pages/default.aspx>

Other Sources of Information and Guidance on UAS Operations

5.35 Other useful information on the regulation and operation of UAS, together with public education material, is available from the following publicly-available sources:

Australia:

<https://www.casa.gov.au/aircraft/flying-dronesremotely-piloted-aircraft-australia>

Hong Kong, China:

https://www.cad.gov.hk/english/Unmanned_Aircraft_Systems.html

India:

<http://dgca.nic.in/rpas/RPAS-ind.htm>

New Zealand:

<https://www.caa.govt.nz/unmanned-aircraft/>

Singapore:

<https://www.caas.gov.sg/public-passengers/unmanned-aircraft-systems>

Thailand:

<https://www.caat.or.th/en/archives/category/aviation-en/drone-en>

USA:

www.faa.gov/uas

CANSO:

<https://www.canso.org/ansp-considerations-unmanned-aircraft-systems-uas-operations>

IATA:

<https://www.iata.org/whatwedo/safety/Pages/drones.aspx>

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PRINCIPLES FOR THE REGULATION OF UNMANNED AIRCRAFT OPERATIONS IN NATIONAL AIRSPACE

Principles for the Regulation of Unmanned Aircraft Operations

6.1 The regulatory guidance provided in Section 7 of this document is based on the following principles.

Public Benefit

1. The development of regulations for the safe operation of unmanned aircraft should recognize the societal benefits of unmanned aircraft operations and the need to facilitate them in a safe manner.
2. The primary purposes of regulations for the operation of unmanned aircraft are the prevention of collisions with manned aircraft, and to minimize the risk of injury to persons or damage to property.
3. The integration of unmanned aircraft operations in ~~the national airspace system~~ **national airspace systems** should not impact upon the safety, regularity and efficiency of conventional aviation.
4. Regulation should not impose an unreasonable burden or limitation on unmanned aircraft ~~operators~~ **operations**.

Harmonization of Regulations

5. Regulations for the operation of unmanned aircraft should be developed for all unmanned aircraft, and applicable to all persons operating unmanned aircraft, where operations are not covered by regulations responding to ICAO SARPS.
6. Regulatory guidance for the operation of unmanned aircraft should, to the extent possible, be consistent with and avoid duplication of work being undertaken by other ICAO and non-ICAO groups.
7. Regulations for unmanned aircraft should be based on the need for clear articulation across the full range of stakeholders.

~~Integration with the National Airspace System~~ **National Airspace Systems**

8. UAS operations should be integrated into the national airspace system with full consideration of the safety and security of all airspace users.
9. Integration into the national airspace system should be encouraged rather than the proliferation of segregated airspace for unmanned aircraft operations
10. Regulations, and requirements for safety assessments for unmanned aircraft operations, should be developed using a risk-based approach.
11. Performance-based and technology-neutral regulations allow for future technological flexibility.
12. Regulations should safely facilitate reasonable access to controlled airspace.

13. Regulations for the operation of unmanned aircraft operation must ensure integration with the established normal and contingency operating procedures commensurate with the airspace classification.
14. Operational limitations for unmanned aircraft relating to weather conditions should consider the needs of the unmanned aircraft ~~operator~~ operation and the expectations of conventional aviation.
15. Contingency operations by unmanned aircraft should be predictable, programmable and limit interference with other airborne traffic.

Public Information, Education and Training

16. Information on regulations for unmanned aircraft operations should be readily available to the general public, supported by public awareness campaigns.
17. Information on regulations applicable to and the operation of an unmanned aircraft should be provided directly to purchasers of unmanned aircraft at the point of sale.
18. A risk-based approach to regulation of unmanned aircraft operations should include a risk-based approach to education, training and qualification of unmanned aircraft operators and any persons who may operate the controls of the unmanned aircraft or otherwise participate in the operation of an unmanned aircraft.

Compliance

19. All unmanned aircraft, ~~and~~ owners and operators of unmanned aircraft, and persons operating the controls of unmanned aircraft, irrespective of the category of the operation, should be registered.
20. Regulatory guidance for coordination with other relevant authorities and relating to public health, safety and security are should be developed in cooperation with other relevant authorities.
21. Regulatory guidance should include requirements for all relevant aeronautical authorities to establish a means of coordination with other authorities such as law enforcement agencies, military, and local government authorities.

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REGULATORY GUIDANCE FOR THE SAFE OPERATION OF UAS IN ~~THE NATIONAL AIRSPACE SYSTEM~~ NATIONAL AIRSPACE SYSTEMS

General Regulatory Guidance

Definitions

Approved Persons or Organizations

7.1 Regulations should define the meaning of an approved person or organization, typically: a person or organization having appropriate expertise in the design, construction or operation of unmanned aircraft, or appropriate knowledge of airspace designations and restrictions, and who has been approved by the regulatory authority to perform one or more of the following specified functions:

1. Issuing a qualification for the operation of an unmanned aircraft; or
2. Appointing persons to give instruction to ~~operators~~ persons operating the controls of of unmanned aircraft; or
3. Authorizing a person to notify the aeronautical information service provider, for the issue of a NOTAM, of unmanned aircraft operations; or
4. Authorizing the construction and modification of small unmanned aircraft; or
5. Inspecting and approving the construction of small unmanned aircraft; or
6. Authorizing the operation of an unmanned aircraft where authorization is required by the regulations.

Authorities

7.2 Regulations should identify the authority or authorities that may grant or deny any authorization required under the regulations to operate an unmanned aircraft:

1. In controlled airspace;
2. Within a specified distance from the perimeter of a controlled aerodrome, typically 3 NM
3. More than a specified height above ground or mean sea level, typically 400 ft AGL or 200 ft above water or 200 ft AMSL.

Note: The purpose of the specification of a maximum height of operation of unmanned aircraft is, in part, to provide a degree of segregation from conventional flights operating under the Visual Flight Rules (VFR) at a height not below 500 feet above ground level (Annex 2 – Rules of the Air - Section 4.6). In determining the maximum specified height for unmanned aircraft operations, regulations should take cognizance of the human factors and UAS technical limitations in accurately judging or measuring heights of 400 ft AGL (unmanned aircraft operator person operating the controls of the unmanned aircraft and/or UAS technical capability,) or 500 ft AGL (pilot of conventional aircraft).

Some existing State regulations limit the operation of unmanned aircraft to 200 feet above ground or water, except where specifically authorized by the appropriate authority.

4. In or over a prohibited, restricted or danger area, or
5. In areas where a public safety or emergency operation is being conducted
6. In any other circumstance where authorization is required to conduct the operation

Autonomous Mode Operations

7.3 Regulations should define the meaning of *autonomous mode* operations – generally considered to be the operation of an unmanned aircraft on a predefined trajectory or within a pre-defined area, that does not allow ~~operator~~ intervention by the person operating the controls of the unmanned aircraft during all stages of the flight.

7.4 Autonomous mode operations may include *semi-autonomous operations*, wherein the aircraft operates for part or all of its operation without the direct control of the ~~operator~~ person operating the controls of the unmanned aircraft, but ~~the operator may resume direct control~~, but direct control of the unmanned aircraft may be resumed at any time.

7.5 Regulations and any operational authorization by the appropriate authority for autonomous mode operations should specify the circumstances under which autonomous or semi-autonomous operations may be conducted, typically for operations along a pre-defined path or within a pre-defined area, or recovery operations in the event of loss of Command and Control (C2) link.

Controlled Aerodrome

7.6 The regulations should define the meaning of a controlled aerodrome, typically an aerodrome at which air traffic control service is provided to aerodrome traffic (Annex 11 – *Air Traffic Services*).

Controlled Airspace

7.7 The regulations should define the meaning of controlled airspace, typically an airspace of defined dimensions within which air traffic control services is provided in accordance with the airspace classification (Annex 11 – *Air Traffic Services*)

Note: Controlled airspace is a generic term which covers Air Traffic Service airspace classes A, B, C, D or E as described in Annex 11 section 2.6)

Indoors

7.8 Regulations should define indoor UAS operation to mean operations contained within an enclosed environment, and to exclude operations where the roof or one or more walls or barriers are removed.

Observer

7.9 Regulations should define an unmanned aircraft Observer as, typically, a trained and competent person supporting the operation of the unmanned aircraft, and who maintains, at all times when the unmanned aircraft is beyond the visual line of sight of the person operating the controls of the unmanned aircraft:

- a) Sight of the unmanned aircraft;
- b) Sight of the surrounding airspace in which the unmanned aircraft is operating; and
- c) Direct communication with the person operating the unmanned aircraft.

Populous Area/s

7.10 The meaning of populous area should be defined in regulations. Typically, an area is a *populous area* in relation to the operation of an unmanned aircraft if the area has a sufficient density of population for some aspect of the operation, or some event that may occur during the operation (in particular, a fault in, or failure of, the unmanned aircraft) to pose an unacceptable risk to the life, safety or property of somebody who is in the area but is not connected with the operation.

Public Safety Operation

7.11 Any area or locations where fire, police or other public safety or emergency service operation is being conducted.

Shielded Operations

7.12 Regulations may include the concept of a *shielded operation*, meaning an operation of an unmanned aircraft within a specified distance, typically 100 metres, from, and below the top of, a natural or man-made object.

Standard Unmanned Aircraft Operating Conditions

7.13 Regulations should include definition of *standard unmanned aircraft operating conditions*. Typically, the unmanned aircraft is operated:

1. By day;
2. within visual line-of sight (VLOS) of the ~~operator~~ person operating the controls of the unmanned aircraft and/or the observer;
3. in weather conditions that permit continuous maintenance of VLOS
4. The unmanned aircraft is not operated:
 - a) less than 30 m from persons not associated with the operation;
 - b) less than 30 m from any building or structure;
 - c) over populous areas;
 - d) more than a specified height above terrain or water, typically 400 feet AGL or 200 feet above water, or 200 feet AMSL;

~~Note: See note in 7.2 In determining the maximum specified height for unmanned aircraft operations, regulations should take cognizance of the human factors limitations in accurately judging heights of 400 ft. AGL (unmanned aircraft operator) or 500 ft. AGL (pilot of conventional aircraft).~~

~~Some existing State regulations limit the operation of unmanned aircraft to 200 feet above ground or water, except where authorized by the appropriate authority.~~

- e) In or over a prohibited, restricted or danger area;
- f) less than 3 NM from the perimeter any aerodrome or heliport, unless it is a shielded operation; or
- g) In any area where a public safety operation is being conducted.

Visual Line of Sight (VLOS)

7.14 Regulations should define the meaning of *Visual Line of Sight (VLOS)*, typically:

1. A straight line along which ~~an operator~~ a person operating the controls of the unmanned aircraft, or the observer has a clear view and which may be achieved with the use of:
 - a) Unaided eyesight; or
 - b) Spectacles, contact lenses or similar device used to correct subnormal vision of the user to no better than normal vision but not the use of an electronic, mechanical, electromagnetic, optical or electro-optical instrument; and
2. In meteorological conditions that permit the ~~operator~~ person operating the controls of the unmanned aircraft or observer to keep the unmanned aircraft in sight at all times; and
3. Below the cloud base at all times.

Note: Regulations may specify that VLOS operations require a minimum ground visibility and distance from cloud

7.15 Regulations should specify that First Person View (FPV) capability does not meet requirements for operations within VLOS, or for collision detection and avoidance.

General Regulations

7.16 General regulations should set out the requirements for the operation of all unmanned aircraft, including model aircraft.

Types of Unmanned Aircraft

7.17 Types of unmanned aircraft should be included in regulations. Typical unmanned aircraft types may include:

1. Aeroplane;
2. Helicopter;
3. Multi-rotor;
4. Airship; and
5. Powered lift (hybrid aeroplanes with vertical take-off capability).

7.18 Regulations for UAS should not apply to the operation of:

1. A control-line model aircraft (that is, a model aircraft that is constrained to fly in a circle, and is controlled in attitude and altitude, by means of inextensible wires attached to a handle held by the person operating the model; or
2. Unmanned aircraft operated indoors;

7.19 Regulations should define the registration and marking requirements for small UAS.

Note: a centralized UAS registration system is under development by the ICAO RPAS Panel and UAS Advisory Group

7.20 Regulations should include direction that a person must not operate an unmanned aircraft in a way that creates a hazard to another aircraft, another person, or property.

Operation over Populous Areas

7.21 Operation of unmanned aircraft over populous areas should be permitted under the regulations only if certain conditions are met. Typically, the unmanned aircraft:

1. must be operated at a height not less than the height from which, if any of its components fails, it would be able to clear the area; or
2. is equipped with suitable safety devices to mitigate the risk to persons on the ground to an acceptable level; or
3. is specifically authorized by the appropriate authority.

7.22 Regulations for the operation of unmanned aircraft over populous areas should specify the types, and/or weight categories (or other categories, where established) of unmanned aircraft that may operate without specific approval of the appropriate authority. This may include, for example, *Micro* unmanned aircraft.

7.23 The regulations should specify factors to be taken into account by the appropriate authority when considering a request for authorization for operations over populous areas, including, typically:

1. the degree of redundancy of the unmanned aircraft's critical systems;
2. fail-safe design characteristics of the unmanned aircraft;
3. safety devices on to mitigate the risk to persons on the ground to an acceptable level, in the event of component failure; and
4. the security of its communications and navigation systems, and the precautions taken by the ~~unmanned aircraft operator~~ person operating the controls of the unmanned aircraft to prevent the proposed flight being dangerous to people and property.

Operation near People

7.24 Regulations should specify the minimum distance from persons that an unmanned aircraft may be operated. Typically, an unmanned aircraft must not operate within 30 metres of a person (the *second person*) who is not directly associated with the operation of the unmanned aircraft, except where:

1. The second person is standing behind an unmanned aeroplane while it is taking off;
2. The second person has consented to the unmanned aircraft operating not less than 15 metres from the second person; or
3. The unmanned aircraft is an airship and the unmanned airship approaches no closer to the second person than 10 metres horizontally and 30 feet vertically.

Approval for Unmanned Aircraft Operations

7.25 In cases where an approval is required for particular UAS operations, or for the approval of an area as an area for the operation of UAS, the regulations should include details of to which authority the application for approval must be made.

7.26 When developing Regulations relating to the approval of particular UAS operations, the State aviation regulatory authority should coordinate closely with other relevant agencies, such as ANSPs and airport operators.

7.27 The regulations should state that, in considering whether to grant an approval for particular UAS operations or operating areas, the designated authority should take into account:

1. The likely effect on the safety of conventional air navigation of the operation of UAS in the area;
2. The date and time that the approval will be in effect;
3. Any conditions that should be imposed in the interests of safety of air navigation;
4. The need for publication of details of the approval in NOTAM or on an aeronautical chart;
5. Provisions for revocation of the approval or amending its conditions, in the interests of the safety of air navigation; and for publication of details of any revocation or change in NOTAM or on an aeronautical chart; and
6. Provisions for ensuring the contact details held by the appropriate authority for the person responsible for gaining an approval, and for continued compliance with an approval, are kept up-to-date.
7. The qualifications of the UAS owner or operator, **person operating the controls of the unmanned aircraft**, and any **other** persons participating in the operation of the unmanned aircraft.

7.28 In cases where the regulations require a person to give information to the designated authority about the operation, launching or release of an unmanned aircraft, then the regulations should also state:

1. The office or organization to whom/which the information may be provided, e.g. via the NOTAM Office, via an approved organization, or direct to the designated authority;
2. Whether the information must be provided in writing, or may be provided by other means;

3. Provisions for the designated authority or other approved organization identified in sub-regulation 1. to request extra information; and
4. Advance notification requirements.

7.29 Each regulation should state, where appropriate, any penalty that may apply under the laws of the State for non-compliance with the regulation.

Requirements for an Unmanned Aircraft operator certification or authorization

7.30 The regulations should specify the types of operation for which ~~an unmanned aircraft operator certificate~~ certification or authorization of the unmanned aircraft operator and any persons associated with the operation of the unmanned aircraft is required; typically, Category C *Regulated Acceptable Risk* operations as described in paragraphs 7.56 and 7.57.

7.31 The regulations should specify the information that must be provided to the certification or authorization authority in any application for ~~an operator~~ certification or authorization of the ~~unmanned aircraft operator~~ an any person associated with the operation of the unmanned aircraft, typically including:

1. Details of any flight crew licence, air traffic control licence or aeronautical station operator licence held by the applicant, including details of ratings, endorsements and qualifications;
2. Details of any military qualification held by the applicant that is equivalent to a licence mentioned in sub-paragraph 1.;
3. If a licence mentioned in sub-paragraph 1. is not held, details of any aeronautical radio operator certificate held;
4. Details of the applicant's experience in operating unmanned aircraft; and
5. Evidence of the completion of any training in unmanned aircraft operation that has been undertaken by the applicant.

7.32 The regulation should specify any conditions that may be applied to an unmanned aircraft operator certificate, authorization or approval. These may typically include:

1. The type of unmanned aircraft that may be operated;
2. The weight category of the unmanned aircraft that may be operated;
3. The maximum speed at which the unmanned aircraft may be operated;
4. The areas where the unmanned aircraft operation may be conducted;
5. Any requirement to operate unmanned aircraft only in Visual Meteorological Conditions (VMC);

Note: ~~Unmanned aircraft operator~~ The certificate, authorization or approval holder's knowledge of conventional aviation concepts and terminology may be limited. Regulations may require that any ~~operator~~ certificate, authorization or approval specifying operation in VMC details the visibility, cloud base and distance from cloud criteria.

6. The requirement to operate unmanned aircraft only within visual line of sight;
7. The conditions applicable to operating in controlled airspace;
8. The requirement that the any remote crew involved in the unmanned aircraft operation hold the appropriate qualifications for the operation being conducted.
9. Where the ~~operator~~ **operating** certificate or other authorization permits operation of unmanned aircraft beyond visual line of sight, the conditions that must be met, typically:
 - a) The requirement for the operator **and any person operating the controls of the** unmanned aircraft to have passed the relevant aeronautical knowledge, aviation qualification theory or other approved examination; and
 - b) The operation of unmanned aircraft beyond visual line of sight is approved by the appropriate authority.

7.33 The regulations should detail requirements for an applicant to be eligible for the granting of ~~an~~ unmanned aircraft ~~operator~~ **operating** certification, typically if the applicant has passed or completed;

1. An aeronautical knowledge examination for unmanned aircraft ~~operator~~ **operating** certification.
2. The theory component of an unmanned aircraft ~~operator~~ **operating** certificate training course; or
3. The theory component of a course conducted in a foreign country which the appropriate authority is satisfied is the equivalent to the theory component an unmanned aircraft ~~operator~~ **operating** certificate training course; and
4. An unmanned aircraft ~~operator~~ **operations** training course relevant to the category of unmanned aircraft operation; or
5. A specified minimum experience operating an unmanned aircraft under standard unmanned aircraft operating conditions.

7.34 Regulations should detail the conditions under which any ~~operator~~ **operating** certificate, authorization or approval to operate unmanned aircraft may be suspended or cancelled by the appropriate authority.

Public Education

7.35 Education material on regulatory requirements for unmanned aircraft operations should be made readily available to the general public. Regulations should require that education material is included in the packaging, invoice, sales receipt, ~~operator~~ **operating** instructions or other documentation of all unmanned aircraft at the point of sale, and at customs and immigration checkpoints.

Dropping or Discharging of Articles

7.36 The regulations should specify the requirement that nothing may be dropped or discharged from an unmanned aircraft in a way that creates a hazard to another aircraft, a person, or property.

Right of Way

7.37 Regulations should require that the person operating an unmanned aircraft must ensure that the unmanned aircraft gives way to, and remains clear of, all manned aircraft on the ground and in flight.

Weather and Time of Day Limitations for low risk (Category A) operations.

7.38 Regulations should include:

1. The general requirement that unmanned aircraft may only be operated in the daytime, in visual meteorological conditions, except:
 - a. in the case of operations under standard unmanned aircraft operating conditions, or
 - b. where the unmanned aircraft may be operated in VMC specified for aircraft operations below 1000 feet above terrain or 3000 feet AMSL (ICAO Annex 2, Section 3.9), if so prescribed by the regulatory authority; or
 - c. where otherwise authorized by the appropriate authority;
2. the requirement that the unmanned aircraft is operated at all times within the operational limitations for wind velocity, ambient air temperature, and any other conditions, as specified by the manufacturer of the unmanned aircraft or by the appropriate authority; and,
3. Any regulations and associated conditions applicable to any exemption from the general weather, operational conditions and daytime operation requirements.

Maximum Operating Height for low risk operations.

7.39 Regulations should state the requirement for any operation of unmanned aircraft above a specified height above ground or water, typically 400 feet AGL or 200 feet above water, to be conducted only within areas approved under the regulations, or under the permissions granted by an authority designated under the regulations.

~~Note: See note in 7.2.—In determining the maximum specified height for unmanned aircraft operations, regulations should take cognizance of the human factors limitations in accurately judging heights of 400 ft AGL (unmanned aircraft) or 500 ft AGL (pilot of conventional aircraft).~~

~~Some existing State regulations limit the operation of unmanned aircraft to 200 feet above ground or water, except where authorized by the appropriate authority.~~

Operations Near Aerodromes

7.40 Regulations for the operation of unmanned aircraft in the vicinity of aerodromes should typically include:

1. General requirements that operations within a specified distance from the perimeter of the aerodrome, typically 3 nautical miles, require either compliance with a relevant regulation or specific authorization by the relevant authority;

2. The requirement to gain the authorization of the relevant authority for any operation:
 - a) Within the boundary of any aerodrome;
 - b) within the approach or departure path of any runway; and;
 - c) at a height greater than the obstacle limitation surfaces and PANS-OPS protection surfaces of the aerodrome and its associated instrument and visual flight procedures.

Note: ICAO Doc 8168 Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) provides procedures and guidance relating to obstacle limitation surfaces and protection surfaces for flight procedures.

3. The requirement that unmanned aircraft must not be operated in such a manner as to create an obstruction to an aircraft taking off from, or approaching for landing at, a landing area or a runway of an aerodrome, or manoeuvring on any taxiway or apron.
4. Identification of the designated authority for controlled aerodromes (generally ATC), and for any other aerodromes;
5. Details of information to be provided to the designated authority, generally including as a minimum:
 - a) The name and contact details of the operator and the person operating the controls of the unmanned aircraft;
 - b) The flight plan;
 - c) The location of the operation; and
 - d) The registration information of all unmanned aircraft to which the authorization will apply.
6. The requirement for the ~~operator~~ person operating the controls of the unmanned aircraft to comply with any and all conditions imposed by the designated authority.

Operations in Controlled Airspace

7.41 The regulations should specify the conditions under which an unmanned aircraft may be operated in controlled airspace. Typical regulations may include the requirement that a person may only operate an unmanned aircraft in controlled airspace if:

1. The operation is approved by the relevant authority;
2. A relevant qualification or authorization for operations in controlled airspace is held by the ~~unmanned aircraft operator~~ person operating the controls of the unmanned aircraft;
3. The ~~unmanned aircraft operator~~ person operating the controls of the unmanned aircraft maintains a listening watch on the specified frequency; and
4. The ~~unmanned aircraft operator~~ person operating the controls of the unmanned aircraft broadcasts specified information, on the specified frequency, at specified intervals.

7.42 The regulations should define the meaning of *relevant qualification*, *specified frequency*, *specified information* and *specified interval*. Typically:

1. *Relevant qualification* may typically mean any of the following qualifications:
 - a) A flight crew or remote pilot licence or certification;
 - b) An air traffic control licence;
 - c) A military qualification equivalent to a licence or certification mentioned in paragraphs a) or b); or
 - d) An aeronautical station operator licence;
1. *Specified frequency* means the radio frequency specified from time to time in AIP, or by ATC, for information that must be reported or broadcast in the airspace;
2. *Specified information* means information specified from time to time in AIP, or by ATC, as information that must be reported or broadcast in the airspace; and
3. *Specified interval* means the interval specified from time to time in AIP, or by ATC, as the interval at which broadcasts must be made while in that airspace.

Segregated Airspace for UAS Operations

7.43 Regulations should include requirements for any segregated airspace that may be established for UAS operations including:

1. Approved persons or organizations that may request the segregation of airspace for UAS operations;
2. The types of operations for which segregated airspace may be considered;
3. safety assessments of the segregated UAS operations;
4. Operations over populous areas, near people or buildings;
5. Flexible Use of Airspace (FUA); and
6. Promulgation of details of the segregated airspace by NOTAM or AIP amendment.

Autonomous Mode Operations

7.44 Regulations should state the requirement for authorization by the relevant authority for any planned or contingency operation of unmanned aircraft in autonomous mode, and compliance with any conditions of the authorization.

Operation of Unmanned Aircraft Beyond Visual Line of Sight

7.45 Regulations should specify any requirements applicable for operation of unmanned aircraft beyond visual line of sight. Such regulations may typically include:

1. The requirement for a specific approval issued by the appropriate authority for any operation of an unmanned aircraft beyond visual line of sight;

2. Height limitations above ground level, above water or mean sea level;
3. Distance limitations from the ~~operator~~ person operating the controls of the unmanned aircraft;
4. Requirements for the unmanned aircraft to be equipped with position fixing and reporting capability for operations in controlled airspace and other specified areas;
5. Requirements for the unmanned aircraft to be equipped with position fixing and geo-fencing capability enabling the exclusion of the operation from areas specified by the designated authority;
6. Requirements relating to the reliability and availability of the command and control (C2) link between the unmanned aircraft and its ~~operator~~ control unit;
7. Requirements for any autonomous mode or degraded mode operation in the event of C2 link failure or outside the communications range of the ~~operator~~ unmanned aircraft control unit; and
8. Requirements for safe landing and recovery in the event of degraded performance of the unmanned aircraft

Registration and Identification

7.46 Regulations should require registration of all unmanned aircraft in a database maintained by the appropriate authority. Minimum registration details should include:

1. The details of the owner of the unmanned aircraft;
2. The unmanned aircraft type, weight and maximum velocity;
3. The make, model and manufacturer's serial number of the unmanned aircraft; and
4. The cargo capacity, if any, of the unmanned aircraft.

7.47 Regulations should specify the identification markings to be applied to the unmanned aircraft. Typical regulations for unmanned aircraft identification include:

1. The requirement that all unmanned aircraft carry an identification mark;
2. the requirement that the markings be applied to an external surface, i.e.:
 - a) are not concealed within battery, payload or other compartments; and
 - b) do not require the removal of any hatch or panel in order to be viewed; and
3. the size, colour and contrast of the identification markings.

Categories of Unmanned Aircraft Operations

7.48 A risk-based approach to regulating unmanned aircraft operations should be implemented, defining the following categories of unmanned aircraft operations:

Category A – Low Risk Category UAS Operations

Category B – Regulated Minimal Risk Category UAS Operations

Category C – Regulated Acceptable Risk UAS Operations

UAS Operations in Category A

7.49 Regulations should define *Category A – Low Risk Category UAS Operations* as those that may be operated without licences, ~~operator~~ **operating** certificates or similar permissions, and with no requirement for authorization. Typically, such operations:

1. are unlikely to result in a fatality or cause serious injury to persons or damage to property on the ground;
2. do not require authorization by the regulatory authority or other approved organization delegated by the regulatory authority to approve UAS operations, except for operations:
 - a. within any prohibited, restricted or danger area, unless authorized by the appropriate authority; or
 - b. in any area where a public safety operation is being conducted, unless authorized by the appropriate authority.
3. are conducted only in airspace that is not normally used by other conventional aircraft;
4. **require basic registration of the unmanned aircraft and the particulars of the operator and any person operating the controls of the unmanned aircraft;**
5. require that educational material detailing the limitations for Category A operations is provided at the point of sale.

7.50 Typically, Category A operations are limited to unmanned aircraft that are:

1. MICRO unmanned aircraft (typically weighing less than 250 grams including any payload); or
2. VERY SMALL unmanned aircraft (typically weighing 250 grams or more, but less than 7 kilograms, including any payload), if it is being operated:
 - a. ~~for the purpose of sport or recreation;~~
 - b. outside controlled airspace; and
 - c. in standard unmanned aircraft operating conditions; or
3. SMALL unmanned aircraft (typically weighing 7 kilograms or more, but less than 25 kg, including any payload) if it is being operated:

- d. outside controlled airspace; and
- e. Over water, or over land owned or occupied by the owner of the unmanned aircraft, or with the permission of the land owner or occupier; and
- f. In standard unmanned aircraft operating conditions; and
- g. For the purposes of one or more of the following, subject to other applicable regulations:
 - i. Sport or recreation;
 - ii. Aerial spotting;
 - iii. Aerial photography;
 - iv. Aerial communications retransmission;
 - v. The carriage of cargo; or
 - vi. Any other activity that is similar to any activity mentioned above; and
 - vii. Operate at low speed, typically not greater than 20 knots, except when operated ~~indoors or~~ in segregated airspace established for the purpose of the operation.

Note: Other weight category terminology should be considered for regulation of unmanned aircraft operations where appropriate to local understanding, for example; NANO in lieu of MICRO, MICRO in lieu of VERY SMALL. Regulations may also define unmanned aircraft operations by weight, without any associated descriptive terminology.

7.51 Category A unmanned aircraft operations may also include the operation of micro, very small or small unmanned aircraft outside controlled airspace and in standard unmanned aircraft operating conditions by:

- 1. A person for the sole purpose of meeting any experience requirement for the granting of any operating authorization or permission; or
- 2. A person holding an operating authorization or permission for the purpose of gaining competency in the operation of the specific type of unmanned aircraft.

UAS Operations in Category B

7.52 Regulations should typically define Category B or *regulated minimal risk* UAS operations as those that:

- 1. are unlikely to result in a fatality or cause serious injury to persons or damage to property on the ground;
- 2. ~~require the unmanned aircraft to carry a basic identification mark;~~
- 3. require that the operator and any person operating the controls of the unmanned aircraft complies with published regulations relevant to the operation;

4. require that the operator and any person operating the controls of the unmanned aircraft receives education or information on relevant basic aspects of conventional aviation and airspace management, obstacle limitation surfaces and PANS-OPS protection surfaces, and on regulations related to category B operations;
5. do not require authorization by the regulatory authority or other organization designated by the regulatory authority to approve UAS operations; and
6. may operate in airspace that may normally be used by other conventional aircraft, subject to observance of standard limitations specified in the regulations.

7.53 Typical conditions for Category B operations may include operation:

1. By very small or small unmanned aircraft;
2. Outside controlled airspace;
3. In standard unmanned aircraft operating conditions
4. Below the obstacle limitation surfaces and PANS-OPS protection surfaces associated with any aerodrome;
5. When operating within 3 NM of any aerodrome located outside controlled airspace and where ATS is not provided;
 - a) Outside the aerodrome boundary; and
 - b) In VMC;
6. Not over populous areas;
7. outside any prohibited, restricted or danger area, unless authorized by the appropriate authority;
8. not in any area where a public safety operation is being conducted, unless authorized by the appropriate authority;
9. not less than 30 metres clear of any person who is not directly associated with the operation of the unmanned aircraft, except when;
 - a) the person is standing behind the unmanned aircraft while it is taking off; or
 - b) the person has consented to the unmanned aircraft operating within 30 metres; and
 - i. the unmanned aircraft is operated not less than 15 m from the person; or
 - ii. the unmanned aircraft is an airship and the unmanned airship approaches no closer to the person than 10 metres horizontally and 30 feet vertically.

7.54 Regulations for Category B unmanned aircraft operations should specify a maximum velocity, typically 40 knots or 80 km/h.

UAS Operations in Category C

7.55 Regulations should define Category C or *regulated acceptable risk* category UAS operations as those that:

1. May not be conducted under Categories A or B;
2. Require specific authorization by the regulatory authority or other organization delegated by the regulatory authority to approve UAS operations;
3. Require the operator to have an appropriate organizational structure and safety management system in place;
4. require that the operator has demonstrated, to the satisfaction of the regulatory authority, or by other approved organization, satisfactory knowledge of technical and operational aspects of unmanned aircraft operations approved by the regulatory authority;
5. may operate in airspace that may normally be used by other conventional aircraft, including controlled airspace and near or over aerodromes, subject to the conditions of the authorization.

7.56 Typically, authorization of Category C UAS operations specifically may require the operation to be limited to unmanned aircraft that:

1. require a specific authorization on a case-by-case basis for the carriage of hazardous biological or chemical materials, or any object that may potentially cause serious injury or fatality, or damage to property, in the event of failure or degraded operation of the UAS or in-flight release of its payload;
2. may not, by design or by operator intention, drop or release any object except in the case of the planned delivery of payload, in accordance with the authorization and subject to an appropriate safety assessment;
3. carry a clearly discernible registration mark assigned from a national UAS registration database or other suitable database, as determined by the regulatory authority;
4. carry and operate, when in controlled airspace, and in all cases of operation greater than a specified height above terrain, typically 400 feet AGL or 200 feet above water or 200 feet AMSL;
 - a) an appropriate navigation light; and, where required by the regulatory authority;
 - b) a functioning SSR transponder, ADS-B transmitter or other equipment for the purpose of identification and tracking of the unmanned aircraft by other airspace users and ATS; and
 - c) collision detection and avoidance capability compatible with the normal use of the airspace concerned;

Note: The regulatory authority or other organization approved by the regulatory authority to authorize UAS Category C operations must be satisfied that the SSR transponder, ADS-B transmitter or other equipment carried for the purpose of identification and tracking the unmanned aircraft is maintained and tested to a suitable standard, by an appropriately authorized maintenance organization.

Note: See note in 7.2

5. For any operations in autonomous mode or beyond visual line-of-sight, are equipped with geo-fencing or similar navigational technology to remain within airspace or areas, and on routes, specified in the authorization;
6. Do not operate above the obstacle limitation surface and PANS-OPS protection surfaces of aerodromes or heliports for which instrument flight procedures are published, except when directly authorized to do so by the ATS unit responsible for the aerodrome or heliport and associated terminal airspace;
7. Do not operate in any area where a public safety operation is being conducted, unless authorized by the appropriate authority;
8. Are operated by a person or persons who have demonstrated, through an appropriate examination or other testing process administered by the regulatory authority, or administered by an organization approved by the regulatory authority, satisfactory knowledge of:
 - a) technical aspects of the unmanned aircraft including:
 - i. flight duration and endurance management;
 - ii. the impact of environmental factors such as ambient air temperature, precipitation and other weather phenomena on the operation of the unmanned aircraft, its remote control unit and the command and control link;
 - iii. command and control link function, radio frequency requirements, range limitations and relevant propagation characteristics;
 - iv. unmanned aircraft behaviour in the event of degradation or failure of the command and control link;
 - v. unmanned aircraft behaviour in the event of degradation or failure of motor power, propellers or other devices providing thrust necessary for flight;
 - vi. management of autonomous flight operations, if any;
 - b) operational, procedural and safety aspects of Category C UAS operations including:
 - i. identification of controlled airspace, aerodromes, heliports, obstacle limitation surfaces and PANS-OPS obstacle protection surfaces, Special Use Airspace (SUA), and locations where public safety operations are being conducted;

- ii. communications with ATS and compliance with ATS instructions; and
- iii. ATS response to unmanned aircraft contingencies.

Responsibilities of Approved Persons or Organizations

7.57 Regulations should define the meaning of *authorities*, *approved persons or organizations*. Typically, a person or organization having appropriate expertise in the design, construction or operation of unmanned aircraft, or appropriate knowledge of airspace designations and restrictions, and who has been approved by the regulatory authority to perform one or more of the following specified functions:

1. Issuing a qualification for operation of an unmanned aircraft; or
2. Appointing persons to give instruction ~~to operators~~ **on the operation** of unmanned aircraft; or
3. Authorizing a person to notify the appropriate ATS unit/s of unmanned aircraft operations; or
4. Inspecting and approving the construction, modification or maintenance of unmanned aircraft.

Contingency Procedures

Unmanned Aircraft Operating Contingencies

7.58 Regulations should include requirements that contingency plans and procedures be established for non-normal unmanned aircraft operations including:

1. Degraded engine performance, flight control or stability;
2. Degraded battery or fuel endurance;
3. Operations of duration close to the limit of battery or fuel endurance;
4. Navigational error;
5. Loss or degradation of any equipment carried for the purpose of identification and tracking of the unmanned aircraft by other airspace users and ATS
6. Any damage to airframe or propulsion components, particularly if there is increased likelihood of a component, or part thereof, separating from the unmanned aircraft in flight;
7. Loss or degradation of the command and control (C2) link including an out-of-range “fly-away” event; and
8. Degraded or failed remote control unit function.

7.59 Regulations and authorizations for Contingency plans and procedures for Category B and Category C unmanned aircraft operations should include requirements for:

1. Built-in fail-safe system/s for terminating the flight including safe landing and recovery of the unmanned aircraft in the event of degraded performance of the unmanned aircraft or C2 link, or loss of the C2 link; and
2. Contingency return-to-base trajectories for unmanned aircraft operating in autonomous mode:
 - a) As specified in the authorization; or
 - b) remaining not more than a specified height above ground or water;
 - c) not less than a specified distance from the boundary of any operational aerodrome;
 - d) remaining clear of all other manned and unmanned aircraft, including the use of collision detection and avoidance capability compatible with the airspace classification;
 - e) remaining clear of prohibited, restricted or danger areas; and
 - f) not over populous areas;
3. Reporting of any degradation or failure of performance, navigation or C2 link to the appropriate authority:
 - a) Immediately, for operations in controlled airspace subject to authorization by ATC; and
 - b) As soon as practicable, in all other cases.

ATS and Airport Contingency Response to Unmanned Aircraft

7.60 Regulations should include requirements for ATS and airport authorities to develop procedures for contingency response by ATS, airport operators and the operator or person operating the controls of an unmanned aircraft, to:

1. unauthorized unmanned aircraft operating:
 - a) in controlled airspace;
 - b) less than a specified distance from the perimeter of a controlled aerodrome, typically 3 NM;
 - c) on or over an aerodrome; or
 - d) within a prohibited, restricted or danger area, in coordination with the administering authority; and
2. authorized unmanned aircraft:
 - a) operating in an area, on a trajectory, or at a height or altitude, other than authorized;

- b) operating in autonomous mode after failure of the C2 link; or,
- c) operating in a degraded mode, or has failed.

7.61 Regulations should include requirements for the provision of notification of unmanned aircraft contingency events to airspace users, and consideration of airspace user risk assessments in the contingency response.

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APPENDIX A**PROCESS ADOPTED BY INDIA FOR EXCLUDING OPERATIONS OF UNMANNED AIRCRAFT NEAR AERODROMES AND FOR GRANTING EXEMPTION FOR OPERATORS IN NO DRONE ZONES (NDZ)****1 REGULATION**

1.1 India published Civil Aviation Requirements (CAR) Section 3, Series X, Part-I dated 27 August 2018 on “*Requirements for Operation of Civil Remotely Piloted Aircraft System (RPAS)*” which became applicable on 1 December 2018.

1.2 The provisions contained in the CAR shall be enforced through a digital application called Digital Sky. The CAR stipulates that all UAS operations, except for Nano Category of RPAS (MTOW of 250 gm or less) intending to operate up to 50 ft (15 m) AGL in uncontrolled airspace or enclosed premises, shall obtain permission through Digital Sky Platform before undertaking the flight.

1.3 Digital Sky application ensures that UAS operation can be conducted only in approved areas. Areas where UAS operations are not permitted will be marked as RED Zones in Digital Sky. A special feature called No Permission No Take-off (NPNT) will require the operator to upload a digital permission file issued by Digital Sky to the flight controller of the UAS before the UAS can start the engines. This feature, coupled with geo-fencing requirements of the UAS, ensures that UAS operations are always confined within approved areas.

2 ESTABLISHMENT OF NO DRONE ZONES (NDZ) AROUND AERODROMES

2.1 The CAR stipulates that no RPA shall be flown:

- a) Within a distance of 5 km from the perimeter of airports at Mumbai, Delhi, Chennai, Kolkata, Bengaluru and Hyderabad;
- b) Within a distance of 3 km from the perimeter of any civil, private or defence airports, other than those mentioned in (a); and
- c) Above the Obstacle Limitation Surfaces (OLS) or PANS-OPS surfaces, whichever is lower, of an operational aerodrome, specified in Ministry of Civil Aviation (Height Restrictions for Safeguarding of Aircraft Operations) Rules, 2015 notified through Gazette of India notification GSR751(E) as amended from time to time.

2.2 The CAR also requires that all UAS operations in Controlled Airspace shall be approved by the concerned ATC unit, irrespective of the category of UAS or their operating altitude.

2.3 The provisions of the CAR described in 2.1 and 2.2 above will ensure that operation of UAS in the Very Low Level (VLL) airspace is effectively segregated from the flight paths of manned aircraft.

3 PROCESS FOR GRANTING EXEMPTION FOR UAS OPERATION IN NDZ

3.1 DGCA may authorise UAS operation in NDZ around airports for specific operations, on case-to-case basis, subject to adequate justification provided by the applicant for safe conduct of UAS operations. Such operations shall be conducted in coordination with the airport operator and the concerned ATC unit.

APPENDIX B

EXAMPLES OF PROCESSES FOR AUTHORIZATION OR EXCLUSION OF OPERATIONS NEAR AERODROMES

UNITED STATES OF AMERICA/FEDERAL AVIATION ADMINISTRATION

1. United States Code 14 Part 107.41, *Operations in certain airspace*, states that “no person may operate a small unmanned aircraft in Class B, Class C, or Class D airspace or within the lateral boundaries of the surface area of Class E airspace designated for an airport unless that person has prior authorization from Air Traffic Control (ATC).” The method by which the Federal Aviation Administration is meeting this requirement is through issuing airspace authorizations.

<https://www.ecfr.gov/cgi-bin/text-idx?SID=e331c2fe611df1717386d29eee38b000&mc=true&node=pt14.2.107&rgn=div5>

2. Airspace authorizations are issued through one of two methods, either processed through the automation process or manually processed.
 - a. Authorizations through Automation Process
 - i. Application under the automated process are submitted through the Low Altitude Authorization and Notification Capability (LAANC - pronounced “lance”), a collaboration between FAA and Industry, directly supporting UAS integration into the airspace.
 - ii. LAANC provides access to controlled airspace near airports through near real-time processing of airspace authorizations below approved altitudes in controlled airspace.
 - iii. LAANC automates the application and approval process for airspace authorizations. Through automated applications developed by an FAA Approved UAS Service Suppliers (USS) through which pilots apply for an airspace authorization.
 - iv. Requests are checked against the Unmanned Aircraft System Facility Maps (UASFM) as well as multiple other airspace data sources in the FAA UAS Data Exchange such as temporary flight restrictions and NOTAMS. If approved, pilots receive their authorization in near-real time.
 - v. LAANC is available at nearly 300 air traffic facilities covering approximately 500 airports. If someone desires to fly in controlled airspace near airports not offering LAANC, they are required to use the manual process to apply for an authorization.
 - vi. Approved requests are valid only for the day and time period (daylight operations only) requested. LAANC currently does not have the capability to process request involving night time operations.
 - vii. Request for night time operations are handled through the manual processing method until modification to LAANC can be made incorporating night time operations.
 - viii. Additional information on LAANC is available at https://www.faa.gov/uas/programs_partnerships/data_exchange/
 - b. Authorizations through Manual Process
 - i. Applications under the manual process are submitted through the FAA UAS Portal called DroneZone at: <https://faadronezone.faa.gov/#/> and processed by FAA staff offices at the FAA Air Traffic Organization Service Centers. https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/mission_support/sc/

- ii. Requests are manually checked against UASFMs to determine if the requested altitudes are in compliance with the altitudes listed on the UASFMs.
 - iii. If the requested altitudes are not in compliance with the UASFMs the request must be coordinated directly with the impacted air traffic control facility to determine if the request could be approved, if additional safety mitigations are included in the approval.
 - iv. Pilots receive notification of the FAA's final decision through the DroneZone website.
 - v. Approved requests are valid only for the day and time period requested with a period requested.
 - vi. Depending on the complexity of the application and the current workload a manually processed application can take anywhere from 60 to 90 days to process and approve.
- c. Unmanned Aircraft System Facility Maps (UASFM)
- i. Processing of both methods of authorizations (Automated and Manual) are based on altitudes listed in the UAS Facility Maps (UASFM) (Fig. 1), developed by the air traffic control facilities managing the airspace in that geographic area. UASFMs depict the maximum altitudes that the FAA may grant controlled airspace access for Part 107 operations, without conducting additional direct coordination with the impacted ATC facility.
 - ii. These maps depict the maximum altitudes that offices (other than ATC facilities) may grant access to operating areas and altitudes around airports in controlled airspace without additional coordination with the air traffic control facilities managing that airspace.
 - iii. It's important to understand that the UASFMs themselves do not authorize operations, they are used as a job aid to assist in streamlining the authorization process. In order to fly, the requester must obtain an authorization either through the automated or manual process.
 - iv. The FAA publicly released the UASFMs to help inform authorization requestors about where they are more likely to get authorization to operate allowing remote pilots to tailor their requests to align with locations and altitudes that the maps show. Maps are available at:
<https://faa.maps.arcgis.com/apps/webappviewer/index.html?id=9c2e4406710048e19806ebf6a06754ad>

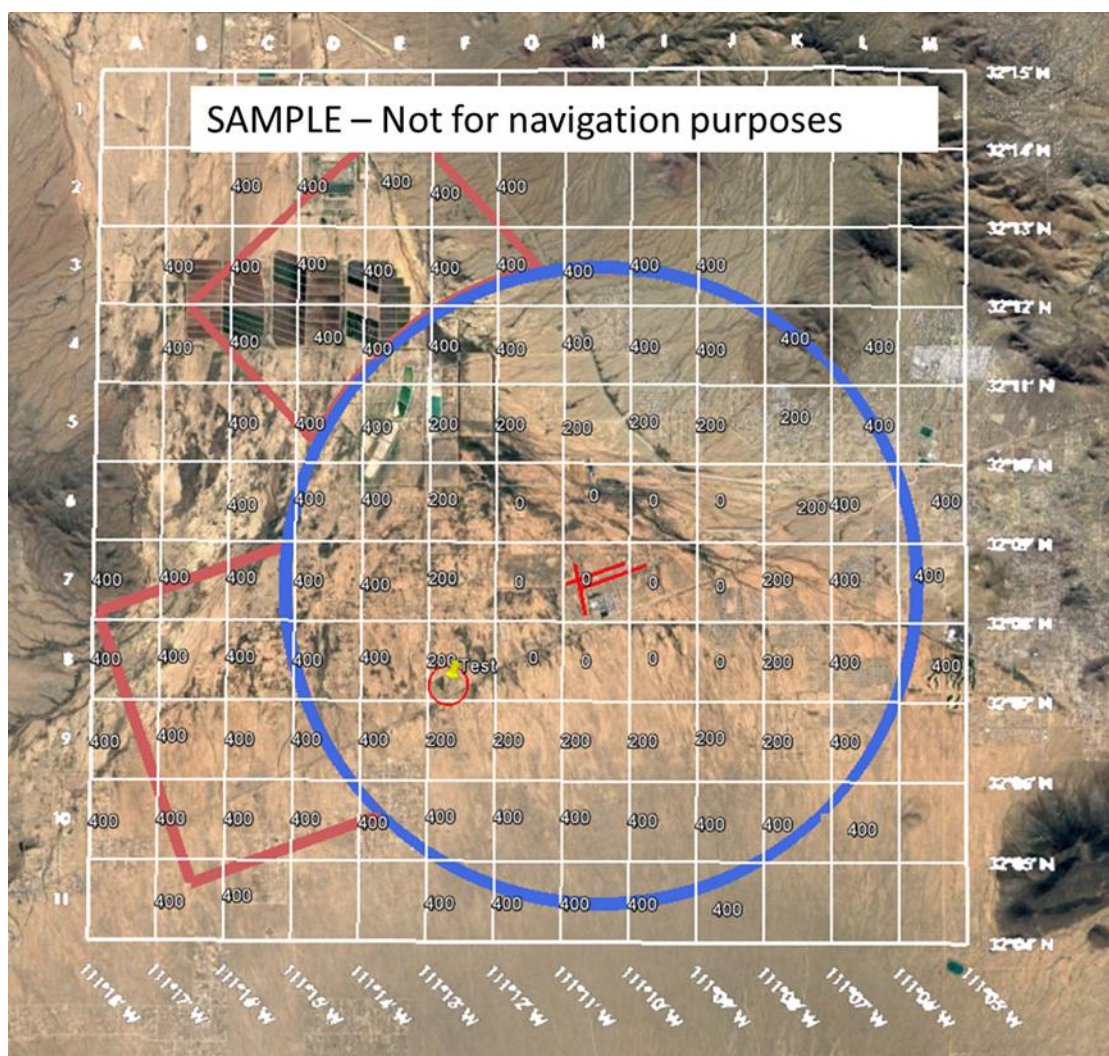


Figure 1. Sample UAS Facility Map

d. Sample Application 1 for using UASFM

- i. Requester Information: Company Name: UAS Flyer 1; Location: 32° 7'11.48"N 111°12'41.48"W; Operational Area: ¼ mile radius; Altitude Requested: At or below 125' AGL; Closest Airport: Ryan Field (RYN), Arizona; Operations Description: Conduct aerial photography above a construction site.
- ii. Figure 2 shows the same map that is shown in Figure 1, but a zoomed in view in order to see the detail on the map as well as the requested location of the operation. The red circle indicates the ¼ mile radius for the operation. It's important to notice that the request radius actually goes into two different grid squares. You'll also notice a value in each square which is the altitude that the facility has provided as part of their UAS facility map. In this case, the facility has indicated that in each of the requested squares that 200' AGL is the highest altitude that an operation should occur without having to conduct additional coordination with the air traffic control facility managing the airspace. Since in the Sample 1 application, UAS Flyer 1 is requesting to operate at or below 125' AGL this application could be approved without additional coordination.

Once the application is approved a copy of the authorization is sent to the requestor as well as to the air traffic control facility for their awareness.

- iii. Under the small UAS rule the air traffic control facility has no separation requirements, but a contact number for the UAS operator is contained in the approval so the facility can contact them if needed.

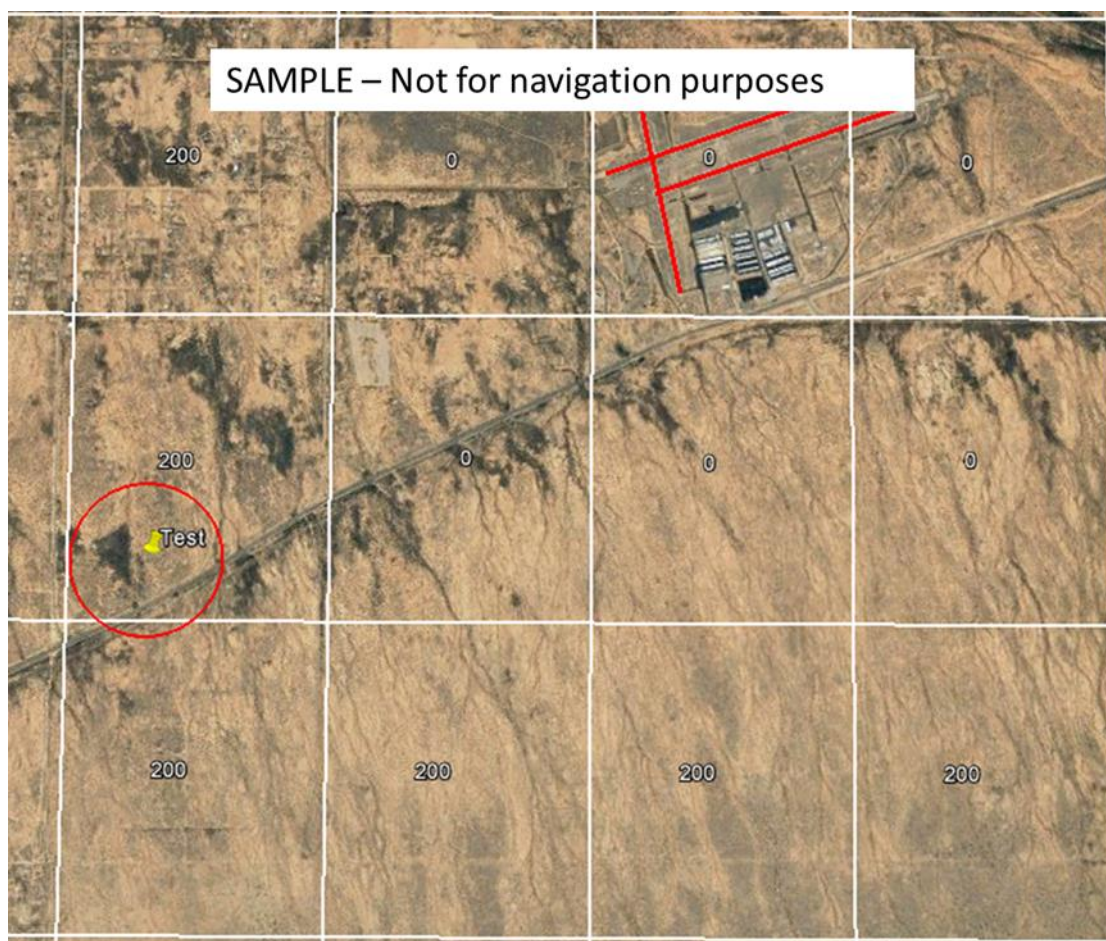


Figure 2. Sample UAS Facility Map Zoomed In View, Application 1 for using UASFM

e. Sample Application 2 Using UASFM

- i. Requester Information: Company Name: UAS Flyer 1; Location: 32° 7'11.48"N 111°12'41.48"W; Operational Area: ¼ mile radius; Altitude Requested: At or below 300' AGL; Closest Airport: Ryan Field (RYN), Arizona; Operations Description: Conduct aerial photography above a construction site.
- ii. Figure 3 shows the same map that is shown in Figure 1, but a zoomed in view in order to see the detail on the map, as well as the requested location of the operation. The red circle indicates the ¼ mile radius for the operation. It's important to notice that the request radius actually goes into 2 different grid squares. You'll also notice a value in each square which is the altitude that the facility has provided as part of their UAS facility map. In this case, the facility has indicated that in each of the requested squares 200' AGL is the highest altitude that an operation should occur without having to conduct additional coordination with the air traffic control facility managing the airspace. Since in the Sample 2 application UAS Flyer 1 is requesting at or below 300' AGL this application could not be approved without additional coordination with the impacted air traffic control facility.
- iii. After additional coordination with the impacted air traffic control facility there are several different results that could happen with the application including:
 - 1. Approved as requested with no additional safety mitigations.

2. Approved as requested with additional safety mitigations (e.g. contact tower before start of operations, monitor tower frequencies during operation, etc.).
3. Approved with modifications to the request (e.g. remain at or below 250' AGL)
4. Disapproval

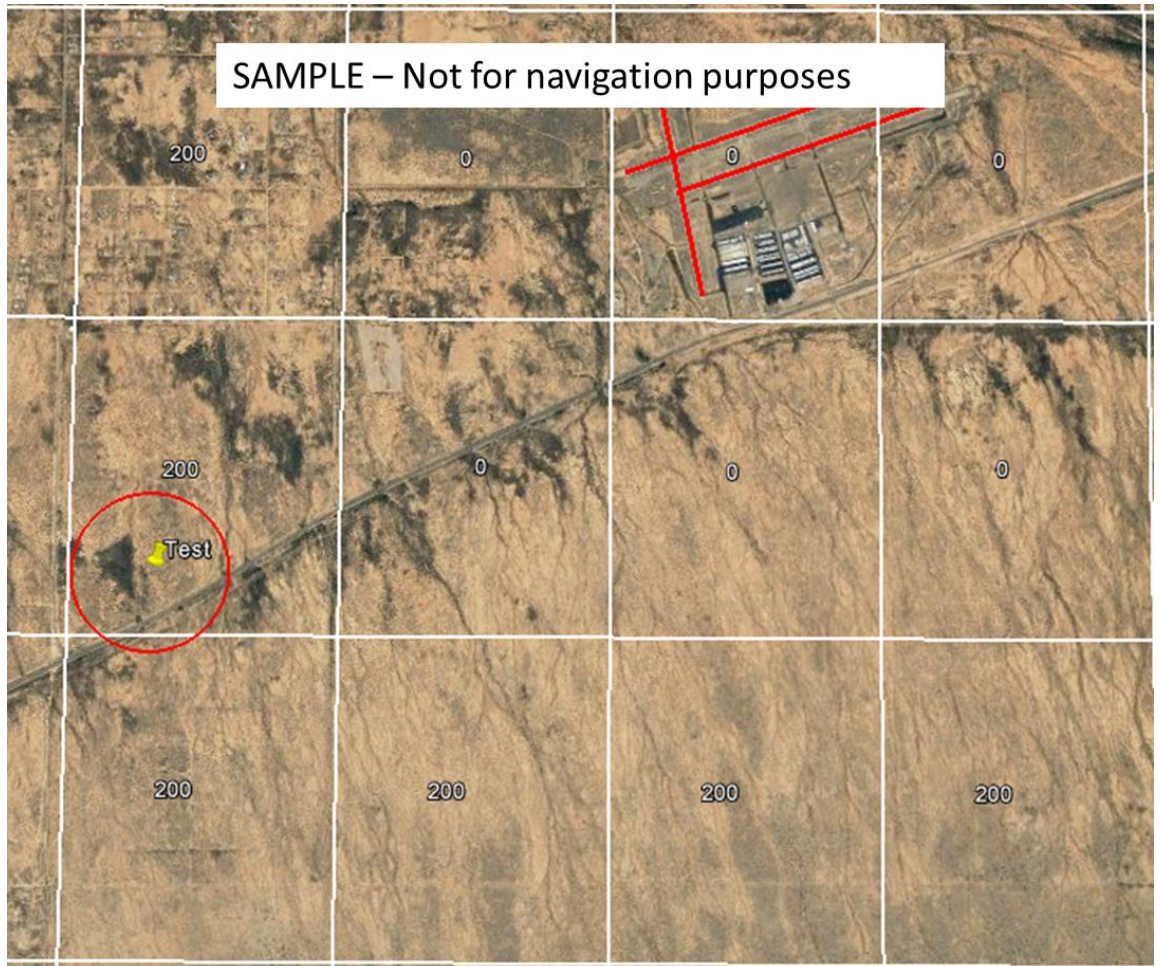


Figure 3. Sample UAS Facility Map Zoomed-In View Example Application 2 for using UASFM

PROPOSED APAC NOTAM TEMPLATES FOR FUA

Scenario 1 – CDR 1: Route close

NOTAM Format 1.1:

(Series and number/year NOTAMN
Q) FIR/ NOTAM code/ Traffic/ Purpose/Scope/ Lower Limit/ Upper Limit/
Coordinates, Radius
A) LCTN indicator B) From (date-time-group) C) To (Perm or date-time-
group)
D) Time schedule
E) CDR 1 [Route designator] [significant point - significant point]
CLSD [due to xxxx]
F) Lower Limit G) Upper Limit)

Example 1.1:

(A0001/18 NOTAMN
Q) EDGG/QANLC/I/NBO/E/350/660/4931N00739E049
A) EDGG B) 18050231500 C) 18050231630
E) CDR 1 UZ210 KRG - NOSAP CLSD DUE TO MIL ACT
F) FL350 G) FL660)

Scenario 2 – CDR 1: Route not plannable (category change)

NOTAM Format 2.1:

(Series and number/year NOTAMN
Q) FIR/ NOTAM code/ Traffic/ Purpose/Scope/ Lower Limit/ Upper Limit/
Coordinates, Radius
A) LCTN indicator B) From (date-time-group) C) To (Perm or date-time-
group)
D) Time schedule
E) CDR 1 [Route designator] [BTN significant point AND significant
point] CHANGE TO CDR 3 REF AIP ENR 3.2
F) Lower Limit G) Upper Limit)

Example 2.1:

(A0002/18 NOTAMN
Q) LFMM/QANLC/I/NBO/E/350/660/4931N00739E049
A) LFMM B) 1805231500 C) 1805231630
E) CDR 1 UM984 KOLON - GANGU CHANGE TO CDR3)

Scenario 3 – CDR 2: State plannable time period and/or altitude range

NOTAM Format 3.1: individual NOTAM per time period / altitude range

```
(Series and number/year NOTAMN
Q) FIR/ NOTAM code/ Traffic/ Purpose/Scope/ Lower Limit/ Upper Limit/
Coordinates, Radius
A) LCTN indicator B) From (date-time-group) C) To (Perm or date-time-
group)
D) Time schedule
E) CDR 2 [Route designator] ACT
F) Lower Limit G) Upper Limit)
```

Example 3.1:

```
(A0003/18 NOTAMN
Q) RJJJ/QANCA/I/NBO/E/000/999/3310N14118E999
A) RJJJ B) 1805011500 C) 1805012100
E) CDR 2 Z29 ACT
F) F290 G) UNL)
```

NOTAM Format 3.2: summary NOTAM

```
(Series and number/year NOTAMN
Q) FIR/ NOTAM code/ Traffic/ Purpose/Scope/ Lower Limit/ Upper Limit/
Coordinates, Radius
A) LCTN indicator B) From (date-time-group) C) To (Perm or date-time-
group)
E) CDR ACT AS FLW:
[Route designator1] [Time schedule from1]-[Time schedule to1] [Lower
limit1]-[Upper Limit1]
[Route designator2] [Time schedule from2]-[Time schedule to2] [Lower
limit2]-[Upper Limit2]
...
[Route designatorn] [Time schedule fromn]-[Time schedule ton] [Lower
limitn]-[Upper Limitn])
```

Example 3.2:

```
(A0004/18 NOTAMN
Q) RJJJ/QANCA/I/NBO/E/000/999/3310N14118E999
A) RJJJ B) 1804302100 C) 1805012100
E) CDR ACT AS FLW:
Z29 1804302100-1805012000 MEA-UNL
Z31 1805011500-1805012100 MEA-UNL
Z32 1805011500-1805012100 MEA-UNL
Z34 1805011500-1805012100 MEA-UNL)
```


Scenario 4 – Temporary Segregated Area

NOTAM Format 4.1: individual NOTAM per time period / altitude range

```
(Series and number/year NOTAMN
Q) FIR/ NOTAM code/ Traffic/ Purpose/Scope/ Lower Limit/ Upper Limit/
Coordinates, Radius
A) LCTN indicator B) From (date-time-group) C) To (Perm or date-time-
group)
D) Time schedule
E) Temporary Segregated Area [Name] ACT
F) Lower Limit G) Upper Limit)
```

Example 4.1:

```
(B0051/18 NOTAMN
Q) LECB/QRTCA/IV/BO/W/000/240/4148N00211E003
A) LECB B) 1805020600 C) 1806221800
E) Temporary Segregated Area 31 ACT
F) SFC G) 4000FT AMSL)
```

NOTAM Format 4.2: summary NOTAM

```
(Series and number/year NOTAMN
Q) FIR/ NOTAM code/ Traffic/ Purpose/Scope/ Lower Limit/ Upper Limit/
Coordinates, Radius
A) LCTN indicator B) From (date-time-group) C) To (Perm or date-time-
group)
E) Temporary Segregated Area ACT AS FLW:
[Name1] [Time schedule from1]-[Time schedule to1] [Lower limit1]-[Upper
Limit1]
[Name2] [Time schedule from2]-[Time schedule to2] [Lower limit2]-[Upper
Limit2]
...
[Namen] [Time schedule fromn]-[Time schedule ton] [Lower limitn]-[Upper
Limitn])
```

Example 4.2:

```
(B0006/18 NOTAMN
Q) LECB/QRTCA/IV/BO/W/000/040/4148N00211E003
A) LECB B) 1805020600 C) 1805021800
E) Temporary Segregated Area ACT AS FLW:
Temporary Segregated Area 31 1805020600-1805021800 SFC-4000FT AMSL
Temporary Segregated Area 32 1805020900-1805021800 SFC-4000FT AMSL)
```

Scenario 5 – Temporary Reserved Area

NOTAM Format 5.1:

(Series and number/year NOTAMN
Q) FIR/ NOTAM code/ Traffic/ Purpose/Scope/ Lower Limit/ Upper Limit/
Coordinates, Radius
A) LCTN indicator B) From (date-time-group) C) To (Perm or date-time-
group)
D) Time schedule
E) Temporary Reserved Area [Name] ACT
F) Lower Limit G) Upper Limit)

Example 5.1:

(B0007/18 NOTAMN
Q) EGPX/QRMCA/I/NBO/E/000/999/3310N14118E999
A) EGPX B) 1804301700 C) 1804301930
E) Temporary Reserved Area 007A ACT DUE TO MIL TRAINING
F) FL195 G) FL245)

Scenario 6 – Cross Border Area

NOTAM Format 6.1:

(Series and number/year NOTAMN
Q) FIR/ NOTAM code/ Traffic/ Purpose/Scope/ Lower Limit/ Upper Limit/
Coordinates, Radius
A) LCTN indicator B) From (date-time-group) C) To (Perm or date-time-
group)
D) Time schedule
E) [Cross-Border Area Name] ACT
F) Lower Limit G) Upper Limit)

Example 6.1:

(B0008/18 NOTAMN
Q) LFFF/QRRCA/IV/BO/W/065/999/4950N00441E24
A) LFFF B) 1805090630 C) 1805091600
E) LF-Cross Border Area 16B ACT
F) FL065 G) UNL)

Attachment A: Proposed Amendment to Asia/Pacific Regional Plan for Collaborative AIM

Insert new paragraphs:

Beijing Declaration

1.8 The *Declaration of the Asia/Pacific Ministerial Conference on Civil Aviation* (Beijing Declaration, Beijing, China, 31 January to 01 February 2018), included the following items indicating the direction agreed by the Ministers responsible for civil aviation in the Asia/Pacific Region in relation to AIM planning and implementation:

2.0 Air Navigation Services

2.1 *Commit to implementation by 2022 of the Asia/Pacific Seamless Air Traffic Management (ATM) Plan to enhance ATM capacity and harmonization in the Region, including a focus on:*

(a) *Transitioning from Aeronautical Information Service (AIS) to Aeronautical Information Management;*

(g) *Air navigation in national planning frameworks such as National Development Plans (NDPs) supported by National Air Navigation Plans*

4.0 Human Resource Development

4.1 *In line with the ICAO initiative on “Next Generation of Aviation Professionals” (NGAP), accord priority to professionals to support the Region’s growing needs, including where appropriate:*

(a) *Establish access to quality training; and*

(b) *Encourage sharing of resources bilaterally and/or multi-laterally, as well as with industry partners*

1.9 The commitments agreed in the Beijing Declaration are supported by performance expectations in Section 7 of this document.

Re-number subsequent paragraphs.

Amend paragraphs:

Performance Improvement Plan

1.151.17 The performance objectives of the Plan are expected to be implemented in phases aligned, where practicable, with those of the Seamless ANS Plan. Having considered a range of performance expectations including those relating ICAO Standards and Recommended Practices (SARPS) and Procedures for Air Navigation Services (PANS) that have been applicable for many years, Regional AIM Capability is expected to be implemented in the following phases:

- Phase I, expected to be implemented immediately;

- Phase II, expected to be implemented by 7 November 2019, and
- Phase III, expected to be implemented by ~~1 December 2022 (to be developed)~~ 27 November 2025.

~~1.17~~1.19 Except where required under State obligations to implement SARPS and relevant regional requirements communicated in the ANP, the phases and performance expectations are not binding any State, but should be considered as a planning framework. The Plan itself is therefore guidance material. Where any performance expectation has been included to emphasize the obligation of States to implement ICAO SARPS and PANS, reference is made to the relevant sections of Annex 15 or PANS-AIM.

Amend paragraph as follows:

~~1.19~~1.21 Noting that the Asia/Pacific Seamless ANS Plan undergoes its routine review each three years including 2019, and that the Global Air Navigation Plan (GANP), together with its Aviation System Block Upgrades (ASBUs) is also reviewed each three years including 2019, it is therefore intended that AAITF conducts a complete review of the Plan in ~~2019~~ 2020, and thence every three years, in alignment with the update cycle of the Seamless ANS Plan and GANP. Reviews should include examination of relevant new or amended ICAO Annexes, PANS and guidance material to ensure the minimization of duplication, and alignment with global direction.

Amend paragraph:

Performance Improvement Plan

3.8 A key feature of the Plan is the Performance Improvement Plan which, ~~in this version of the Plan, is~~ was initially, in version 1.0 of the Plan, aligned with Phases 1 and 2 of the ICAO Roadmap for Transition from AIS to AIM, supporting States in the transition to digital databases of aeronautical information and the implementation of electronic AIP (eAIP). The Performance Improvement Plan is arranged in Regional AIM Capability Phases I and II, II and III, listing fundamental AIS performance elements expected to be implemented either immediately (Phase I), particularly in the case of elements that have been reflected ICAO SARPs for many years, or by 7 November 2019 (Phase II), or ~~1 December 2022~~ 27 November 2025 (Phase III).

Delete paragraph:

~~3.9 A third phase of the Performance Improvement Plan, aligned with Roadmap Phase 3 – Information Management, will be developed by AAITF and included in a future update of the Plan.~~

Insert new paragraphs

Global AIM Implementation Dashboards

3.10 ICAO Headquarters is developing a scheme of dashboards to monitor and report global, regional and State progress in AIM implementation. The dashboards will include the implementation status of:

1. Quality Management Systems;
2. World Geodetic System – 1984 (WGS-84);

3. Earth Gravitational Model – 1996 (EGM-96); and

4. Terrain and Obstacle Datasets.

3.11 The Performance Improvement Plan in Section 7 of this document includes performance expectations in each of these areas.

BACKGROUND INFORMATION

Delete paragraphs and table, and renumber subsequent tables accordingly:

ICAO Roadmap for Transition from AIS to AIM

5.5 The ICAO Roadmap for Transition from AIS to AIM introduces and develops on the AIM concept and associated performance requirements by providing a basis upon which to manage and facilitate, on a worldwide basis, the transition from AIS to AIM.

5.6 The Roadmap includes a number of project steps for the transition to AIM, arranged into three implementation phases. The three phases and the project steps included in them are summarized in **Table 1**.

ROADMAP PHASE	ROADMAP STEPS	Expected Implementation
PHASE 1 <i>Consolidation</i>	P-03 — AIRAC adherence monitoring	November 2010
	P-04 — Monitoring of States' differences to Annex 4 & 15	
	P-05 — WGS-84 implementation	
	P-17 — Quality	
PHASE 2 <i>Going Digital</i>	P-01 — Data quality monitoring	November 2013
	P-02 — Data integrity monitoring	
	P-06 — Integrated aeronautical information database	
	P-07 — Unique identifiers	
	P-08 — Aeronautical information conceptual model	
	P-11 — Electronic AIP	
	P-13 — Terrain	
	P-14 — Obstacles	
	P-15 — Aerodrome mapping	
PHASE 3	P-09 — Aeronautical data exchange	November 2016

<i>Information Exchange</i>	P-10 — Communication networks	
	P-12 — Aeronautical information briefing	
	P-16 — Training	
	P-18 — Agreements with data originators	
	P-19 — Interoperability with meteorological products	
	P-20 — Electronic aeronautical charts	
	P-21 — Digital NOTAM	

Table 1: Phases and Project Steps of the Roadmap for Transition from AIS to AIM.

5.7 Asia/Pacific Regional progress in AIM transition is measured against the implementation of Roadmap steps, reported to the ICAO Asia/Pacific Regional Office at least once each year and recorded in the AIS Transition table, available on the Regional Office website eDocuments web page at:

<https://www.icao.int/APAC/Pages/edocs.aspx>.

Add new paragraph:

5.5 The ASBU are undergoing a major re-structure, which will be presented for approval at the 40th Triennial ICAO Assembly, to be held in Montreal, Canada, from 24 September to 04 October 2019. Future amendment of this document will include relevant ASBU references, and any related regional priorities and performance expectations.

Amend paragraph:

Current Status of Transition from AIS to AIM AIS/AIM Implementation – USOAP Audit

6.5 Analysis of PQs which are related with the four priority steps from AIM transition roadmap. The following summarizes the Asia/Pacific Regional implementation performance in the four priority areas of AIRAC adherence, monitoring of States' differences to Annex 4 and Annex 15, WGS-84 implementation, and quality management:

- The four priority transition steps are: P-03 AIRAC Adherence Monitoring, P-04 Monitoring of States' differences to Annex 4 and Annex 15, P-05 WGS-84 implementation, and P-17 Quality.
- Analysis of PQs related with the four priority steps above.

PQ 7.309: Does the State ensure that the Aeronautical Information Regulation and Control (AIRAC) system is used to notify the establishment, withdraw and premeditated significant changes of circumstances listed in accordance with Chapter 6 and Appendix 4 Part 2 of Annex 15?

- Associated AIM Transition Step: P-03: AIRAC Adherence Monitoring
- Average Effective Implementation (EI) of PQ 7.309 for APAC region is 83%.

PQ 7.011: Has the State implemented procedures for amending its ANS specific regulations as well as for identifying and notifying differences, taking into consideration ICAO provisions and their amendments?

- ~~Associated AIM Transition Step: P 04: Monitoring of States' differences to Annex 4 and Annex 15~~
- Average Effective Implementation (EI) of PQ 7.011 for APAC region is **46%**.

PQ 7.109: If the State has initiated the implementation of performance-based navigation (PBN), are the prescribed navigation specifications appropriate to the level of communication, navigation and air traffic services? (Where applicable, review documented evidences that the safety of the system is assured with WGS-84 implementation)

- ~~Associated AIM Transition Step: P 05: WGS-84 implementation~~
- Average Effective Implementation (EI) of PQ 7.109 for APAC region is 79%.

PQ 7.311: Has the State established a mechanism to ensure that aeronautical data quality **requirements** related to publication resolution and data integrity are in accordance with the provisions of Annex 15, Appendix 7, Tables A7-1 to A7-5? (CE-5)

PQ 7.359: Has the State established a mechanism to ensure that aeronautical data quality requirements related to the data integrity and charting resolution are in accordance with the provisions of Tables 1 to 6 in Appendix 6 of Annex 4? (CE-5)

PQ 7.267: Does the State ensure that a properly organized quality management system in the AIS has been established? (CE-7)

- Average Effective Implementation (EI) of PQ 7.311 for APAC region is **43%**.
- Average Effective Implementation (EI) of PQ 7.359 for APAC region is **49%**.
- Average Effective Implementation (EI) of PQ 7.267 for APAC region is **54%**.
- ~~Associated AIM Transition Step: P 17: Quality~~

Add new paragraph:

PERFORMANCE IMPROVEMENT PLAN

Structure of the Performance Improvement Plan

7.4 The performance improvement Plan includes performance expectations based on relevant implementation steps from the ICAO Roadmap for Transition from AIS to AIM.

REGIONAL AIM CAPABILITY PHASE I

Expected to be implemented immediately

Legislation, Policy and Regulations

Renumber and Amend paragraph:

7.47.5 States should develop policy, and enact primary legislation and supporting regulations for Annex 4 and Annex 15 SARPS, and PANS-AIM Procedures, including:

- i. Establishment of an organizational structure for the safety oversight of aeronautical information service providers;
- ii. Requirements for monitoring of differences from Annex 4 and Annex 15 SARPS;
- iii. Requirements for aeronautical information/data originators;
- iv. Requirement for AIS quality management systems and processes to be established by all entities in the end-to-end AIS data chain.

Add new paragraph:

7.6 National Air Navigation Plans developed in accordance with the Beijing Declaration, and the provisions of the Asia/Pacific Seamless ANS Plan, should include the implementation planning for each of the performance expectations of the Regional Plan for Collaborative AIM.

Renumber subsequent paragraphs as necessary:

7.57.7 AIS should be established either as a separate entity within or, ideally, separated from the civil aviation administration in accordance with the guidance provided in ICAO Doc 8126 – AIS Manual Chapter 3.

Human Performance

7.67.8 Competency requirements for AIS personnel should be developed, including English language proficiency requirements, supported by a program of regular performance assessment.

7.77.9 Regular programs of engagement with all stakeholders should be established, including education on:

- i. State, organization and individual obligations under the Chicago Convention;
- ii. State Legislation and State Regulations;
- iii. AIM-related ICAO Annexes to the Chicago Convention, Procedures for Air Navigation Services and guidance material.

Quality Management

Amend paragraph:

7.87.10 Quality management systems processes for aeronautical information services, as are required to be established under the SARPS in Annex 15¹, ~~should be developed and implemented~~ should include processes for:

- i. Data quality monitoring;
- ii. AIRAC adherence monitoring; and
- iii. Quality checking

Add new paragraph:

7.11 Formal agreements, as required to be established between AIS providers and aeronautical data originators under the relevant SARPS in Annex 15², should specify the content, quality, maintenance and timing of the provision of aeronautical data that is required to be promulgated in AIP, and the quality management process that shall be applied.

Re-number paragraph:

AIM Systems

7.97.12 Full access to relevant ICAO Annexes and Documents should be provided to all personnel having responsibility for the origination, reception, management, publication and/or distribution of aeronautical information and aeronautical data.

Add new paragraphs:

7.13 States should ensure full compliance of all aeronautical information products³ with the following common reference systems in accordance with the relevant SARPS and procedures in Annex 15 and PANS-AIM⁴:

¹ Annex 15 *Aeronautical Information Services* Section 3.6

² Annex 15 Section 2.15

³ Annex 15 defines *Aeronautical Information Products* as aeronautical data and aeronautical information provided either as digital data sets or as a standardized presentation in paper or electronic media, including AIP (including Amendments and Supplements), AIC, aeronautical charts, NOTAM and digital data sets.

⁴ Annex 15 Section 1.2, and Doc 10066 *Procedures for Air Navigation Services – Aeronautical Information Management* (PANS-AIM) Section 2.1

- i. Horizontal reference system – *World Geodetic System 1984 (WGS-84)*;
- ii. Vertical reference system – Mean Sea Level (MSL) datum and Earth Gravitational Model – 1996 (EGM-96);
- iii. Temporal reference system – UTC.

REGIONAL AIM CAPABILITY PHASE II

Expected to be implemented by 7 November 2019

Add new paragraph:

Legislation, Policy and Regulations

7.14 Policy, primary legislation and supporting regulations for Annex 4, Annex 15 SARPS and PANS AIM should be adapted as necessary to support transition to AIM, including:

- i. Requirements for the implementation of digital databases of aeronautical information, from which digital data sets may be generated;
- ii. Requirements for production of electronic AIP and other Aeronautical Information Products⁵ derived from digital databases of aeronautical information.

Human Performance

Re-number and amend paragraphs as follows:

~~7.10~~7.15 Training, competency development and performance assessment of AIS personnel should be adapted as necessary to the needs of transition to AIM, including ~~aeronautical information exchange, the establishment and maintenance of digital databases and generation of data sets of aeronautical information, data quality management systems, and electronic AIP, electronic charting and digital NOTAM.~~

Quality Management

~~7.11~~7.16 Quality management systems should be implemented and maintained encompassing all functions of an aeronautical information service.

Delete paragraph:

~~7.12 Formal agreements should be established between AIS providers and aeronautical data originators specifying the content, quality, maintenance and timing of the provision of aeronautical data that is required to be promulgated in AIP, and the quality management process that shall be applied.~~

⁵ Annex 15 defines *Aeronautical Information Products* as aeronautical data and aeronautical information provided either as digital data sets or as a standardized presentation in paper or electronic media, including AIP (including Amendments and Supplements), AIC, aeronautical charts, NOTAM and digital data sets.

AIM Systems

Add new paragraph:

7.17 All Administrations should establish and maintain digital databases of aeronautical information as specified in PANS-AIM Appendix 1 Aeronautical Data Catalogue Tables A1-1 to A1-10, where applicable.

7.18 Terrain~~and~~, Obstacle and Aerodrome Mapping Data should be managed through the establishment of:

- i. A terrain database, from which terrain data sets conforming with Annex 15 Section 5.3.3.3 may be generated;
- ii. An obstacle database, from which obstacle data sets conforming with Annex 15 Section 5.3.3.4 may be generated; and
- iii. An aerodrome mapping database, from which aerodrome mapping data sets conforming with Annex 15 Section 5.3.4 may be generated.

Re-number paragraph:

~~7.13~~7.19 All Administrations should implement internet-accessible electronic AIP generated from a digital database of aeronautical information.

REGIONAL AIM CAPABILITY PHASE III

Amend paragraph:

Expected to be implemented by ~~1 December 2022~~ 27 November 2025

Add new paragraphs:

Legislation, Policy and Regulations

7.21 Policy, primary legislation and supporting regulations for Annex 4 and Annex 15 SARPS, and PANS AIM procedures, should be adapted as necessary to support the automated exchange of aeronautical data in a SWIM environment, including requirements for:

- i. Interoperability with meteorological products;
- ii. Communications networks for the exchange of aeronautical data; and
- iii. Electronic aeronautical charts.

Human Performance

7.22 Training, competency development and performance assessment of AIS personnel should be adapted as necessary to support the automated exchange of aeronautical data in a SWIM environment, and the generation of electronic aeronautical charts.

AIM Systems and Processes

7.23 All Administrations should

- i. exchange digital data sets of aeronautical information in a SWIM environment, aligned with ASBU DAIM-B2/1.
- ii. provide Aeronautical Information briefing with integrated meteorological information; and
- iii. provide Electronic aeronautical charts.

Note 1: The Asia/Pacific Seamless ANS Plan PASL Phase III includes the expectation that ATM systems should be supported by digitally-based NOTAM aligned with ASBU DAIM-B1/7, replacing paper product-based NOTAM with digital NOTAM.

Note 2: Aeronautical briefing with integrated meteorological information, and electronic charts, are subject to the review of the ICAO Roadmap for Transition from AIS to AIM.

Delete paragraph:

~~To be developed~~

.....

REGIONAL AIM PLAN MONITORING AND REPORTING FORM
AIM PERFORMANCE INDICATORS

The following indicators are based on the Performance Improvement Plan of the Asia/Pacific Regional Framework for Collaborative AIM, which should be read in conjunction with this form. The information provided will be used by the relevant Regional bodies to assess individual Administration and overall regional compliance with the AIM Plan and may be used by Administrations to internally evaluate their implementation status.

INSTRUCTIONS

1. Use the drop-down menu corresponding to each question.

2. Forward the completed form in MS Excel format to apac@icao.int.

Indicate whether your administration has:

Regional AIM Capability Phase I

1	Developed policy and enacted primary legislation and supporting regulations for Annex 4 and Annex 15 SARPS, and PANS-AIM Procedures including:	
1a	establishment of an organizational structure for the safety oversight of aeronautical information service providers;	0%
1b	requirements for monitoring of differences from Annex 4 and Annex 15 SARPS;	0%
1c	requirements for aeronautical information/data originators;	0%
1d	requirement for AIS quality management systems and processes to be established by all entities in the end-to-end AIS data chain.	0%
2	Ensured National Air Navigation Plans include implementation planning for each of the performance expectations of the Regional Plan for Collaborative AIM.	0%
3	Established AIS either as a separate entity within, or separated from the civil aviation administration.	0%
4	Developed competency requirements for AIS personnel, including English language proficiency requirements, supported by a program of regular performance assessment.	0%
5	Established regular programs of engagement with all stakeholders.	0%
6	Established quality management processes for aeronautical information.	0%
7	Established formal agreements between AIS providers and aeronautical data originators.	0%
8	Provided full access to relevant ICAO Annexes and Documents to all personnel having responsibility for the reception, management, publication and/or distribution of aeronautical information and aeronautical data.	0%

ATM/SG/7
Appendix J to the Report

9	Ensured compliance of all aeronautical products with common reference systems WGS-84, MSL/EGM-96 and UTC	0%
	<u>Regional AIM Capability Phase II</u>	
10	Adapted policy, primary legislation and supporting regulations to support digital data sets of aeronautical information and associated products	0%
11	Adapted training, competency and performance assessment of AIS personnel for digital data sets and eAIP	0%
12	Implemented and maintained quality management systems encompassing all functions of the AIS	0%
13	Established and maintained digital databases of aeronautical information (PANS-AIM Appendix 1)	0%
14	Managed terrain, obstacle and aerodrome mapping data through the establishment of:	
14a	a terrain database, from which terrain data sets conforming with Annex 15 Section 5.3.3.3 may be generated	0%
14b	an obstacle database, from which obstacle data sets conforming with Annex 15 Section 5.3.3.4 may be generated	0%
14c	an aerodrome mapping database, from which aerodrome mapping data sets conforming with Annex 15 Section 5.3.4 may be generated	0%
15	Implemented internet-accessible electronic AIP generated from digital database of aeronautical information	0%
	<u>Regional AIM Capability Phase III</u>	
16	Adapted policy, primary legislation and supporting regulations to support automated exchange of aeronautical data in a SWIM environment	0%
17	Adapted competency development and performance assessment of AIS personnel to support the automated exchange of aeronautical data and production of electronic charts in a SWIM environment.	0%
18	Commenced aeronautical information exchange through digital data sets, integrated briefing and electronic charts in a SWIM environment.	0%
		0%

GADSS ADT Phase Basic Guidance

Purpose and Scope

1.1 This Guidance Material is intended to provide basic information on the Autonomous Distress Tracking (ADT) as part of the ICAO Global Aeronautical Distress and Safety System (GADSS).

1.2 The key stakeholders of this phase are:

- Air Navigation Service Providers (ANSPs);
- Aircraft Operators;
- ADT Service Providers; and
- Search and Rescue (SAR).

1.3 It should be noted that ADT Service Providers had not yet been determined. The providers of Automatic Dependent Surveillance-Broadcast (ADS-B) surveillance systems and Cospas-Sarsat were potential ADT providers, but the requirements for an autonomous power source for the airborne distress tracking component would need to be taken into account as current ADS-B systems may not meet this requirement.

ICAO OPS Control Directory

2.1 An online OPS Control Directory portal had been established at <https://www4.icao.int/opsctrl> by ICAO, to assist the implementation of the Annex 6 Aircraft Tracking standard which became applicable on 8 November 2018. It is provided to facilitate communication and exchange of information between air operators and ANSPs. It also provides a link to a map depicting ANSP surveillance where position reports are received at less than 15 minute intervals to assist air operators with meeting Aircraft Tracking requirements.

Autonomous Distress Tracking (ADT)

2.2 There are two high-level functional objectives for an ADT system. These are to:

- a) receive timely notice of an aeroplane in a distress condition to facilitate timely SAR operations, and
- b) locate an accident site with high probability after a crash based on last known position of the aircraft.

2.3 The ADT function would be used to identify the location of an aircraft in distress with the aim of establishing, to a reasonable extent, the location of an accident site within a 6 NM radius. The accuracy of position information shall, as a minimum, meet the position accuracy requirements established for Emergency Locator Transmitters (ELTs).

2.4 It is important to note that there was not expected to be many ADT-generated notifications at the beginning of operations. From 1 January 2021 the Standards and Recommended Practices (SARPs) of ICAO Annex 6 – *Operation of Aircraft, Part I – International Commercial Air Transport – Aeroplanes* (11th Edition, July 2018):

- a) mandated that newly manufactured aircraft over 27,000 kg maximum certificated take-off mass to autonomously transmit information from which a position can be determined by the operator at least once per minute when the aircraft is in distress;

- b) recommend the same requirement be applicable for defined aircraft over 5,700 kg maximum certificated take-off mass; and
- c) require the aircraft operator to make the position information of a flight in distress available to Air Traffic Services Units (ATSUs), Rescue Coordination Centres (RCCs) and any additional entity as established by the State of the Operator.

2.5 The ADT capability requires the automatic triggering and transmission of distress data when the aircraft enters a state which, if left uncorrected, is likely to result in the crash of the aircraft. Aircraft position information will be transmitted automatically at least once every minute when the aircraft is in a distress condition. The initial transmission shall commence immediately or no later than five seconds after the detection of the activation event. Pilots may also manually activate the ADT. The ADT will only be able to be deactivated by the same mechanism that activated it.

Distress Tracking Data Repository (DTR)

2.6 The GADSS Concept of Operations (CONOPS) identified the need to collect, store and provide access to ADT data to notify and assist appropriate stakeholders such as ATSUs and RCCs to locate an aircraft in distress and enhance SAR and recovery capabilities. A centrally managed data repository, the DTR, is considered the preferred means to enable this.

2.7 The DTR is planned by ICAO as a secure web-based storage facility where aircraft ADT data will be communicated and stored to enable the last known position of an aircraft in distress, or potential distress, to be available to authorized stakeholders in a timely manner.

2.8 DTR stakeholders will include DTR Administrators, Contributors and Users. Users will have read-only access. RCCs, as DTR Users, will need to subscribe as an authorized user to access ADT data in the DTR. Other Users will have access to available information according to their profile. For example, Air Operators will only have access to ADT data for their aircraft and ANSPs to ADT data within their Flight Information Region (FIR) and within a planned area 80 NM outside the FIR boundary.

2.9 Subscribers will receive a notification whenever new ADT information relevant to them arrives in the DTR. Subscribers will then need to look in the DTR to access the ADT data. Subscription will be voluntary.

2.10 States will determine who will have access to the DTR data as this is potentially sensitive. For example, an airline will only have access to its own aircraft, and ATSUs will only be able to access information within, or close to their area of responsibility.

End of Flight Localization

2.11 SAR experts had stressed the value of the 121.5 MHz homing signal from real SAR incident experience, as the ADT system had not yet determined whether the 121.5 MHz ELT homing feature would be retained.

Operational Considerations

2.12 Existing Annex 11 and Annex 12 SARPs between ATSUs and RCCs remain unchanged.

2.13 The ADT system was not intended as a distress alerting system like ELTs. It was intended as a means to identify and notify a distress, or potential distress, condition.

2.14 Upon the triggering of an ADT transmission, the aircraft operator was responsible for validation of the transmission and initial checks, if possible, including attempted contact with the aircraft to confirm the situation. The aircraft operator would then notify the relevant ATSU of the results including if a false activation. The ATSU will declare an emergency phase as appropriate and notify the relevant RCC per existing Annex 11, Chapter 5, *Alerting Service*.

2.15 DTR notifications would be sent to all affected DTR subscribers. Typically an initial ADT notification would go to the aircraft operator and the ATSU and RCC associated with the aircraft's position. This was one of the reasons why the establishment of clear areas of responsibility with non-overlapping or separated SRR boundaries was a priority.

2.16 Notwithstanding the responsibility of the aircraft operator, it was highly likely that the responsible ATSU and RCC could already be aware of an in-flight emergency for that aircraft by other alerting means and have already initiated a response. Aircraft operators, ATSUs and RCCs would need to ensure their staff understand each other's roles, responsibilities and processes to ensure clear communication and coordination to avoid, where possible, conflicting effort and unnecessarily increasing workload; hence special training and awareness programmes would be necessary.

Note – States may consider this as part of meeting the expectations of Preferred SAR Capability Specification (PSCS) 7.4 (h) of the ICAO Asia/Pacific SAR Plan, which states that all States should facilitate a programme of regular liaison visits between relevant RCCs, ATC units and airline operating centres in order to understand those organizations, facilities and capabilities.

2.17 More detailed information on GADSS and Global Tracking Initiatives is at the following ICAO HQ webpage: <https://www.icao.int/safety/globaltracking/Pages/Homepage.aspx>.

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INTERNATIONAL CIVIL AVIATION ORGANIZATION



ASIA/PACIFIC SEARCH AND RESCUE (SAR) PLAN

Version 2.3 August 2019

This Plan was developed by the Asia/Pacific Search and Rescue Task Force (APSAR/TF) and the Asia/Pacific Search and Rescue Work Group (APSAR/WG)

Approved by APANPIRG/30 and published by the
ICAO Asia and Pacific Office, Bangkok

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SCOPE OF THE PLAN

Plan Structure

1.1 The Asia/Pacific Search and Rescue (SAR) Plan (hereinafter referred to as the 'Plan') references different levels. At the higher level are global requirements established by the ICAO Annex 12 to the ICAO Convention on International Civil Aviation (ICAO Doc 7300). Global guidance material is provided by the International Maritime Organization (IMO) and ICAO's joint publication, the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual. Beneath this is regional planning guidance primarily provided by this Plan and other regional guidance material, in order to enable States to define the goals and means of meeting objectives for State planning towards improving State SAR System capability, such as Regional Air Navigation Plan (RANP, ICAO Doc 9673) objectives.

1.2 The global air navigation perspective is guided mainly by the *Global Air Navigation Plan* (GANP, Doc 9750), the *Global ATM Operational Concept* (Doc 9854) and the *Global Aviation Safety Plan* (GASP).

1.3 The scope of the Plan is the identification of:

- the current status of SAR preparedness of Asia/Pacific Region States and State SAR arrangements; and
- recommendations for SAR planning and preparedness enhancements, in terms of compliance with Annex 12 of the ICAO Convention, IAMSAR Manual guidance, and accepted best international practice.

1.4 References in the Plan to 'States' are intended to include Special Administrative Regions and territories.

Plan Review

1.5 As an iterative process, the Plan requires regular updating to keep current with changes in ICAO Annexes and guidance material, outcomes from the ICAO-IMO JWG-SAR, the IAMSAR manual, regional aviation activity, developments in the Air Traffic Management (ATM) system, new technology, political considerations, human performance and lessons learned from actual SAR responses. Plan updates should also focus on the SAR system being an important component of an integrated regional and global air navigation system. It is intended that APANPIRG and its contributory bodies conduct a complete review every three years from 2019 (or a shorter period determined by Asia/Pacific Air Navigation Planning and Implementation Regional Group - APANPIRG) of the Plan to align with the review cycle of the GANP and the IAMSAR Manual. The review should be guided by a consultative process involving States and relevant International Organisations and technical bodies.

OBJECTIVES

Introduction

2.1 Asia/Pacific States who are signatories to the Chicago Convention accept the responsibility for the provision of SAR services per the requirements of Annex 12 – *Search and Rescue*. Increases in both aviation and maritime traffic throughout the Asia/Pacific region places additional importance on the ability for States to be adequately prepared for potentially increased demand for aeronautical and maritime SAR services.

2.2 The world's citizens, who frequently fly over or sail through the Asia/Pacific, expect a timely and adequate SAR response to be provided should it be required. States in the region need to be adequately prepared for the provision of efficient and effective SAR services. To assist in achieving this, it is essential for States to cooperate, collaborate and in some cases assist with resources to neighbouring and sub-regional RCCs.

2.3 ICAO Regional Office maintains a record, as reported to ICAO by the States themselves, of the status of individual State SAR compliance against Annex 12 requirements. There are significant variations in the level of State SAR capability across the region with significant gaps requiring urgent action, especially in oceanic areas. A number of States have not reported their status at all to ICAO. The ICAO Universal Safety Oversight Audit Programme – Continuous Monitoring Approach (USOAP-CMA) also provides a useful tool to States to self-assess their individual SAR system status. Since the establishment of this Plan, there had already been commendable improvements to the SAR systems of some States which have contributed to building better regional SAR capability. However, there was still considerable work required to address capability gaps.

2.4 There is a high risk of negative consequences to a State which does not provide an adequate SAR response to an aircraft or vessel in distress. The primary concern is the higher probability for loss of lives which may have been saved. The ability for news to spread rapidly in today's technologically connected world also provides the opportunity for a poor or ineffective SAR response to quickly reach a global audience resulting in damage to that State's reputation internationally and potential economic loss to sensitive State industries such as tourism and transport. However, the benefits of an effective and reliable SAR service to States offers many advantages. Besides reduction of loss of life and human suffering, other advantages include the following aspects.

- a) Safer and more secure environment for aviation and maritime related industries, commerce, recreation and travel. Increased safety may promote use and enjoyment of aviation and maritime environments, tourism and economic development. This is especially true when the SAR system utilised programmes aimed at preventing or reducing the effects of mishaps, sometimes referred to as 'Preventative SAR'.
- b) Availability of SAR resources often provides the initial response and relief capabilities critical to saving lives in the early stages of natural and man-made disasters. SAR services offer an integral part of local, national and regional emergency management systems.
- c) Well performed SAR operations can provide positive publicity about situations which may otherwise be viewed negatively. This can lead to improved public confidence in that State's reputation and commitment to providing a safe environment, leading to increased confidence to conduct activities beneficial to that State's economy.
- d) As SAR is a relatively non-controversial and humanitarian mission, it provides an excellent opportunity to enhance cooperation and communication in general between States and organisations, not only for SAR. It can also foster better working relationships between States and organisations at the local, national and international levels, including civil/military cooperation.

In 2014 Malaysia Airlines flight MH370, a Boeing 777 with 239 persons on board, disappeared when flying from Kuala Lumpur, Malaysia to Beijing, China, and Air Asia QZ8501 was lost on a flight from Surabaya to Singapore. The MH370 event resulted in probably the largest and most expensive search response for a missing aircraft in human history. Together with Air France flight AF447, which crashed into the Atlantic Ocean in 2009, these tragedies have highlighted vulnerabilities in the current air navigation system, including the SAR system, which have hampered timely identification and localisation of aircraft in distress, hindering effective response efforts. ICAO is addressing these vulnerabilities through implementation of functions of the Global Aeronautical Distress and Safety System (GADSS) concept of operations; however, this new system is also dependent on improvements in global SAR capability, especially for remote and oceanic SAR response.

2.6 The Plan is designed to address both civil and military SAR authorities and has been developed in consultation with Asia/Pacific States, SAR administrations and relevant International Organisations. States should consult with stakeholders nationally, regionally and internationally as appropriate and determine actions in order to commit to achieving the objectives of this Plan in order to meet at least the minimum SAR service requirements in accordance with ICAO Annex 12. It is noted that where a State is unable to meet minimum SAR Standards and Recommended Practices (SARPs) of ICAO Annex 12, Article 38 to the ICAO Convention requires notification to ICAO of the differences between its own practice and that established by the international standards.

2.7 It is a common practice for the military to conduct or have a major role in SAR operations to fulfil or assist in fulfilling the State's obligation to provide SAR services. From the perspective of providing SAR services, civil-military coordination takes on many forms. This includes coordination during an actual SAR response, national coordination with other agencies to determine the military role, part of an international agreement or set of procedures with a neighbouring State to assist in SAR response, or other types of coordination. ICAO Document 10088 – Civil/Military Cooperation is focused on airspace management and includes SAR matters relevant to civil-military coordination in airspace management.

2.8 The 2019 edition of the IAMSAR Manual, Volume II, Chapter 7 Multiple Aircraft Operations has guidance on establishing areas of SAR action to assist with the safe coordination and management of aircraft operations during SAR operations. SAR authorities should have procedures in place to rapidly notify airspace users of SAR operations and the establishment of any temporary airspace operation such as danger areas or restricted areas through appropriate State authorities. The combination of guidance in the IAMSAR Manual and ICAO Document 10088 should enable a State to have an appropriate plan in place for civil-military coordination and cooperation in readiness for efficient and effective SAR response.

2.9 States should aim to meet their obligations progressively in a strategically structured and planned manner with improvement goals set for short term, medium term and long term implementation. It may be more productive to make gains in small steps commencing with measures that are more easily achievable in the short term and have a minimal cost, progressing to measures which will take longer to implement over the medium to long term. Short term measures that may be implemented relatively easily include the establishment of a national SAR Committee and ensuring SAR Agreements are in place with neighbouring States allowing for seamless cross-border transit of search assets engaged in SAR activity. A SAR agreement can be in the form of 'Letter of Agreement' (LOA) or a Memorandum of Understanding or other acceptable term indicating a lower form of arrangement for operational matters between SAR service providers (such as RCCs and/or RSCs) or a more formal agreement for arrangements between governments concerned.

2.10 All States are encouraged to use the guidance provided within this Plan as a way forward, thus ensuring a timely, well-coordinated response to any SAR incident within their area of responsibility, or during cooperative responses involving more than one Search and Rescue Region (SRR) including overlapping aeronautical and maritime SRRs which may be the responsibility of different RCCs.

Plan Objective

2.11 The objective of this SAR Plan is to provide a framework to assist Asia/Pacific States to meet their SAR needs and obligations accepted under the Convention on International Civil Aviation and for the harmonised and interoperable delivery of both aeronautical and maritime SAR services within the region, and across other ICAO regional boundaries, where practicable.

2.12 The Plan is to be consistent with the SARPs of ICAO Annex 12 - Search and Rescue, and aligned where appropriate with the SAR technical and operational standards and guidance of the IMO.

2.13 The Plan recognizes that ICAO serves as the forum for the implementation of practical and achievable measures to improve SAR services for international civil aviation. The Plan also recognizes that the IMO provides a similar forum for SAR services to maritime shipping.

2.14 Both ICAO and IMO share the same goal of ensuring that SAR services are available globally wherever people sail or fly. The SAR services that ICAO and IMO promote are complementary and offer tangible opportunities to derive mutually beneficial efficiencies for both the aviation and maritime transportation SAR systems globally, regionally and nationally. The objective of this Plan includes encouraging States to take advantage of such efficiencies. States should, where practicable, align their SAR systems with the guidance provided by the IAMSAR Manual, which also provides the benefit for standardised SAR coordination between RCCs and across SRR lines of delineation.

2.15 State SAR plans describe how SAR services will be provided, organized and supported in order for States to meet their obligations under the relevant Conventions. Search and Rescue Coordinators (SC) and SAR managers oversee and implement these plans. National SAR plans should be signed by all Government agencies which can provide or support SAR services. These agencies should all be represented on the State's Search and Rescue Coordinating Committee (SCC), which oversees these plans.

Note: The SC should not be confused with the operational nature of the SAR Mission Coordinator (SMC). The primary purpose of the national SC is to enable a whole-of-government approach to make efficient and effective use of a State's capabilities for SAR.

Plan Development

2.16 The Plan was developed as part of a suite of Asia/Pacific air navigation plans, including the *Asia-Pacific Seamless ATM Plan*, the *Asia-Pacific Plan for Collaborative Aeronautical Information Management (AIM)*, the *Asia-Pacific Framework for Collaborative Air Traffic Flow Management (ATFM)*, and the *Regional ATM Contingency Plan*, so the Plan should not be considered in isolation.

2.17 The Plan is expected to provide guidelines and recommendations for Asia/Pacific States to consider for the enhancement and improvement of national, sub-regional and regional SAR capability including:

- a) compliance with Annex 12 SARPs;
- b) identification and addressing of deficiencies in SAR capability;
- c) continuous and coherent development of SAR capability;
- d) harmonisation of aeronautical and maritime SAR services;
- e) civil/military cooperation and coordination (including SAR response, information sharing and use of airspace);
- f) remote oceanic SAR response capability (including provision for Mass Rescue Operations (MRO));

- g) establishment and review of arrangements between neighbouring States to expeditiously facilitate SAR coordination, operations and cooperation across regional boundaries including sharing SAR resources and contingency procedures;
- h) facilitation of the implementation of SAR systems and services including the establishment of JRCCs where suitable and practicable;
- i) supporting the sharing of SAR information, data and expertise;
- j) integration with ATM systems and future ATS developments, where appropriate;
- k) monitoring of outcomes from APANPIRG Sub-Groups, other ICAO Region SAR groups, ICAO/IMO Joint Working Group on Harmonisation of Aeronautical and Maritime SAR (JWG) and related forums for issues that may affect the Plan;
- l) facilitation of a continuous reporting mechanism of State SAR capability, Annex 12 compliance and SAR performance data to the APAC Regional Office through the APANPIRG Air Traffic Management Sub-Group (ATM/SG);
- m) implementation of a SAR System Improvement and Assessment measures, including Safety Management System, Quality Assurance programme and risk assessment, and programs to reduce the number of SAR incidents;
- n) coordinating the introduction of new technology affecting the regional SAR system;
- o) sharing future research and development concepts;
- p) seeking efficiencies, through the coordination and facilitation of concurrent regional SAR meetings, seminars, workshops and exercises, including joint ICAO and IMO, and sub-regional forums where practicable; and
- q) conducting efficient SAR Exercises (SAREXs) that identify improvements and latent problems.

2.18 The Plan elements should be periodically reviewed by APANPIRG to ensure that they remain relevant to the SAR system, particularly for new technology developments and alignment with other relevant global and regional SAR plans and the Global Air Navigation Plan.

EXECUTIVE SUMMARY

3.1 The Asia/Pacific Region had the largest share of Passenger Kilometres Performed (PKP), accounting for more than one third of the global total at 34.5% (Europe and North America were the two other key regions, with shares of 26.7% and 22.4% respectively). As the world's major manufacturing and distribution hub, the Asia/Pacific Region also accounted for the largest share of global air freight traffic in 2018, at 35.5%.

3.2 For the maritime industry, the United Nations Conference on Trade and Development (UNCTAD) Review of Maritime Transport 2017 reported that Asia remained the main global cargo loading and unloading area in 2016 with the largest world shipping tonnage share of 40% Loaded and 61% Unloaded. Growth in the cruise ship industry together with the many other forms of maritime transport such as fishing vessels and passengers ferries creates added potential demand for regional SAR services. Whilst IMO assists the Parties to the Maritime SAR Convention, particularly their implementation related to the provision of maritime SAR services, the demand for aeronautical SAR services which frequently support responses to maritime SAR incidents is also likely to rise.

3.3 Asia/Pacific States who are signatories to the Chicago Convention accept the responsibility for the provision of SAR services per the requirements of Annex 12 - *Search and Rescue*. Increases in both aviation and maritime traffic throughout the Asia/Pacific region places additional importance on the ability for States to be adequately prepared for potentially increased demand for aeronautical and maritime SAR services.

3.4 Considering that many of the Asia/Pacific States have the challenging responsibility for providing a SAR service over vast and remote areas, including three of the world's five oceans, the importance for States with oceanic SAR responsibility to cooperate, collaborate and share resources with their neighbouring and regional/sub-regional RCCs is essential.

3.5 High-level support might be necessary from regional bodies that can effectively support the Plan's implementation, such as the:

- Association of Southeast Asian Nations (ASEAN) and ASEAN Regional Forum (ARF);
- Asia Pacific Economic Cooperation (APEC);
- South Asian Association for Regional Cooperation (SAARC);
- Secretariat of the Pacific Community (SPC); and
- Indian Ocean Rim Association (IORA).

SAR System Funding

3.6 The level of funding provided for effective SAR systems is a matter of concern for all senior decision-makers. An effective SAR system helps prevent lives being lost that may have been saved which provides a persuasive argument for proper funding. The resources should be sufficient to develop and/or maintain the required SAR service per their obligations as signatories to the relevant aeronautical and maritime SAR conventions. This may require the development of business cases to governments outlining where additional funding is required.

3.7 Such business cases should include consideration of amendments to existing State SAR arrangements which may provide more efficient delivery of the SAR service by better utilisation of existing resources (for example by establishing Joint RCCs (JRCCs), or additional funding sources where required (for example charging a levy to aircraft operators for providing the SAR service or seeking company sponsorship for SRUs). The economic value of a life saved when compared against the economic value of a life lost can also be a significant persuasive factor in any business case.

Joint Rescue Coordination Centres (JRCCs)

3.8 Where practicable, States are encouraged to examine the potential benefits that may be derived by the establishment of JRCCs to incorporate the aeronautical and maritime SAR activities and/or facilities of ARCCs/ARSCs and MRCC/MRSCs. JRCCs have the potential to not only provide a more effective SAR service to both the aeronautical and maritime industries, but also offer potential financial efficiencies by releasing funds for improvements in other SAR areas.

Note: Where JRCCs are not practicable, facilities and procedures should be developed which provide and/or enhance effective SAR coordination and collaboration between the ARCCs and MRCCs in support of each other, to provide an efficient and integrated State SAR system for both aeronautical and maritime SAR incident response.

3.9 Where practicable, the JRCC evaluation may consider consolidation of two or more different State RCCs into single sub-regional JRCCs-

Note: a single sub-regional JRCC may be established in partnership with a group of States and serve as a 24 hour nodal JRCC supported by Joint Rescue Sub-Centres (JRSCs) of the other partner States which may not necessarily need to be manned 24 hours but could be activated when required.

ABBREVIATIONS AND ACRONYMS

ADS-B	Automatic Dependent Surveillance-Broadcast
ADS-C	Automatic Dependent Surveillance-Contract
ADT	Autonomous Distress Tracking
ANRF	Air Navigation Reporting Form
ANSP	Air Navigation Service Provider
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
APEC	Asia Pacific Economic Cooperation
APSAR/TF	Asia/Pacific SAR Task Force
ARCC	Aeronautical Rescue Coordination Centre
ARF	ASEAN Regional Forum
ARSC	Aeronautical Rescue Sub-Centre
A/SMC	Assistant SMC
ASEAN	Association of Southeast Asian Nations
ASPOCS	Administrative Single Point of Contact for SAR
ATC	Air Traffic Control
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
CONOPS	Concept of Operations
COSPAS-SARSAT	C osmicheskaya S istema P oiska A variynyh S udov-Search and Rescue Satellite-Aided Tracking
EI	Effective Implementation
ELT	Emergency Locator Transmitters
GADSS	Global Aeronautical Distress and Safety System
GANP	Global Air Navigation Plan
GASP	Global Aviation Safety Plan
GLONASS	Global Navigation Satellite System
GPS	Global Positioning System
IAMSAR	International Aeronautical and Maritime SAR (Manual)
IMO	International Maritime Organization
IORA	Indian Ocean Rim Association
iSTARS	Integrated Safety Trend Analysis and Reporting System
JRCC	Joint (aeronautical and maritime) Rescue Coordination Centre
JRSC	Joint Rescue Sub-Centre
JWG-SAR	ICAO/IMO Joint Working Group on the Harmonisation of Aeronautical and Maritime Search and Rescue
LOA	Letter of Agreement
MCC	Mission Control Centres
MEOSAR	Medium-altitude Earth Orbit Search and Rescue
MRCC	Maritime Rescue Coordination Centre
MRO	Mass Rescue Operations
MRSC	Maritime Rescue Sub-Centre
OJT	On-the-Job Training
PQs	Protocol Questions
PSCS	Preferred SAR Capability Specifications
RANP	Regional Air Navigation Plan
RCC	Rescue Coordination Centre
RPK	Revenue Passenger Kilometres
RPAS	Remotely Piloted Aircraft Systems
SAR	Search and Rescue
SARPs	Standards and Recommended Practices
SAARC	South Asian Association for Regional Cooperation
SAREX	SAR Exercises

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SC	Search and Rescue Coordinator
SCC	Search and Rescue Coordinating Committee
SMC	Search and Rescue Mission Coordinator
SMS	Safety Management System
SOLAS	International Convention for the Safety of Life at Sea
SPC	Secretariat of the Pacific Community
SPOC	SAR Point of Contact
SRR	Search and Rescue Region
SRU	Search and Rescue Unit
SWIM	System Wide Information Management
UNCLOS	United Nations Convention on the Law of the Sea
USOAP-CMA	Universal Safety Oversight Audit Programme – Continuous Monitoring Approach
VSP	Variable Set Parameter

BACKGROUND INFORMATION

Improvement Drivers

5.1 The ICAO USOAP-CMA focuses on a State's capability in providing safety oversight by assessing whether the State has effectively and consistently implemented the critical elements of a safety oversight system and determining the State's level of implementation of ICAO's safety-related SARPs, including Annex 12 Search and Rescue, and associated procedures and guidance material.

5.2 ICAO APAC Regional Office maintains an Air Navigation Deficiencies List. This list is based on the uniform methodology for identification, assessment and reporting of such deficiencies as described in Part V of the APANPIRG Procedural Handbook. By identifying and addressing specific deficiencies, APANPIRG and its Sub-groups facilitate the development and implementation of action plans by States to resolve identified deficiencies, where necessary.

5.3 The ANS Deficiency information had been populated into the ICAO iSTARS (Integrated Safety Trend Analysis and Reporting System) CHECK database and was accessible through the ICAO Secure Portal. The intention is to merge this data with the CMA Data, and manage the deficiencies using a single web-based process.

Asia/Pacific SAR System Monitoring

5.4 Significant Annex 12 compliance weaknesses had been identified within the Asia/Pacific region based upon information provided (and in many cases not provided) by States to the ICAO Regional Office. This regional information status of the SAR capability and SAR agreements was recorded in tables made available to APANPIRG, which was expected to be enhanced with the integration of SAR elements into the Seamless ATM on-line monitoring system.

ICAO Global Aeronautical Distress and Safety System (GADSS)

5.5 The tragedies of Malaysia Airlines flight MH370 in 2014 and Air France flight AF447 in 2009 highlighted vulnerabilities in the air navigation system which hampered timely identification and location of aircraft in distress, particularly in remote oceanic areas. This significantly hindered effective SAR efforts and recovery operations.

5.6 As part of the response to the Conclusions and Recommendations from the 2014 ICAO Multi-disciplinary Meeting on Global Tracking, ICAO developed a Concept of Operations (CONOPS) for a GADSS. The implementation of this target concept affects the provision of services such as air traffic control, SAR and accident investigation. It contained a large number of measures targeting improvements in SAR system response integrated within the wider ATM and aircraft/airline operations systems.

5.7 The CONOPS notes that the effectiveness of the current alerting systems and SAR services should be addressed by a number of key improvement areas. The CONOPS also included aspects which potentially involve use of different distress systems, including for example 406 MHz Emergency Locator Transmitters (ELTs) and the Cospas-Sarsat system as part of the proposed GADSS solution.

5.8 Guidance on the aircraft tracking function is provided in ICAO Circular 347, *Aircraft Tracking Implementation guidelines*. Chapter 8 outlines procedures to be followed when an operator notifies an ATSU of a missed aircraft 15 minute tracking report. This circular is for aircraft operators and civil aviation authorities, and applies to the aircraft tracking function that commenced 8 November 2018. Of particular relevance is Section 8.2 and Appendix C *Missed 4D/15 Position Report Form for Operator*. The operator is required to notify the air traffic services unit (ATSU) of a

missed aircraft 4D/15 tracking report (four-dimensional position of individual aircraft in flight at 15-minute intervals). The information that the operator has to provide the ATSU closely aligns with what the ATSU has to provide the RCC. However, the ATSU-to-RCC requirement does not have a standard form and it is not automated (machine-to-machine).

5.9 The ADT device notifies the aircraft operator (the airline) of the last known position of an aircraft that may be in a distress condition in flight. ADT activation is a notification, not a distress alert. This would be at one-minute intervals while the aircraft is in flight. The operator is responsible to make the position information available to the ATSUs and RCCs. ICAO is leading the effort to create an ADT distress tracking repository (DTR) as a database for storing the ADT information. The DTR would then notify the aircraft operator, ATSU and RCC that ADT information relevant to them is in the DTR for those stakeholders to pull the data.

5.10 The ATS unit may already be informed by other means of an emergency situation, such as from the aircrew. The aeronautical alerting process is based on the ATS unit making the decision about whether or not the aircraft is in distress and, if determined to be a distress situation, must notify the RCC immediately before contacting the operator per Annex 11. ICAO has not prescribed a specific technology for the ADT device but one of the technologies will be a new version of the aeronautical 406 MHz emergency locator transmitter – the ELT Distress Tracking ELT(DT)

5.11 ADT notifications from the ELT(DT) will be delivered directly to SAR services using the existing Cospas-Sarsat ground segment infrastructure. Having the

5.12 ADT notifications from the ELT(DT) going directly to an RCC was not the original intent of ICAO and is a major change in the aeronautical alerting process envisaged under the GADSS. RCCs need to prepare for the ADT capability and that the aircraft could remain in flight across multiple SAR regions. Appendix 1 contains specific guidance on RCC

5.13 ADT notifications from the ELT(DT). RCCs may need to update SAR practices and procedures before 1 January 2021 for concerns such as:

- accurate delimitation of SAR regions to ensure proper transfer of the SAR operation to the next responsible RCC;
- effective and efficient coordination between the ATS unit (or aeronautical RCC) and the maritime RCC;
- harmonized operations between aeronautical and maritime SAR services; and
- initial response to an ADT notifications from the ELT(DT) includes rapid contact with the ATS unit to notify and confirm if the aircraft is in distress.

Cospas-Sarsat System

5.14 Cospas-Sarsat has been developing two major enhancements to its distress-alerting System of value to all System users, including the aviation industry. One is the introduction of 2020, a new space-segment architecture based primarily on Medium-altitude Earth Orbit Search and Rescue (MEOSAR) payloads aboard the European Commission's Galileo system, the Russian Federation's Global Navigation Satellite System (GLONASS) and the United States' Global Positioning System (GPS) satellites. Another potential satellite system from China, the Beidou Navigation Satellite System, could be part of the Cospas-Sarsat Space Segment. -

5.15 This architecture would permit determination of an end-of-flight distress incident location (independent of any location data transmitted in the beacon message) beginning with the first burst from the distress beacon. This could mean near real-time and very frequent delivery of distress alerts.

5.16 The SAR/Galileo space segment would also provide a Return Link Service (RLS) that, among other possible future uses, would provide an acknowledgment from the MCC back to the beacon to confirm that the distress message has been received.

5.17 The technical specifications for the second generation 406 MHz distress beacon has been approved, including ELTs. This new generation of beacons should further improve speed and accuracy in locating an activated distress beacon. The period from beacon activation to first transmission was expected to be reduced from 50 seconds to three seconds. The specification would consider in-flight activation of ELTs when certain flight parameters were exceeded. Consequently, false alerts would affect real SAR events significantly.

5.18 States needed to continue to ensure that aviators were aware that 121.5 MHz and 243 MHz beacons cannot be detected by the global Cospas-Sarsat System and the low-power 121.5 MHz signal on the 406 MHz distress beacon was only intended as a final homing signal.

5.19 States also need to ensure the critical requirement to provide for a suitable, clear and simple means for aircraft owners to register and keep updated their 406 MHz distress beacon details.

Note: information on beacon registration is at: <http://www.cospas-sarsat.int/en/beacons-pro/beacon-regulations-pro/ibrd-user-information-for-professionals>).

5.20 Entries in the beacon register should be available to both aeronautical and maritime RCCs on a 24 hour basis (Annex 12 – *Search and Rescue* refers, although Annex 10 establishes the registration requirement).

ICAO Annexes

5.21 States should note that Annex 12 should be read in conjunction with elements of the following ICAO Annexes:

Annex 6 – *Operation of Aircraft*;

Annex 10 – *Aeronautical Telecommunications*;

Annex 11 – *Air Traffic Services* (particularly Chapter 5 Alerting Service); Annex 14 – *Aerodromes* (particularly aerodrome emergency planning with the RCC); and

Annex 19 – *Safety Management* (particularly SAR services under the authority of an ATS provider).

CURRENT SITUATION

Global Situation

6.1 The ICAO USOAP Report of audit results, 3rd Edition, April 2005 to August 2010 revealed a number of SAR deficiencies during the audits of 165 Member States: REVIEW AND UPDATE

- 38% of States had not laid down provisions for entry into their territory of SAR units (SRU) of other States for the purpose of search for the site of aircraft accidents and rescuing survivors;
- 44% of States had not developed a detailed plan on operation for the conduct of SAR operations within their respective Search and Rescue Regions (SRRs); and
- 67% of States had not established the necessary coordination of their SAR organisations with those of neighbouring States, including the conclusion of bi-lateral SAR agreements in order to coordinate SAR operations; and
- regarding RCCs –
 - i. about 40% of States had not developed job descriptions for their technical staff;
 - ii. 45% did not ensure that RCC personnel using radiotelephony communications were proficient in the use of the English language; and
 - iii. about 56% of States do not regularly train their SAR personnel, and nor did they conduct SAREXs.

Asia/Pacific SAR Analysis

6.2 The last decade has seen a steady increase in air traffic in the Asia/Pacific Region. Maritime traffic is also increasing, adding further urgency to ensure that States with oceanic SAR responsibilities in the region meet the requirements of both ICAO and IMO for the provision of aviation and maritime SAR services.

6.3 An analysis of the 26 Universal Safety Oversight Audit Programme (USOAP) SAR-related Protocol Questions (PQs) indicated that the overall Effective Implementation (EI) in the Asia/Pacific Region for SAR had risen from 50.7% in July 2015 to 58.99% in March 2019. **Figure 1** provides the EI of individual SAR-related PQs in March 2019.

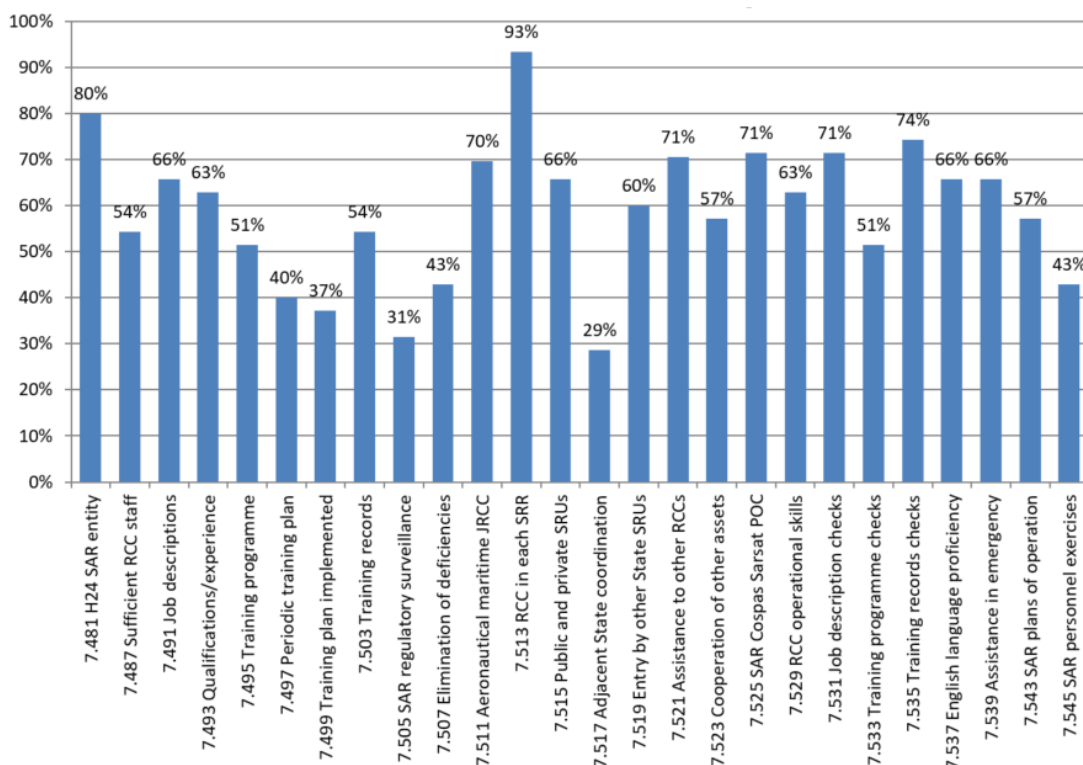


Figure 1: APAC USOAP CMA SAR PQ Compliance (average: 59%, March 2019)

6.4 From this analysis, it appeared that the major areas of weakness is in coordination with adjacent States, effective SAR oversight, and training of SAR staff that provide the SAR services. Therefore, a focus on the minimisation of barriers associated with the efficient cross-border coordination of SRU (such as pre-arranged approval) and other coordination mechanisms, including updates of SAR agreements (whatever their form) was vital. Finally, there was a need for improved systemic approaches to training for both SAR inspectors and personnel responsible for the provision of SAR services, including the regular organisation of effective SAR exercises that test systems and personnel. It should be noted that the training of SAR inspectors did not require SAR-specific technical training, but was more focused on effective audit and inspection techniques, etc.

6.5 The current analysis indicated significant Annex 12 compliance weaknesses remained in the South Asia area and the Southwest Pacific. In addition, there were parts of Southeast Asia and East Asia that indicated a need for compliance improvement.

6.6 With the advent of the Asia/Pacific SAR Plan and its more comprehensive expectations, an accurate assessment of capability aligned with the SAR Plan (was developed. This assessment could be used by States as a means of internal gap analysis, in addition to providing a more accurate metric of the Asia/Pacific SAR Plan implementation, noting that implementation was scheduled for 2019.

Asia/Pacific SAR Coordination Forums

6.7 The Asia/Pacific Region will benefit from the cooperation and coordination of States and International Organizations involved in the APSAR SAR Working Group. The establishment of permanent joint ICAO/IMO Regional SAR Forums to enable collaboration and cooperation on oceanic SAR matters across the specific oceanic regions and including adjacent ICAO regions should be considered.

6.8 There were several regional initiatives for cooperative support and development already being undertaken in the Asia/Pacific Region to assist with SAR capability enhancement.

6.9 Such improvement programmes could result from a request by a State needing assistance, ICAO/IMO oversight, the users of the SAR system itself, an audit or following a SAR ‘Go-Team’ visit that identifies weaknesses in the State’s SAR capability (a ‘Go Team’ normally consists of external SAR experts from ICAO/IMO, more advanced ‘champion’ States or external agencies such as Cospas-Sarsat). The programs can be conducted by experts from a ‘champion’ State, or through a cooperative effort by several States or a regional body.

Note: Appendix xxx provides a summary of benefits to the SAR System of States assisting other States.

Barriers

6.10 The following potential issues should be considered to ensure they do not become barriers to the achievement of the expected SAR capability:

- a) absence of established appropriate legal framework designating, recognizing, supporting and giving authority to national SAR authorities, RCCs and SMCs;
- b) inadequate funding and equipping of SAR authorities and in particular, resourcing of RCCs;
- c) absence of an appropriate SAR organizational framework;
- d) absence of a national SAR committee;
- e) lack of clarity of responsibilities for each component of the SAR system;
- f) inadequate collaboration and cooperation between aeronautical and maritime SAR agencies;
- g) absence of bilateral/multi-lateral/international SAR Agreements;
- h) inadequate civil/military cooperation; and
- i) complacency about, or lack of recognition of, the importance or priority given to SAR.

Global and Regional SAR Issues

6.11 States should monitor outcomes from global and regional ICAO and IMO SAR forums to ensure their State SAR authorities are updated on relevant SAR developments, otherwise State planning may not be synchronized with external international expectations, including users. Such forums may include APANPIRG and its Sub-Groups, other ICAO Region SAR groups, the JWG, ICAO High Level Safety Conferences, etc.

6.12 The provision of sufficient resources is critical in a number of areas, including:

- a) Financial-
 - funding for 24 hour RCC facility and staff;
 - funding for use/hire of search and rescue units; and
 - provision of a suitable administrative process enabling financial support including the ability for SAR authorities to quickly authorise payments required for emergency response aircraft, vessels and supporting logistics such as fuel.
- b) RCC personnel- a suitable number of trained and skilled staff, supplemented by a pool of trained RCC support staff where appropriate;
- c) RCC facilities-
 - appropriate RCC facility space;

- minimum RCC tools (such as current charts, plotting equipment, documentation, etc.);
 - ability to identify and task available SRUs;
 - aircraft and vessel tracking information including ATS surveillance, Automatic Identification System, etc.;
 - reliable and rapid H24 communications, and a suitable means to-
 - receive, communicate and acknowledge distress alerts
 - communicate with ATS units, other RCCs/RSCs, Coast Radio Stations, COSPAS-SARSAT Mission Control Centres (MCCs), military units, medical services, meteorological offices, etc.;
 - information technology-
 - RCC workstation computers;
 - Software including basic databases, drift modelling, incident management, etc.;
- d) Contingency- back-up RCC facility, or arrangement with another RCC as a contingency against inability to operate from the primary RCC due to the need to evacuate or loss of systems, etc.;
- e) Search and Rescue Units (SRUs)-
- available and suitable SAR aircraft and crews;
 - funding arrangements/agreements for hiring/payment/sharing of SRUs to permit rapid deployment; and
 - Available and suitable SAR survival equipment for delivery by aircraft to survivors and to assist SAR coordination efforts (e.g.: SAR Datum Buoys, droppable life rafts and survival supplies, etc.);
- f) Training support-
- RCC staff – basic and ongoing;
 - SRU crews – pilots, air crew and air observers; and
 - RCC support staff – basic and refresher.
 - SAR inspectorate staff- basic and on-going
 - Other SAR Units- aeronautical units
 - maritime units
 - land units
 - specialised units (paramedical, divers, etc.)

PERFORMANCE IMPROVEMENT PLAN

Preferred SAR Capability Specifications (PSCS)

Note: PSCS are the non-mandatory expectations on all Asia/Pacific Region States to enhance SAR systems in order to meet a minimum level of SAR capability, with a high degree of interoperability and harmonisation, and interoperability with other ATM components such as Air Navigation Service Providers (ANSPs) and aerodrome operators, and between aeronautical and maritime SAR services. PSCS were not expected to contravene existing Annex 12 standards.

PSCS (expected implementation by 07 November 2019)

7.1 Legal Framework and Structure Planning: All States should develop statutes and related provisions that establish or enhance the legal foundation for a State SAR organization and its framework, resources, policies and procedures, where appropriate to:

- a) ensure that it is party to, and/or aligned with the following Conventions, as applicable –
 - iv. Convention on International Civil Aviation 1944;
 - v. International Convention on Maritime Search and Rescue, 1979;
 - vi. International Convention for the Safety of Life at Sea (SOLAS), 1974;
 - vii. Convention on the High Seas, 1958; and
 - viii. United Nations Convention on the Law of the Sea (UNCLOS), 1982;
- b) unless delegated by written agreement, establish an entity that provides, on a 24-hour basis, SAR services within its territories and designated area of responsibility/SRR;
- c) establish a national SAR committee consisting of civil and where appropriate, military members to enable a whole-of-government approach;
- d) empower SAR Mission Coordinators with the authority to adequately carry out their responsibilities;
- e) establish an Administrative Single Point of Contact for SAR (ASPOCS) for non-urgent, administrative matters, such details to be submitted to the ICAO Regional Office;
- f) conduct studies to check the feasibility for, and develop an implementation plan if practicable, the integration of aviation and maritime SAR activities, and as far as practicable, civil and military activities, including joint training and familiarisation of staff and review of documentation to ensure harmonisation of procedures, and joint exercises;
- g) conduct studies to align, as far as practicable, aeronautical and maritime Search and Rescue Regions (SRRs); and SRRs and Flight Information Regions (FIRs); and
- h) establish a single State SAR Plan that –
 - i. designates the responsible RCC(s), RSC(s) and 24-hour SPOC/ASPOC;
 - ii. describes the relevant SRRs, including the coordinates and geographical chart depiction of the SRR and neighbouring SRRs;
 - iii. details the National SAR Committee;

- iv. details the governmental and non-governmental agencies with authority and responsibility for SAR coordination within its territories and designated area of responsibility;
- v. details required and available SAR facilities, personnel, and equipment;
- vi. details the SAR manuals, plans and procedures for national and regional cooperative SAR response arrangements;
- vii. details the SAR personnel training and competency programme, qualification standards, SAR certification if applicable and SAR cooperation training;
- viii. details the SAR agreements required;
- ix. is electronic and accessible on the Internet, such details to be submitted to the ICAO Asia/Pacific Regional Office; and
- x. is monitored by quality assurance processes.

7.2 SAR Standards and Procedures: All States should:

- a) establish aerodrome emergency plans that provide for co-operation and co-ordination with RCCs;
- b) establish SAR agreements with States having adjoining SRRS or FIRs, including trans-regional neighbours (the agreements should include clear responsibilities for overlapping or non-adjointing aeronautical and maritime SRRs);
- c) provide up to date cross-border information on SAR capability (this should be included in bilateral SAR agreements);
- d) pre-arrange procedures for cross-border SAR responses (this should be included in bilateral SAR agreements);
- e) establish a program for regular SAREX, which may be a desktop communications exercise, with each alternate SAREX being a full exercise (this expectation may be fulfilled by participating in a sub-regional SAREX that tests the State's SAR system; and
- f) establish RCC plans for response to Mass Rescue Operations (MROs) integrated with national disaster plans;
- g) establish SAR Operations Plans between the State's SAR Authorities and Government, Military and Commercial operators including those with an over-water rotary wing or sea plane capability to include:
 - i. procedures for cooperation and deployment of foreign SRUs;
 - ii. provision for translators/liaison Officers/Embassy Officers for the daily tasking of the SRUs at the RCC;
 - iii. provision of information for logistic and administrative support (hotels, fuel, security passes, food, medicine, etc.);
 - iv. instructions on communication (ops normal reports, sightings, etc.) for search planning, command and control to foreign SRUs;
 - v. planning and arrangements that ensure the availability of State and other SRU assets, especially over-water rotary wing capability where applicable, to support a timely and effective SAR response;
 - vi. daily end of day report by SRUs to the RCC (via mobile, email, fax, etc.); and
- h) establish SAR Alerting procedures which:
 - i. are tested and fully integrated with RCC procedures so that RCCs are rapidly

notified of any SAR event 24 hours a day;

- ii. include procedures for joint aeronautical and maritime distress alert notification, including reliable delivery and acknowledgement of Cospas-Sarsat distress alerts, support and response to both aviation and maritime SAR incidents; and
- iii. where applicable, include protocols for civil and military support and sharing of information.

SAR Facilities and Resources

7.3 RCC Facility: All States should ensure that RCCs are of sufficient size with adequate provision for operational positions designed in accordance with human factors principles (such as human machine interface) for a major search involving civil and military assets where applicable, and facilities such as:

- a) workstations, telephones (with international access), plotting tables, wall notice/status boards, computer, and communications equipment and systems, briefing/debriefing areas room for storage including incident records and recorders, RCC staff break and rest facilities;
- b) computer resources which may provide support to RCCs with incident management, plotting, search planning, mapping, contact databases, web-based information, etc.;
- c) charts, electronic or paper, which:
 - i. apply to SAR (aeronautical, nautical, topographic and hydrographic);
 - ii. depict SRR, neighbouring SRRs, FIR(s), SAR resources and made available for all relevant aeronautical and maritime RCCs, ATS units, aircraft operators; and
 - iii. provide a means of plotting;
- d) ability to reliably receive and acknowledge distress alerts 24 hours a day;
- e) maritime broadcast facilities;
- f) a means of recording, playback and archiving of communications;
- g) shipping/vessel communications and maritime broadcast facilities such as Coast Radio Stations, RCC radio and satellite communications, marine radio networks;
- h) aircraft communications – via ATS units, aircraft operators, satellite communications or direct between RCC and aircraft;
- i) access to aircraft and ship tracking data, e.g. ATS surveillance data, Automatic Identification System and Long Range Identification and Tracking of Ships (LRIT) allowing rapid identification of potential aircraft and vessels that may divert to assist;
- j) a means of obtaining meteorological information – forecast, present and historical data;
- k) if applicable drift modelling software;
- l) if applicable, ocean data including sea temperature, currents, winds, tides, etc.;
- m) if applicable, SAR Datum Buoys, preferably with satellite tracking capability; and
- n) RCC documentation and reference material such as plans of operation, procedures manuals, guidance material, ICAO and IMO references, SAR agreements;
- o) Cospas-Sarsat equipment and reference material; and

- p) SWIM-enabled systems that can evolve the sharing of Flight Data, Aeronautical Information and MET data in alignment with contemporary practices being implemented under global and regional planning.

7.4 Personnel and Training All States should, where applicable to maintain a 24 hour service:

- a) provide adequate ATC resources (either an ATS supervisor or other staff) that can provide relief within Area Control Centres (ACCs) to allow timely response to SAR alerts and information to RCCs;
- b) provide sufficient RCC staffing;
- c) provide a sufficient number of trained specialist RCC officers including SMCs and Assistant SMCs (A/SMCs);
- d) provide availability of a pool of RCC support staff who are familiar with RCC operations, but not trained as coordinators, that can assist with the functioning of the RCC during SAR incident response;
- e) develop SAR personnel position descriptions that detail responsibilities and eligibility criteria for recruitment of operational staff;
- f) develop a comprehensive training programme that includes SAR training for:
 - i. RCC SAR Coordinators (SCs) based on a competency-based assessment approach to ensure technical and English language proficiency, cyclical (periodic) instruction that provides continuous training to ensure competency is maintained, and a system for maintaining training records; and
 - ii. SRU staff, including military personnel.
- g) facilitate RCC staff to be proficient in the English language; and
- h) facilitate a programme of regular liaison visits between relevant RCCs, ATC units and airline operating centres in order to understand those organizations, facilities and capabilities (reference Annex 12, paragraph 3.1.9).

7.5 Oceanic Capability: Where applicable, States should establish additional oceanic SAR capability as far as practicable to ensure a timely and adequate SAR response is available to all oceanic areas of their SRRs. This may be met through cooperative arrangements with neighbouring States or other RCCs.

7.6 Search and Rescue Units: All States should establish capabilities enabling:

- a) availability and deployment of suitably crewed, trained and equipped SRUs (including a pool of air search observers trained in visual search techniques), public and/or private, civil and military, for rapid SAR response;
- b) availability and deployment of SRU craft that may be in use for another primary purpose but made available to RCCs for SAR purposes on an as needed emergency basis (vessels, aircraft and land units);
- c) protocols for civil SAR authorities to request the assistance of military assets, and similarly military SAR authorities to request civil assets;
- d) a communication means and information protocols between the State's Aeronautical and Maritime SAR Authorities;
- e) cooperative use and/or sharing of SAR assets with protocols incorporated within National SAR Plans and bilateral SAR Agreements;
- f) pre-arranged government authority for funding of costs associated with hiring of SRUs, and payment for critical supporting logistics such as fuel, to avoid any delays

in response availability;

- g) pre-approval of specified SRU assets that may be utilised cross-border (requiring diplomatic pre-approval) or cross-SRR boundary (which may not require diplomatic approval if operating within international airspace); and
- h) aircraft with the ability and regulatory approval to safely conduct SAR missions.

Note: guidance material on SAR aircraft capability is found in the IAMSAR manual.

7.7

Distress Beacons: All States should:

- a) where separate ARCCs and MRCCs exist with responsibility for coincident aviation and maritime SRRs, coordinate distress beacon alert procedures to ensure both RCCs are aware of any distress beacon activations within their areas to avoid duplication of response. For example, MRCCs should ensure their procedures alert ARCCs and ATS units to any EPIRB activations;
- b) have a reliable distress beacon registration system that:
 - i) provides a readily-accessible mechanism (preferably one that is available by Internet as well as other conventional means) to enable distress beacon owners to fulfil their obligation to register ELTs, EPIRBs and PLBs, and update the registration data as information changes (e.g., change in ownership);
 - ii) is available to RCCs 24 hours a day and includes up-to-date registration details for all national civil and military ELTs, EPIRBs and PLBs;
- c) take steps (including education) required to prepare for, and to implement changes related to, the introduction of second generation beacons, the transition to the MEOSAR satellite architecture, and the pending Return Link Service provided by the Galileo constellation;
- d) establish an appropriate nationwide means of disposal for old distress beacons; and
- e) conduct promotional programmes, including, where appropriate, with airworthiness agencies and civil aviation authorities, related to the minimization of false alerts. .

Note 1: Information on beacon registration is at: <http://www.cospas-sarsat.int/en/beacons-pro/beacon-regulations-pro/ibrd-user-information-for-professionals>.)

Note 2: Incorrect disposal of distress beacons often causes the deployment of scarce and often expensive SAR resources only to have the beacon located as a non-distress event in a rubbish dump or similar location. This also creates the risk of SAR resources being diverted away from a real emergency should it arise at the time. Beacon batteries are hazardous items which should be disposed of in an environmentally friendly manner.

Note 3: Education should include matters such as an update on beacon registration systems to be compatible with new beacon hexadecimal identifications, the transition to the MEOSAR satellite architecture (e.g.: update local user terminals and mission control centres to properly receive and manage MEOSAR data), in accordance with Cospas-Sarsat specification documents (<http://www.cospas-sarsat.int/en/documents-pro/system-documents>).

7.8

Contingency Facilities: All States should ensure there are established contingency facilities, or when a SAR service is not able to be provided, procedures in place for the temporary delegation of the SAR responsibility to another appropriate national body or State. All States should test their contingency arrangements periodically, but not less than once every six months.

SAR Information

7.9 Provision of Information: All States should ensure the:

- a) establishment of a centralised information source publishing all Asia/Pacific State Aeronautical Information Publication (AIP) information:
 - i. The agency responsible for providing SAR services;
 - ii. The area of SAR responsibility where SAR services are provided;
 - iii. The type of SAR services and facilities provided including indications where SAR aerial coverage is dependent upon significant deployment of aircraft;
 - iv. SAR agreements;
 - v. The conditions of SAR facility and service availability; and
 - vi. SAR procedures and signals used;
- b) establishment of an Internet-based SAR information sharing system (with security protocols as required and in accordance with the emerging System Wide Information Management – SWIM concept as applicable) to share SAR activity with States and key stakeholders participating in a SAR activity (the information sharing system should include a means of handling media and next of kin enquiries, and recognise the need to avoid premature media statements); and
- c) maximum practicable cooperation between State entities in the provision of accurate and timely information when required, including from military sources except where national security could be adversely affected.

7.10 SAR Facilities and Equipment Lists: All States should develop and maintain a current, comprehensive electronic list of State SAR Facilities, SAR Equipment, and SAR Units (SRUs), including joint or shared facilities and equipment, and provide the Internet link to that list to the ICAO Asia/Pacific Regional Office.

7.11 SAR Library: All States should:

- a) establish a web-based SAR Library, or cooperate by contributing to an Internet-based Asia/Pacific resource (such as <https://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Response-Policy-CG-5R/Office-of-Incident-Management-Preparedness-CG-5RI/US-Coast-Guard-Office-of-Search-and-Rescue-CG-SAR/SAR-Publications/>); and
- b) ensure that each RCC and SAR Authority has ready access to a current copy (either electronic or hard copy) of the following reference documents at a minimum:
 - i. ICAO Annex 12;
 - ii. IAMSAR Manual Volumes I, II and III;
 - iii. International Convention on Maritime SAR (SAR Convention);
 - iv. Asia/Pacific SAR Plan/electronic Air Navigation Plan; and
 - v. relevant regional, national and agency SAR documents.

Note: The Asia/Pacific SAR Library hosted by the US Coast Guard contains a list of documents that may be held by RCCs and JRCCs as appropriate. In addition, a list of documents (SAR.7/Circ.12) would be available on the IMO web site at: (<http://www.imo.org/en/OurWork/Safety/RadioCommunicationsAndSearchAndRescue/SeArchAndRescue/Pages/Default.aspx>).

SAR Improvement

7.12 Search and Rescue Exercises (SAREX): All States should conduct regular SAREX (at least once every two years) to test and evaluate existing coordination procedures, data and information sharing and SAR response arrangements involving:

- a) both aeronautical and maritime SAR authorities including both civil and military agencies as applicable, and related bodies such as Air Navigation Service Providers (ANSPs) and Airline Operations Centres (AOCs);
- b) where appropriate, cross-aeronautical SRR boundary coordination (SAREX should routinely involve SAR authorities of adjacent SRRs); and
- c) SAREX effectiveness through a post-SAREX review and written report, completed to ensure that deficient areas or latent problems are identified and remedied.

Note 1: a SAREX template is provided in the 2019 edition of the IAMSAR Manual, Volume I, Appendix O, Sample template for a joint SAREX.

Note 2: SAREX should test the SAR system, including unannounced alerts that allow an actual search (whether it is a desktop or a physical operation), to be conducted which will indicate weaknesses in the system. SAREX should not be confused with, or take the form of, simulated crash fire exercises such as for Aerodrome Emergency Procedures that do not have a search component.

Note 3: Real SAR incident responses which include an adequate post-response review and evaluation with lessons learned may replace the need for a SAREX.

7.13 SAR Quality Assurance: All States should implement SAR System Improvement and Assessment measures, including Safety Management and Quality Assurance systems, that:

- a) provide performance and safety indicators, including post-incident/accident lessons learned and management reviews (RCC and SAR System Continuous Improvement process), and feedback from RCC staff, SAR system users or SAR stakeholders;
- b) identifies risk and corrective and preventive actions that prevent or minimise risk and the possibility of substandard SAR performance;
- c) establishes an internal quality assurance programme, which includes regular internal audits of the RCC, SAR operations, SAR facilities and procedures that are conducted by trained auditors;
- d) ensures the person responsible for internal quality assurance within the entity responsible for SAR services has direct access to report to the Head of the entity responsible for SAR services on matters of quality assurance; and
- e) where appropriate, provides submissions to the JWG to share lessons learned and experiences with other global States for the continuous improvement of the worldwide SAR system.

Note 1: Resourcing of SAR system audit arrangements could be mitigated by States entering cooperative arrangements, including sub-regional regulation, between States for auditing of each other's SAR systems to share expertise and costs.

Note 2: Provisions of Annex 19 for a Safety Management System (SMS) may apply where a SAR service is provided under the authority of an ATS provider (Annex 19, Chapter 3, 3.1.3 e refers).

Note 3: Peer review, either external or internal, may provide a useful internal quality assurance tool.

7.14 *SAR Management Review*: All States should conduct an annual or more frequent analysis of their current State SAR system to identify specific gaps in capability against the minimum requirements of Annex 12 and the guidelines of the IAMSAR Manual to:

- a) enable the ICAO Asia/Pacific SAR data to be updated to accurately reflect the State's capability;
- b) be informed regarding the availability and capability of SAR services in neighbouring States;
- c) identify SAR research and development programmes, especially those which could be conducted if possible in cooperation with other States;
- d) establish a common set of basic SAR system statistics, which include-
 - i. number of SAR incidents per year;
 - ii. number of lives at risk versus number of lives saved;
 - iii. records of time from first alert to tasking the SRU;
 - iv. records of time from first alert to arrival on scene of first SRU; and
 - v. records of time from first alert to rescue.
- e) plan for any necessary improvements to gradually build and improve capability over time, which would be detailed in the State SAR Plan; and
- f) regularly review and update SAR agreements as appropriate.

Note 1: The National self-assessment on SAR found in IAMSAR Manual Vol I Appendix H and the ICAO USOAP-CMA Protocol Questions for SAR may assist States with their reviews.

Note 2: The number of incidents should identify the type (e.g.: Cospas-Sarsat alert, ATS alerts, etc.) and outcome of SAR incidents.

7.15 *SAR Promotion*: All States should conduct SAR promotional programs (e.g. Seminars, Workshops and public safety campaigns) to:

- a) encourage higher SAR preparedness by persons that may require SAR services through public safety campaigns aimed at preventing persons getting into distress situations (i.e.: 'preventative SAR');
- b) ensure the support of government decision-makers for SAR facilities and improvements, in particular adequate funding availability;
- c) assist media to understand SAR operations in order to minimise the need for explanations during SAR responses;
- d) recognise improvement in State SAR systems;
- e) enhance cooperation between SAR services and –
 - i. civil, military and police agencies;
 - ii. ANSPs;
 - iii. aerodrome and port operators;
 - iv. aircraft and shipping operators;
 - v. meteorological agencies;
 - vi. accident investigation agencies;
 - vii. government and non-government agencies affected by SAR operations, in

particular large scale national and international responses involving whole of government agencies and

viii. other States.

Note: social media may be an effective means of SAR promotion that reduces the workload of SAR staff during major SAR responses.

EMERGING ISSUES AND FUTURE DEVELOPMENTS

Planning for the Future

(New numbering required) States should monitor developments such as improvements to existing and new technologies and other emerging matters which may impact on the SAR system of the future as part of State, regional and global aviation strategic direction and planning. This may include matters such as:

- the need to cater for increased growth or changes in air and maritime traffic through SAR regions which may increase the demand, or present changed capability requirements, for SAR services. This may include, for example, new air routes using longer range aircraft into more remote areas or increased numbers of, and/or larger, cruise ships; and
- new technology such as UAS, autonomous vessels, new distress alerting devices and systems.

Research and Development

8.1 To develop the tools and systems required to meet foreseeable long-term requirements, there is a need for States to undertake planning and co-operation on SAR matters. This includes major efforts to define concepts, to extend knowledge and invent new solutions to future SAR challenges so these new concepts are selected and applied in an appropriate timely manner. Such efforts could be forged through collaborative partnerships between, States, ANSPs, International Organizations, institutes of higher learning and specialised technical agencies. This concept is consistent with Seamless ATM Principle 36 (*Inter-regional cooperation ('clustering') for the research, development and implementation of ATM projects*), and may manifest itself in joint projects such as:

- ICAO and/or IMO regional SAR training opportunities where provided to assist States that are unable to provide their own SAR training;
- Joint Sub-regional RCCs (ASEAN States in particular may be candidates for a single centre of excellence that brings together civil and military SAR experts from all ASEAN States and provides a single SAR facility that is cost-effective and has a level of resources and facilities that would be difficult for all States to maintain by themselves); and
- Regional online eLearning packages.

Note: Appendix 2 provides a summary of benefits to the SAR System of States assisting other States.

8.2 With the end goal of a globally interoperable SAR system in mind, the region will have to consider planning for a long term supporting concept and infrastructure. The following are possible areas that should be considered for future SAR research and development, in order to promote the maximum possible harmonisation and interoperability of SAR systems:

- a) data sharing such as aircraft and ship tracking information;
- b) automated data link communication to RCCs when an aircraft or ship exceeds a Variable Set Parameter (VSP) in terms of its operating envelope, or activation of an emergency status (could be displayed as a symbol, and the data could include certain operating parameters such as acceleration and altitude for an aircraft) – note the ICAO GADSS includes this concept;
- c) regional UAS and autonomous vessels for use in SAR;
- d) inclusion of the SAR system and RCC access as a component of the new ICAO

SWIM concept of operation and implementation;

- e) on-going development of standardised SAR training objectives and advanced training systems, including the use of high fidelity simulators;
- f) enhanced technology oriented systems to improve SAR system effectiveness; and
- g) transition to MEOSAR System and second generation beacons.

MILESTONES, TIMELINES, PRIORITIES AND ACTIONS

Milestones

9.1 Section 7 (*Performance Improvement Plan*) provides a scheme for the implementation of a collective set of enhancements for a number of elements in the PSCS, effective 07 November 2019.

9.2 States should commence planning for the various PSCS elements from the approval of this Plan, to ensure a smooth transition by 07 November 2019, and should include consideration of issues such as:

- safety/operational analysis and assessment;
- cost-effectiveness;
- budgetary issues;
- development of operational procedures; and
- training.

9.3 Section 8 (*Research and Future Development*) provides, subject to future agreement by concerned parties, possible SAR improvements beyond 2020 until 2030.

Priorities

9.4 It is a matter for each State to determine priorities in accordance with its own economic, environmental, safety and administrative drivers.

Actions

9.5 This Plan necessitates a number of implementation actions. It is expected that each Asia/Pacific State report progress on each applicable element to APANPIRG. All States should note the importance of SAR status monitoring, which is expected to be conducted as part of the Seamless ATM on-line monitoring. Reporting of implementation progress of SAR elements from this Plan is expected to be conducted by the on-line Seamless ANS Reporting and Monitoring system, once this system is enabled to include the subsidiary plan such as the Asia/Pacific SAR Plan.

9.6 Section 6 (*Current Situation*) provides analysis and major concerns in the region, which should be considered in the formulation of specific State plans.

9.7 SAR Coordination Forums, which are likely to be based on sub-regional development (such as a Pacific Ocean SAR Forum and Indian Ocean SAR Forum) need to be promoted, established and supported to ensure the on-going implementation work and future review of SAR expectations linked to this Plan are conducted.

SAREX

9.8 A program is expected to be established for an annual SAREX in each sub-region (South Asia, Southeast Asia, East Asia and the Pacific), with every second year being a desktop communications exercise, and alternate years being a full exercise. The SAREX outcomes and lessons learned should be reported to APANPIRG through the ATM Sub-Group.

9.9 The ICAO Asia and Pacific Regional Office is responsible for taking actions that assist the implementation of SAR within its accredited States, in cooperation with the IMO. In addition, the Asia and Pacific Regional Office was responsible for coordinating with adjacent ICAO regional offices on an ad hoc basis or at relevant trans-regional meetings.

APPENDIX 1: RCC PROCEDURES FOR AUTONOMOUS DISTRESS TRACKING (ADT) SIGNALS

Asia/Pacific States and territories need to prepare for the implementation of functions of the Global Aeronautical Distress and Safety System (GADSS). GADSS applies to certain passenger and cargo aircraft. The first phase commenced 8 November 2018 for the aircraft tracking function of automated reporting of position at least every 15 minutes. The next phase commences 1 January 2021 for the autonomous distress tracking (ADT) function of reporting at least once every minute. It is possible for the ADT to transmit as the aircraft flies across multiple SAR regions and flight information regions WP13 US comments change ADT to ...

The sharing of GADSS alerting information requires global coverage and a global interoperable systems approach. Aircraft tracking and ADT alert information for aircraft emergency conditions need rapid distribution to the aircraft operator, responsible ATSU and the responsible RCC. Effective sharing of this information to the responsible stakeholders requires well defined, accurate and readily accessible global flight information region and SAR region data, plus reliable 24-hour contact details for the aircraft operators, ATSUs and RCCs. For many States, these are key areas needing improvement to enable effective SAR response. And, territories which may not have an RCC but have an international airport, need to be prepared to correctly react when an RCC or ATSU informs it of such a possible inflight emergency.

RCC Procedures for no later than 1 January 2021

The RCC will greatly benefit from autonomous distress tracking (ADT), which provides timely detection of an aeroplane in distress and the last known location of the aeroplane. Current RCC processes are established under the provisions of ICAO Annex 11 and ICAO Annex 12 – *Search and Rescue*, and apply to the aeronautical RCC (ARCC). However, the International Convention on Maritime SAR also established a global maritime search and rescue system but uses maritime RCCs (MRCCs). To ensure close coordination between the aeronautical and maritime SAR services, States are expected to either establish a joint RCC (JRCC) or to ensure the closest practicable coordination between the ARCC and MRCC.

Note: In this plan, the term RCC will be used to apply to an ARCC, MRCC or JRCC.

While the ADT process is new, it is anticipated that the alerting process for the RCC will not fundamentally change.

The distress alert notification processes associated with ADT, based on ICAO Annex 11, Chapter 5 can be summarized as follows:

- if an ATSU detects an aeroplane in distress it will notify the RCC and the operator;
- if the operator detects an aeroplane in distress, it will notify the ATSU who will in turn notify the RCC;
- if an ELT is activated, the RCC will be notified via the Cospas-Sarsat system and the RCC will subsequently notify the ATSU and the aircraft operator;
- ADT notifications, including from the ELT(DT), provide the last known position of an aircraft that may be in a distress condition in flight; and, the aircraft operator, ATSU and RCC will be notified when the information is available from the ADT distress tracking repository; and

- The RCC should confer with the ATSU to decide if the ADT notification is a distress alert. It may be appropriate to consider this as in at least the uncertainty phase until further information is provided by the ATSU or aircraft operator.

As specified in Annex 11, Chapter 5, not only is the ATSU expected to notify the RCC immediately when an aeroplane is considered to be in a state of emergency, the notification is expected to contain as much as is available of information listed in that chapter. This list of information closely aligns with content of the “Missed 4D/15 Position Report Form for Operator” that the operator should provide in notifying an ATSU, as identified in ICAO Circular 347, *Aircraft Tracking Implementation Guidelines*, Chapter 8 – *Operator Missed Reports Notifications to ATS Unit*. CHECK WITH HQ

Once notified of a distress, the RCC will initiate action based on preparatory measures and operating procedures set forth in Annex 12. Under preparatory measures, the RCC is required to have readily available at all times up-to-date information concerning its search and rescue region, including ATSUs addresses and telephone numbers of all operators, or their designated representatives, engaged in operations in the region, and MRCCs which are not part of a JRCC.

If the ATSU was not the notification source, the RCC should contact the ATSU to confirm the possible distress and have the ATSU gather further information, which would be the list of information in Annex 11 and the most recent 4D aeroplane position data leading up to the ADT activation. These actions are taken concurrently as the RCC immediately initiates search and rescue actions. When the information concerning the emergency is received from another source, such as the ELT alert going directly to the RCC via the Cospas-Sarsat system, the RCC will notify the associated ATSU and also notify the operator, where possible, and keep the operator informed of all developments. (The MRCC does not have a requirement to notify the operator but should try to have arrangements in place to notify or seek the support of the ARCC or ATSU to notify the operator.)

The responsible RCC and the associated ATSU serving the flight information region (FIR) in which the aeroplane is operating coordinate their activities and work closely together. The RCC is expected to provide that ATSU with planned SAR action initiated by the RCC so that such information can be passed to the aeroplane.

If the aeroplane in distress continues in flight and crosses into other SAR region(s), the first RCC originally notified will contact and coordinate with the other RCC(s) to decide which RCC will have responsibility to coordinate the SAR operation. If coordination is handed off to another RCC then its associated ATSU would be expected to support that RCC.

The RCC and ATSU will keep each other informed as to changes in the emergency phase after the initial declaration as well as if the aeroplane has resumed normal operations or safely landed, and, as soon as practicable, notify the operator concerned.

APPENDIX 2: BENEFITS TO THE SAR SYSTEM OF STATES ASSISTING OTHER STATES

APAC States Face Demanding SAR Responsibilities with Few Resources

2.1 Many APAC States have the challenging responsibility of providing SAR services over vast and remote land and oceanic areas and several have few resources available to meet Annex 12 requirements.

Taking A Regional Approach Improves Effectiveness and Efficiency

2.2 To provide an effective and efficient SAR service in the region it is important that States focus not only on meeting their own national obligations, but also take the broader view that their State SAR system is only one part of the wider regional SAR system. States therefore need to cooperate, collaborate and share resources and technical expertise with their neighbouring and regional RCCs, with the more developed SAR States in particular looking for opportunities to assist their lesser developed State neighbours.

When Developed SAR States Support Less Developed Neighbours, Everyone Wins

2.3 Sometimes simple measures can reduce the incidence of SAR operations in a State's Area of Responsibility.

2.4 An example of this is where New Zealand has been regularly requested to send resources to Kiribati, which is not in New Zealand's SRR, to conduct aerial searches for people missing in small vessels at sea. New Zealand recognised that with the provision of basic aids, the number of people going missing at sea could be reduced. The work was completed through an aid program and the benefit was immediate and twofold. There has been a large reduction in the number of people going missing at sea and New Zealand has reduced costs through less aerial searches being required.

2.5 Another example is where Australia has recognised that increasing aircraft and vessel traffic in the north and western areas of its SRR in the Indian Ocean region comes with increased likelihood of more frequent SAR responses in that region. As a result, Australia has commenced a new project in partnership with the Maldives, Mauritius and Sri Lanka to fund and provide technical assistance to improve the SAR capabilities of those countries that will also assist Australia's SAR response obligations in that area of its SRR. Similarly, since 2008 Australia has been providing funding and development assistance to Indonesia to improve SAR capability and cooperation.

2.6 States who aren't compliant with Annex 12 SARPs and who are unable to meet the minimum SAR service requirements could consult and seek assistance from 'champion' States who are compliant and have well developed SAR systems in place.

2.7 Examples of assistance that could be provided by States, International Organisations (such as IMO and ICAO) or multi-lateral initiatives include:

- a) conducting of a SAR Gap Analysis;
- b) advice on the establishment of a SAR organisational framework;
- c) advice for the establishment of a National SAR Committee;
- d) technical assistance in the development of a National SAR Plan;
- e) providing copies of relevant SAR documents to be used as templates;
- f) technical assistance on the establishment of SAR agreements;
- g) technical assistance in the development of RCC position descriptions;
- h) training of SAR personnel;

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- i) provision of SRU where appropriate and training of SRU crews;
- j) provision/sharing of computerised SAR tools including incident management systems, databases, maritime drift modelling software, etc.;
- k) establishing data and information sharing agreements between RCCs;
- l) provision of operational search plan data;
- m) providing advice on how to conduct a SAREX and post-SAREX analysis; and
- n) set up of SAR system publicity and safety awareness campaigns.

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ATM/AIM/SAR Deficiencies List (Updated 16 August 2019)

	Deficiencies			Corrective Action		
States/facilities	Description	Date first reported	Remarks	Executing body	Target date	Priority **
	WGS-84 Requirements of Paragraph 3.7.1 1.2.1 of Annex 15					
Afghanistan	WGS-84 - Not implemented	24/6/2014		Afghanistan	TBD	A
Bangladesh	WGS-84 - Not implemented	24/6/2014		Bangladesh	TBD	A
Bhutan	WGS-84 - Not implemented	2/7/1999	Data conversion completed, but not published	Bhutan	TBD	A
Brunei Darussalam	WGS-84 - Not implemented	24/6/2014		Brunei Darussalam	TBD	A
~~Cook Islands~~	~~WGS-84 - Not implemented~~	~~24/6/2014~~		~~Cook Islands~~	~~TBD~~	~~A~~
Marshall Islands	WGS-84 - Not implemented	24/6/2014		Marshall Islands	TBD	A
Micronesia	WGS-84 - Not implemented	24/6/2014		Micronesia	TBD	A
Nauru	WGS-84 - Not implemented		Conferring with consultant	Nauru	TBD	A
Palau	WGS-84 - Not implemented	24/6/2014		Palau	TBD	A
Samoa	WGS-84 - Not implemented	24/6/2014		Samoa	TBD	A
Thailand	WGS-84 - Not implemented	24/6/2014		Thailand	TBD	A
Vanuatu	WGS-84 – Not implemented	2/7/1999	Implemented at main airports	Vanuatu	1999	A
	AIP Format Requirements of Chapter 4 5 of Annex 15					
Kiribati	AIP Format - Not implemented	7/7/99	ATM/AIS/SAR/SG/18 (June 2009) was advised AIP in draft stage	Kiribati		A

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	Deficiencies			Corrective Action		
States/facilities	Description	Date first reported	Remarks	Executing body	Target date	Priority **
Nauru	AIP Format - Not implemented	7/7/99	ATM/AIS/SAR/SG/18 (June 2008) was advised work soon to start	Nauru		A
	<u>AIS Quality Management System Requirements of Paragraph 3.2.4 3.6.1 of Annex 15 Quality Management System - Not implemented</u>					
Afghanistan	AIS Quality Management System - Not implemented	24/6/2014		Afghanistan	TBD	A
Bangladesh	AIS Quality Management System - Not implemented	24/6/2014		Bangladesh	TBD	A
Bhutan	AIS Quality Management System - Not implemented	24/6/2014		Bhutan	TBD	A
Brunei Darussalam	AIS Quality Management System - Not implemented	24/6/2014		Brunei Darussalam	TBD	A
Cambodia	AIS Quality Management System - Not implemented	24/6/2014		Cambodia	TBD	A
Indonesia	AIS Quality Management System - Not implemented	24/6/2014		Indonesia	TBD	A
Kiribati	AIS Quality Management System - Not implemented	24/6/2014		Kiribati	TBD	A
Lao PDR	AIS Quality Management System - Not implemented	24/6/2014		Lao PDR	TBD	A
Maldives	AIS Quality Management System - Not implemented	24/6/2014		Maldives	TBD	A

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	Deficiencies			Corrective Action		
States/facilities	Description	Date first reported	Remarks	Executing body	Target date	Priority **
Marshall Islands	AIS Quality Management System - Not implemented	24/6/2014		Marshall Islands	TBD	A
Micronesia	AIS Quality Management System - Not implemented	24/6/2014		Micronesia	TBD	A
Myanmar	AIS Quality Management System - Not implemented	9/6/2016		Myanmar	TBD	A
Nauru	AIS Quality Management System - Not implemented	24/6/2014		Nauru	TBD	A
Nepal	AIS Quality Management System - Not implemented	24/6/2014		Nepal	TBD	A
Palau	AIS Quality Management System - Not implemented	24/6/2014		Palau	TBD	A
Philippines	AIS Quality Management System - Not implemented	24/6/2014		Philippines	TBD	A
Samoa	AIS Quality Management System - Not implemented	24/6/2014		Samoa	TBD	A
Solomon Islands	AIS Quality Management System - Not implemented	24/6/2014		Solomon Islands	TBD	A
Sri Lanka	AIS Quality Management System - Not implemented	9/6/2016		Sri Lanka	TBD	A
Thailand	AIS Quality Management System - Not implemented	24/6/2014		Thailand	TBD	A
Timor-Leste	AIS Quality Management System - Not implemented	24/6/2014		Timor-Leste	TBD	A
Vanuatu	AIS Quality Management System - Not implemented	24/6/2014		Vanuatu	TBD	A

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	Deficiencies			Corrective Action		
States/facilities	Description	Date first reported	Remarks	Executing body	Target date	Priority **
	<u>Aeronautical Data Area of Responsibility</u> - requirements of Paragraph 2.1.2 of Annex 2 to ensure that the provision of aeronautical data and aeronautical information covers its own territory and those areas over the high seas for which it is responsible for the provision of ATS					
Bangladesh	Aeronautical Data Promulgation Within the State's Area of Responsibility - Not implemented	29/03/2019 SAIOACG /9		Bangladesh	TBD	A
	<u>Designation of Restricted Areas</u> - requirements of Annex 2 (Definitions) to ensure that restricted areas are designated above the land areas or territorial waters of a State					
Australia	Designation of Restricted Areas Above the Land Areas or Territorial Waters of a State - Not implemented	29/03/2019 SAIOACG /9	Danger areas within international airspace that is part of a State's responsibility is acceptable	Australia	TBD	A
India	Designation of Restricted Areas Above the Land Areas or Territorial Waters of a State - Not implemented	29/03/2019 SAIOACG /9	Danger areas within international airspace that is part of a State's responsibility is acceptable	India	TBD	A
Indonesia	Designation of Restricted Areas Above the Land Areas or Territorial Waters of a State - Not implemented	29/03/2019 SAIOACG /9	Danger areas within international airspace that is part of a State's responsibility is acceptable	Indonesia	TBD	A
	<u>Airspace Classification Requirements of Paragraph 2.6 of Annex 11</u>					

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States/facilities	Deficiencies			Corrective Action		
	Description	Date first reported	Remarks	Executing body	Target date	Priority **
China	Airspace Classification - Not implemented	7/7/99	Difference to Annex 11 is published in AIP, China.	China	APANPIRG/19 updated, implementation planned by end 2010.	A
Macau, China	Airspace Classification - Not implemented	05/09/2018		Macau, China	TBD	A
Nauru	Airspace Classification - Not implemented	7/7/99		Nauru	TBD	A
Solomon Islands	Airspace Classification - Not implemented	7/7/99		Solomon Islands	TBD	A
	<u>ATS Message Addressing Requirements of Doc 4444 PANS-ATM Section 11.4 (Message Types and their Application)</u>		Note: the threshold for a Deficiency is 10 or more DEP messages reported to have not been sent, and where the analysed data provided evidence of a systemic (either systems or human factors) failure to send the message			
Bangladesh	DEP message transmission	05/09/2018	DEP messages inconsistently transmitted Conclusion APANPIRG/27/12 and ICAO correspondence	Bangladesh	TBD	A
India	DEP message transmission	05/09/2018	DEP messages inconsistently transmitted Conclusion APANPIRG/27/12 and ICAO correspondence	India	TBD	A

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States/facilities	Deficiencies			Corrective Action		
	Description	Date first reported	Remarks	Executing body	Target date	Priority **
Indonesia	DEP message transmission	05/09/2018	DEP messages inconsistently transmitted Conclusion APANPIRG/27/12 and ICAO correspondence	Indonesia	TBD	A
Malaysia	DEP message transmission	05/09/2018	DEP messages inconsistently transmitted Conclusion APANPIRG/27/12 and ICAO correspondence	Malaysia	TBD	A
Maldives	DEP message transmission	09/08/2019	DEP messages inconsistently transmitted Conclusion APANPIRG/27/12 and ICAO correspondence	Maldives	TBD	A
Myanmar	DEP message transmission	05/09/2018	DEP messages inconsistently transmitted Conclusion APANPIRG/27/12 and ICAO correspondence	Myanmar	TBD	A
Nepal	DEP message transmission	09/08/2019	DEP messages inconsistently transmitted Conclusion APANPIRG/27/12 and ICAO correspondence	Nepal	TBD	A
Philippines	DEP message transmission	05/09/2018	DEP messages inconsistently transmitted Conclusion APANPIRG/27/12 and ICAO correspondence	Philippines	TBD	A
Republic of Korea	DEP message transmission	05/09/2018	DEP messages inconsistently transmitted Conclusion APANPIRG/27/12 and ICAO correspondence	Republic of Korea	TBD	A

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States/facilities	Deficiencies			Corrective Action		
	Description	Date first reported	Remarks	Executing body	Target date	Priority **
USA	DEP message transmission	05/09/2018	DEP messages inconsistently transmitted Conclusion APANPIRG/27/12 and ICAO correspondence	USA	TBD	A
	SAR capability: Requirements of Annex 12 as defined in the Regional Air Navigation Plan Volume II Part I – GENERAL PLANNING ASPECTS Section 3 SPECIFIC REGIONAL REQUIREMENTS, failure to reach 90% or more implementation of the Asia/Pacific SAR Plan					
Afghanistan	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (no data)~~ APSAR/WG/4 45%	Afghanistan	~~2016~~ 2019	U
Bangladesh	Asia/Pacific SAR Plan	17/05/2019	APSAR/WG/4 69%	Bangladesh	2019	U
Bhutan	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (no data)~~ APSAR/WG/4 34%	Bhutan	~~2016~~ 2019	U
Brunei	Asia/Pacific SAR Plan	17/05/2019	APSAR/WG/4 63%	Brunei	2019	U
Cambodia	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (14 of 20)~~ APSAR/WG/4 76%	Cambodia	~~2016~~ 2019	U
China	Asia/Pacific SAR Plan	17/05/2019	APSAR/WG/4 82%	China	2019	U
Cook Islands	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (19 of 20)~~ APSAR/WG/4 0%	Cook Islands	~~2016~~ 2019	U

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States/facilities	Deficiencies			Corrective Action		
	Description	Date first reported	Remarks	Executing body	Target date	Priority **
Cook Islands	Annex 12 requirements not implemented. No agreements with adjacent States.	31/1/95	Cook Islands implement Annex 12 requirements and co-ordinate LOA with adjacent States ICAO assist to develop SAR capability and to co-ordinate with adjacent States	Cook Islands	2009. SAR agreement with New Zealand completed 2007.	U
DPR Korea	SAR Capability Matrix Asia/Pacific SAR Plan	6/07/2015	SAR Capability (15 of 20 elements non-compliant) APSAR/WG/4 66%	DPR Korea	2016-2019	U
Fiji	SAR Capability Matrix Asia/Pacific SAR Plan	6/07/2015	SAR Capability (13 of 20 elements non-compliant) APSAR/WG/4 80%	Fiji	2016-2019	U
French Polynesia	Asia/Pacific SAR Plan	17/05/2019	APSAR/WG/4 84%	French Polynesia	2019	U
India	Asia/Pacific SAR Plan	17/05/2019	APSAR/WG/4 88%	India	2019	U
Indonesia	Asia/Pacific SAR Plan	17/05/2019	APSAR/WG/4 87%	Indonesia	2019	U
Kiribati	SAR Capability Matrix Asia/Pacific SAR Plan	6/07/2015	SAR Capability (no data) APSAR/WG/4 26%	Kiribati	2016-2019	U
Lao PDR	SAR Capability Matrix Asia/Pacific SAR Plan	6/07/2015	SAR Capability (10 of 20 elements non-compliant) APSAR/WG/4	Lao PDR	2016-2019	U
Macau, China	SAR Capability Matrix Asia/Pacific SAR Plan	6/07/2015	SAR Capability (10 of 20 elements non-compliant) APSAR/WG/4 85%	Macau, China	2016-2019	U
Malaysia	Asia/Pacific SAR Plan	17/05/2019	APSAR/WG/4 77%	Malaysia	2019	U
Maldives	SAR Capability Matrix Asia/Pacific SAR Plan	6/07/2015	SAR Capability (9 of 20 elements non-compliant) APSAR/WG/4 71%	Maldives	2016-2019	U

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	Deficiencies			Corrective Action		
States/facilities	Description	Date first reported	Remarks	Executing body	Target date	Priority **
Marshall Islands	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (no data elements non-compliant)~~ APSAR/WG/4 0%	Marshall Islands	~~2016~~ 2019	U
Micronesia	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (20 of 20 elements non-compliant)~~ APSAR/WG/4 0%	Micronesia	~~2016~~ 2019	U
Mongolia	Asia/Pacific SAR Plan	17/05/2019	APSAR/WG/4 63%	Mongolia	2019	U
Myanmar	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (17 of 20 elements non-compliant)~~ APSAR/WG/4 67%	Myanmar	~~2016~~ 2019	U
Nauru	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (no data elements non-compliant)~~ APSAR/WG/4 0%	Nauru	~~2016~~ 2019	U
Nepal	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (12 of 20 elements non-compliant)~~ APSAR/WG/4 17%	Nepal	~~2016~~ 2019	U
New Caledonia	Asia/Pacific SAR Plan	17/05/2019	APSAR/WG/4 54%	New Caledonia	2019	U
Palau	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (no data)~~ APSAR/WG/4 0%	Palau	~~2016~~ 2019	U
Pakistan	Asia/Pacific SAR Plan	17/05/2019	APSAR/WG/4 84%	Pakistan	2019	U
Papua New Guinea	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (11 of 20 elements non-compliant)~~ APSAR/WG/4 0%	Papua New Guinea	~~2016~~ 2019	U
Philippines	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (12 of 20 elements non-compliant)~~ APSAR/WG/4 61%	Philippines	~~2016~~ 2019	U

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	Deficiencies			Corrective Action		
States/facilities	Description	Date first reported	Remarks	Executing body	Target date	Priority **
Samoa	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (no data elements non-compliant)~~ APSAR/WG/4 0%	Samoa	~~2016~~ 2019	U
Solomon Islands	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (no data)~~ APSAR/WG/4 0%	Solomon Islands	~~2016~~ 2019	U
Sri Lanka	Asia/Pacific SAR Plan	17/05/2019	APSAR/WG/4 60%	Sri Lanka	2019	U
Thailand	Asia/Pacific SAR Plan	17/05/2019	APSAR/WG/4 82%	Thailand	2019	U
Timor-Leste	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (no data)~~ APSAR/WG/4 0%	Timor-Leste	~~2016~~ 2019	U
Tonga	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (18 of 20 elements non-compliant)~~ APSAR/WG/4 0%	Tonga	~~2016~~ 2019	U
Vanuatu	~~SAR Capability Matrix~~ Asia/Pacific SAR Plan	6/07/2015	~~SAR Capability (no data)~~ APSAR/WG/4 0%	Vanuatu	~~2016~~ 2019	U
	Non Provision of Safety-related Data Requirement of Paragraph 3.3.5.1 of Annex 11 (provision of data for monitoring the height-keeping performance of aircraft) and APANPIRG Conclusion 16/6 – Non Provision of safety related data by States					
Afghanistan	Non-provision of safety related data	12/07/2019	Failure to submit Kabul LHD data for January-December 2018	Afghanistan	RASMAG24	U
Bangladesh	Non-provision of safety related data	12/07/2019	Failure to submit the 2018 TSD. Failure to submit Dhaka LHD data for January-December 2018	Bangladesh	RASMAG24	U
Bhutan	Non-provision of safety related data	12/07/2019	Failure to submit the annual RVSM approval snapshot for two consecutive years	Bhutan	RASMAG24	U
French Polynesia	Non-provision of safety related data	05/07/2018	Failure to submit the 2016, 2017	French Polynesia	RASMAG23	A

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States/facilities	Deficiencies			Corrective Action		
	Description	Date first reported	Remarks	Executing body	Target date	Priority **
			and 2018 TSD			
India	Non-provision of safety related data	13/07/2017	Failure to submit RVSM approvals for a large number of aircraft, most of which have also been reported in 2016. RASMAG/24	India	RASMAG23	U
Lao PDR	Non-provision of safety related data	13/07/2017	Failure to submit the annual RVSM approval snapshot for ~~3~~ four consecutive years	Lao PDR	RASMAG23	A
Pakistan	Non-provision of safety related data	12/07/2019	Failure to submit Karachi LHD data for July-December 2018. Late submission of 2018 Karachi TSD	Pakistan	RASMAG24	U
	State Responsibility to comply with the Annex 6 Height-Keeping Monitoring Requirement Annex 6 Part I Section 7.2.9 (10th Ed.) and Part II Section 2.5.2.10 (9th Ed.)					
Afghanistan	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/23	Remaining monitoring burden of 38% reported in RASMAG/23	Afghanistan	RASMAG24	A
Bangladesh	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/22	Remaining monitoring burden of 44% reported in RASMAG/23 RASMAG/24 14%	Bangladesh	RASMAG24	A
Indonesia	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/23	Remaining monitoring burden of 42% reported in RASMAG/23 Revised number as of August 2018 is 30.1% RASMAG/24 21%	Indonesia	RASMAG24	A
Malaysia	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/23	Remaining monitoring burden of 38% reported in RASMAG/23	Malaysia	RASMAG24	A
Myanmar	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/23	Remaining monitoring burden of 36% reported in RASMAG/23 RASMAG/24	Myanmar	RASMAG24	A

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States/facilities	Deficiencies			Corrective Action		
	Description	Date first reported	Remarks	Executing body	Target date	Priority **
Pakistan	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/22	Remaining monitoring burden of 69% reported in RASMAG/23 RASMAG24 56%	Pakistan	RASMAG24	A
~~The Philippines~~	~~Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)~~	~~RASMAG/23~~	~~Remaining monitoring burden of 30% (30.1%) reported in RASMAG/23 RASMAG24 26%~~	~~The Philippines~~	~~RASMAG24~~	~~A~~
	Data Link Performance Monitoring and Analysis Requirements of Paragraph 2.28 and/or 3.3.5.2 of Annex 11 not met					
Fiji	Post-implementation monitoring not implemented	25/06/2018	Problem reports not provided to CRA. ~~Performance monitoring and analysis not reported to FIT RASMAG24~~	Fiji	TBD	A
India	Post-implementation monitoring not implemented	13/07/2017	Performance monitoring and analysis was reported for the Chennai FIR, but was not reported for the Kolkata and Mumbai FIRs.	India	TBD	A
~~Malaysia~~	~~Post implementation monitoring not implemented~~	~~29/5/2015~~	~~Problem Reports not provided to CRA. RASMAG/24~~	~~Malaysia~~	~~TBD~~	~~A~~
Myanmar	Post-implementation monitoring not implemented	29/5/2015	Problem Reports not provided to CRA.	Myanmar	TBD	A
Maldives	Post-implementation monitoring not implemented	29/5/2015	Problem Reports not provided to CRA. Performance monitoring and analysis not reported to FIT.	Maldives	TBD	A

**** Note:** In accordance with the *APANPIRG Handbook - Asia/Pacific Supplement to the Uniform Methodology for the Identification, Assessment and Reporting of Air Navigation Deficiencies*, priority for Air Navigation Deficiencies is guided by the principle that a deficiency with respect to an ICAO Standard is accorded a “U” status, while a non-compliance with a Recommended Practice or a PANS is considered as “A” or “B” subject to additional expert evaluation. The final prioritization of deficiencies is the prerogative of APANPIRG.

ATM Sub Group of APANPIRG — TASK LIST

The priorities assigned in the list have the following connotation:

A = Tasks of a high priority on which work should be expedited; and

B = Tasks of a medium priority on which work should be undertaken as soon as possible but not to the detriment of Priority “A” tasks.

(Last update 03 August 2018, amendments are shown in highlight)

ACTION ITEM & PRIORITY	DESCRIPTION	TARGET DATE	RESPONSIBLE PARTY	STATUS	REMARKS
18/8 Priority A	<u>Identify and manage Deficiencies in the ATM, AIS and SAR fields</u> a) Develop and maintain Deficiencies list, b) Identify unimplemented items in the ~~ANP~~ BANP, c) Assist States to correct deficiencies, d) Promote timely resolution of safety-critical items identified by APANPIRG	ONGOING	Functional Responsibility: No specific working group established, all parties have responsibilities in this area (States, Users, International Organisations, Regional Office, ATMSG APANPIRG)	OPEN	

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ACTION ITEM & PRIORITY	DESCRIPTION	TARGET DATE	RESPONSIBLE PARTY	STATUS	REMARKS
18/9 Priority B	<u>SAR Matters</u> Assist appropriate provision of SAR facilities, services and procedures within the Asia Pacific Region by: a) Periodic review of SAR facilities, services and procedures in the region, b) Encourage States to delegate or negotiate SAR services, c) Asia/Pacific SAR Plan Assessment be kept up to date and distributed to States for information and action., d) Asia/Pacific “Register of SAR Agreements” be kept up to date and distributed to States for information and action	ONGOING	States, Regional Office, APSARWG/TF ATM/AIS/SAR/SG APANPIRG	OPEN	States to update the ATM/SG and APSAR/WG each year on SAR capability
<u>22/1</u> Priority B	<u>Review and Update the Asia/Pacific Route Catalogue</u>	On-going	IATA, ATM Coordination Groups, ATM/SG	OPEN	
<u>2/3</u>	Secretariat to follow-up on ATM/SG/2 comments relating to Doc 7030 PfAs for Performance Based Airspace, and modify the PfAs as necessary before formal circulation to States. - Annex 10 requirement for <i>equipped</i> rather than <i>serviceable</i>; - IATA concerns regarding same; - Re-wording of sub-paragraph relating to enhanced service delivery;	ATM/SG/8	ICAO	OPEN	

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ACTION ITEM & PRIORITY	DESCRIPTION	TARGET DATE	RESPONSIBLE PARTY	STATUS	REMARKS
	Clarification of non-applicability to State aircraft (Article 3 of the Convention);				
<u>3/3</u>	Need for follow-up by ICAO and relevant States on the many actions that had not been completed, regarding Afghanistan contingency arrangements planned.	31 December 2018	ICAO MID and APAC, IATA, Pakistan, India, Afghanistan, Iran	~~OPEN~~ CLOSED	
<u>4/1</u>	Analysis of ANSPs which failed to send Departure (DEP) messages, notify the States and raise deficiencies	ATM/SG/8	ICAO	Open	Some States were not Asia/Pacific so were just subject to notification
<u>4/3</u>	States were urged to respond to the State Letters that would be circulated to advise of their FIR/SRR status.	ATM/SG/8	ICAO (State Letter), States (response)	Open	
<u>4/4</u>	India and Pakistan to internally discuss connectivity NH to Pratapgarh as a matter of urgency and inform Pakistan the results.	ATM/SG/7	India and Pakistan	~~Open~~ CLOSED	
<u>4/5</u>	The Philippines was requested to provide an update on progress of the implementation of operational ADS-C/CPDLC services	ATM/SG/7 SEACG/27	Philippines	Open	
<u>5/2</u>	Establish communication process for ATFM measure information originated by China and relating to aircraft northbound on M771 and similar routes	?? ATM/SG/7	China, Singapore, Thailand?? Others??	~~Open~~ CLOSED	Regional Framework for Collaborative ATFM Sections 5.54 – 5.47, and 7.17 refers (ADEXP)
<u>5/3</u>	Multi-Nodal ATFM Operational Trial Group and NARAHG to harmonize ATFM measures.	ATM/SG/8	China, Japan, Republic of Korea, Hong Kong China, Singapore, Thailand, other relevant Multi-	Open	

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ACTION ITEM & PRIORITY	DESCRIPTION	TARGET DATE	RESPONSIBLE PARTY	STATUS	REMARKS
			Nodal ATFM project States		
<u>5/4</u>	Include analysis of missing FPL messages in ATFM/SG task on missing DEP messages	ATFM/SG/10	China, participating ATFM/SG States, Secretariat	~~Open~~ CLOSED	Duplicate
<u>5/5</u>	Phase 2 of the Alphanumeric Call Sign Project report to ATM/SG/7	ATM/SG/8 ~~July/August 2019~~	IATA	Open	
<u>5/7</u>	Develop proposal for harmonized format for NOTAM notifying airspace use plans	~~AAITF/13~~ AAITF/14	Australia, India, Japan, Thailand	~~Open~~ CLOSED	Proposal to be made to AAITF/13 Reviewed at ATM/SG/6
<u>5/8</u>	Follow-up on Mumbai/Mogadishu/Seychelles FIR route PfA	~~30/09/2017~~ ATM/SG/8	India, ICAO	Open	Coordinate with ICAO ESAF and States
<u>6/1</u>	After discussions about the Ministerial Declaration's priorities, the meeting agreed that an effective means of monitoring would be a publically-available implementation progress report.	ATM/SG/8	ICAO	Open	
<u>6/2</u>	The Performance Indicator Framework and Implementation Plan should be submitted for the ATM/SG's consideration by the RAPMF/SWG	Before 01 July 2019	RAPMF/SWG and related member States	~~Open~~ CLOSED	
<u>6/3</u>	The Secretariat requested that the States that had participated in the missing FPL and DEP data gathering activity conduct another such activity at a future date yet to be coordinated	ATFM/SG/10	Australia China India Japan Singapore Thailand	Open	
<u>6/4</u>	Given the development of Afghanistan's surveillance capability (Flimsy 09), the meeting agreed to the States concerned developing a transition plan in this regard as a matter of priority.	31 October 2018	Afghanistan, Pakistan, India and Thailand, ICAO	~~Open~~ CLOSED	ATM/SG/6 Side Meeting

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ACTION ITEM & PRIORITY	DESCRIPTION	TARGET DATE	RESPONSIBLE PARTY	STATUS	REMARKS
<u>6/5</u>	ICARD application update - deleted 5LNC into State reserved list after 6 months. China proposed that ICARD references to 'coordinating country' be changed to 'coordinating country/administration' to facilitate the Special Administration Regions of China	AAITF/14	ICAO	~~Open~~ CLOSED	
<u>6/6</u>	AAITF would undertake periodic sampling of NOTAMs, with a view to direct engagement with States responsible for permanent, long duration NOTAM and subsequent reporting to APANPIRG through the Air Navigation Deficiencies list. IATA requested that this issue be escalated to reflect that it was an inter-regional problem.	AAITF/15	ICAO, States	Open	
<u>6/7</u>	The meeting agreed that AAITF should further examine the performance objectives and status reporting elements with a view to future rationalization in this regard of the AIM Plan and Seamless ATM Plan. AAITF should also re-consider the necessity for two levels of implementation reporting.	AAITF/14	ICAO	~~Open~~ CLOSED	
<u>6/8</u>	The meeting urged ICAO to provide the resources for a harmonized, single portal for reporting implementation of the performance expectations of the Seamless ATM Plan and its supporting, subsidiary plans (Regional Framework for Collaborative ATFM, Regional ATM Contingency Plan, Regional SAR Plan and Regional Plan for Collaborative AIM)	ATM/SG/7	ICAO	~~Open~~ CLOSED	Conclusion
<u>7/1</u>	A survey of Asia/Pacific implementation of the new	01 March	ICAO	Open	

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ACTION ITEM & PRIORITY	DESCRIPTION	TARGET DATE	RESPONSIBLE PARTY	STATUS	REMARKS
	SID/STAR phraseology would be circulated in Q3 2019 and Q1 2020	2020			
<u>7/2</u>	ICAO suggested that Afghanistan provide an outline of its action plan to ICAO that demonstrated how they would overcome the surveillance and communication issues.	October 2019	Afghanistan	Open	
<u>7/3</u>	The Philippines would provide an amended draft Letter of Agreement (LoA) to reflect the 50NM longitudinal spacing change to Indonesia as soon as possible.	September 2019	Philippines	Open	
<u>7/4</u>	India was requested to provide a draft of a contingency ATFM response concept.	ATFM/SG/ 10	India Thailand Secretariat	Open	
<u>7/5</u>	Referring to the SEACG/26 discussion of RNP2 (or equivalent) equipage on ATS routes L642 and M771, Hong Kong China informed the meeting that the results of their analysis differed from those reported at SEACG/26 by Singapore. The two Administrations agreed to coordinate offline to reach an agreed common analysis methodology. (to be transferred from ATM/SG to SEACG	SEACG/27	Singapore, Hong Kong China	Open	
<u>7/6</u>	Neighbouring States were urged to expedite action to resolve ICARD anomalies associated with FIR boundary waypoints (named APAC States – and ICAO to coordinate with other States through their Regional Offices).	AAITF/15	Name States ICAO	Open	
<u>7/7</u>	Circulate an invitation to ATFM experts to support the proposal in the Decision by encouraging subject matter experts from ATFM/SG to participate in an	30 November 2019	ICAO Chair ATFM/SG	Open	

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ACTION ITEM & PRIORITY	DESCRIPTION	TARGET DATE	RESPONSIBLE PARTY	STATUS	REMARKS
	ad-hoc group to develop use cases and user requirements for future SWIM-based MET information services supporting ATFM (in consultation with ATFM/SG Chair, notify ATFM/SG participants and request they engage/participate).				
<u>7/8</u>	Fiji informed the meeting that Nauru had completed an AIP, and would facilitate contact between Nauru and ICAO to remove the APANPIRG Deficiency	September 2019	Fiji	Open	
<u>7/9</u>	Coordinate and Report UAS developments with/from other APAC regional bodies, other ICAO regions, UAS-AG and JARUS	Ongoing	Secretariat	Open	Residual task following dissolution of APUAS/TF
<u>7/10</u>	WP on ATM/SG/7 Appendix G amendments	SAIOACG/ 10	India	Open	

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UPDATED: 15 August 2019

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	AFGHANISTAN			
CCT	Mr. Shah Habibi	Deputy Director, Afghanistan Civil Aviation Authority	Mob: +93 703333337	habibi@acaa.gov.af
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CCT	Mr. Ghalam Masoom Masoomi	Chief of Air Traffic Control Tower	Tel: +93 786 308 480	yman_masoomi@yahoo.com
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ATC	Mr. Mike Fallon			mf.kacc.training@gmail.com
ATC	Kabul ACC			kabulacc@yahoo.com
ARC	Mr. Prasad Selvaraj	Afghanistan AIS Staff		Prasad.Selvaraj@iapws.com
ADM	Capt. Ghulam Jailani Wafa	Air Traffic Management Director Afghan Civil Aviation Authority Kabul	Mob: +93 700304828	jailaniw63@gmail.com ; jailaniw@acaa.gov.af Other contacts habibi.acaa@gmail.com ; habibi@acaa.gov.af
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	ARMENIA			

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CCT	Mr. Artur Gasparyan	Director General "ARMATS" CJSC	Tel: +374 10284142 Fax: +374 10284142	arthur.gasparyan@armats.am
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CCT	Mr. Bala Mirzayev	Head of ATS, Azeraeronavigation	Tel: +99 41249716 04 Fax: +99 4124971604	BalaMirzayev@azans.az
CCT	Mr. Agabek Balabekov			agabek.balabekov@azans.az
	AUSTRALIA			
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AIS	Mr. Timothy Hurley	Aviation Safety Inspector (AIM & IFP) Civil Aviation Safety Authority GPO Box 2005, Canberra ACT 2600	Tel: +61 7 3144 7609 Fax: +61 7 3144 755	timothy.hurley@casa.gov.au
AIS	Mrs. Louise Alberts	Quality and Service Improvement Manager Airservices Australia	Tel: 02 6268 4196	louise.alberts@airservicesaustralia.com ;
SAF	Mr. Simon McDonald	Safety Performance Analyst and Researcher, Safety Assurance Branch Safety and Assurance Group Airservices Australia Australian Airspace Monitoring Agency (AAMA)		aama@airservicesaustralia.com

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ARC	Mr. Timothy Hurley	Air Navigation, Airspace and Aerodromes Branch Civil Aviation Safety Authority Australia		timothy.hurley@casa.gov.au
ADM	Ms. Pip Spence	Deputy Secretary Department of Infrastructure and Regional Development GPO Box 594 Canberra ACT 2601	Tel: +61 (2) 6274 7086 Fax: +61 (2) 6274 7804	austicao@infrastructure.gov.au ; InternationalICAO@infrastructure.gov.au
ADM	Mr. Neil Bain	ATS Specialist Team Leader Operational Standards Airservices Australia Locked Bag 747 Eagle Farm, Qld, 4009	Tel: +61 7 3866 3526 Mobile: +61 409069851 Fax: +61 7 38663742	neil.bain@airservicesaustralia.com
ADM	Mr. Andrew Sparrow	Section Head Air Navigation, Airspace and Aerodromes Branch Civil Aviation Safety Authority GPO Box 2005 Canberra ACT 2601	Tel: +61 2 6217 1690 Fax: +61 2 6217 1500	andrew.sparrow@casa.gov.au ;
	BAHRAIN			
CCT	Abdallal Alquadhi	Director AIS		aalqadhi@mtt.gov.bh
CCT	Ahmed Bucheery	Director ATM		aalqadhi@mtt.gov.bh
	BANGLADESH			
SAR		Director, Flight Safety & Regulations Kurmitola, Dhaka-1229 Civil Aviation Authority, Bangladesh		dfsraab@bracnet.net

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ATC		Director, Air Traffic Services & Aerodromes Civil Aviation Authority, Bangladesh		datsaero@caab.gov.bd
ATC	Mr. Masud Rana	Assistant Director Station Air Traffic Officer (SATO) Air Traffic Control Center Hazrat Shahjalal International Airport Dhaka, Bangladesh	Tel: +880 2 890 1460 Fax: +880 2 890 1450	mdmrana@yahoo.com
AIS	Mr. Mohammad Doulotuzzaman	Assistant Director (AIS) Civil Aviation Authority of Bangladesh ATS & Aerodromes Division, CAAB Headquarter, Kurmitola, Dhaka -1229	Tel: +880 1913 575716 Fax: +8802 8901411	65mdzaman@gmail.com
AIS	Ms. Selina Akhtar Banu	Assistant Director Chief Communication Operation Officer, Hazrat Shahjalal International Airport, Operation Building, Kurmitola, Dhaka-1229	Tel: +880 1913 313178 Fax: +88028901411	selinaakhtarbanu@yahoo.com
AIS	Mr. Mohammad Hasan Johir	Senior Aerodrome Officer Civil Aviation Authority of Bangladesh Station Air Traffic Officer Shah Amanat International Airport, Chittagong 4205,	Tel: +880 1777631328 Fax: +880 241350101	hasanatc3240@gmail.com
ARC	Mr. Paritosh Kumar Halder	ANS Consultant (AIS) Civil Aviation Authority of Bangladesh		laboni.falguni@gmail.com
ARC	Mr. Abu Kayes Mohammad Zahirul Islam	Consultant (GIS) Civil Aviation Authority of Bangladesh		zahirulislamovich@gmail.com

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ADM	Air Vice Marshal M Naim Hassan, BBP, OSP, AFWC, PSC	Chairman Civil Aviation Authority of Bangladesh Headquarters Office Kurmitola Dhaka 1229	Tel: +880 2 8901400 +880 2 7912366 Fax: +880 2 8901411	chairman@caab.gov.bd D/FS dfsr@caab.gov.bd zia.dfsr@gmail.com
ADM	Mr. Md. Nurul Islam	Director (ATS and Aerodromes) Civil Aviation Authority of Bangladesh ATS & Aerodrome Division HQ, Kurmitola Dhaka 1229 Bangladesh	Tel: +880 2 890 1404 Fax: +880 2 890 1411	datsaero@caab.gov.bd
ADM	Mr. S.M. Lutful Kabim	Assistant Director (IR and Regulation) Flight Safety and Regulations Division Civil Aviation Authority of Bangladesh Headquarters Office Kurmitola Dhaka 1229 Bangladesh	Tel: +880 2 890 1914-8 ext 3407 Fax: +880 2 8913322	kabimcaab@gmail.com
ADM	Mr. Md. Mizanur Rahman	Deputy Director, ATS ATS and Aerodrome Division Civil Aviation Authority of Bangladesh Headquarters Office Kurmitola Dhaka 1229 Bangladesh	Tel: +880 2 890 1431 Fax: +880 2 890 1411	azad_mizan@yahoo.com
	BHUTAN			

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SAR	Dr. Karma Wangchuk	Deputy ANS Chief Bhutan Civil Aviation Authority	Mob: +97517423747	Kwangchuk@bcaa.gov.bt
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BRUNEI DARUSSALAM				
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	CHINA			

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ARC	Mr. Su Hang	Deputy Director of ATC ATMB of CAAC		hanssued@atmb.net.cn
ARC	Mr. Baiweng Zhang	Deputy Director of AIS Center ATMB of CAAC		zhangbaiweng@sina.com
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ADM	Ms. Hu Huiling	Deputy Director of ATC Division Middle & South Regional ATMB of CAAC No.3 Nanyundong street, Jichang Road, Guangzhou	Tel: +86 20 86122223 Fax: +86 20 36229685	hhl@atmb.org
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ADM	Mr. Wang Jun	Assistant ATC Division of ATMB, CAAC #12 East San-huan Road, Middle Chaoyang District, Beijing	Tel: +86 10 8778 6819 Fax: +86 10 8778 6810	junwang@atmb.net.cn
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ADM	Mr. Feng Zhenglin	Administrator Civil Aviation Administration of China 155 Dongsi Street West Beijing 100710	Tel: +86 (10) 64092517 Fax: +86 (10) 64016918,64091341	china_icao@caac.gov.cn
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AIS	Mr. Alan Li Ms. Gladys Koon (Secondary point of contact)	Electronics Engineer Civil Aviation Department Civil Aviation Department Headquarters 1 Tung Fai Road Hong Kong International Airport, Lantau 2/F, Office Building, Civil Aviation Department Headquarters, 1 Tung Fai Road, Hong Kong International Airport, Lantau	Tel: +852 2910 6559 +852 2910 6517 Fax: +852 2845 7160	awlli@cad.gov.hk gsckoon@cad.gov.hk

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SAF	Mr. Lau Sze Po, Sansom Mr. Taka Chow	Senior Safety Manager Civil Aviation Department 2/F, Office Building, Civil Aviation Department Headquarters, 1 Tung Fai Road, Hong Kong International Airport, Lantau	Tel: +852 2910 6442 Fax: +852 2910 1160 +852 2910 0186	ssplau@cad.gov.hk tctchow@cad.gov.hk
ARC	Mr. Timothy KC Yeung	Senior Operations Officer Civil Aviation Department, Hong Kong China 2/F, Office Building, Civil Aviation Department Headquarters, 1 Tung Fai Road, Hong Kong International Airport, Lantau	Tel: +852 2901 6443 Fax: +852 2910 0186	tkcyeung@cad.gov.hk
ADM	Mr. Taka Chow (Primary Point of Contact)	Senior Safety Manager Civil Aviation Department Headquarters, 1 Tung Fai Road Hong Kong International Airport 2/F, Office Building, Civil Aviation Department Headquarters, 1 Tung Fai Road, Hong Kong International Airport, Lantau	Tel: +852 29106442 Fax: +852 29100186	tctchow@cad.gov.hk
ADM	Mr. Raymond Li Ms. Mona Cheung (Alternate Point of Contact)	Assistant Director General of Civil Aviation Civil Aviation Department Headquarters, 1 Tung Fai Road Hong Kong International Airport 6/F, Office Building, Civil Aviation Department Headquarters, 1 Tung Fai Road, Hong Kong International Airport	Tel: +852 2910 6988 Fax: +852 2910 0139	rkeli@cad.gov.hk mlkcheung@cad.gov.hk
	MACAO, CHINA			

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ATC	Mr. Bryan, K.H. Chiu	Safety Officer (ATC) Civil Aviation Authority – Macao, China SAR 18/F, Cheng Feng Commercial Centre, 336-342, Alameda Dr. Carlos D’Assumpção, Macao	Tel: +853 8796 4142 Fax: +853 2833 8089	bryanchiu@aacm.gov.mo
AIS	Mr. Edward Ip Veng Chon	Assistant Safety Officer (AIS) Civil Aviation Authority, Macao SAR 18/F, Cheng Feng Commercial Centre, 336-342, Alameda Dr. Carlos D’Assumpção, Macao	Tel: +853 8796 4118 Fax: +853 2833 8089	edwardip@aacm.gov.mo edwardip@aacm.gov.mo
AIS	Mr. Cleskey Cheang Koi Cheng	Assistant Safety Officer (AIS) Civil Aviation Authority, Macao SAR 18/F, Cheng Feng Commercial Centre, 336-342, Alameda Dr. Carlos D’Assumpção, Macao	Tel: +853 8796 4121 Fax: +853 2833 8089	cleskeycheang@aacm.gov.mo cleskeycheang@aacm.gov.mo
AIS	Ms. Choi Vai Man, Brendah	Head of AIC Service Airport Operations Department Macao International Airport Co. Ltd. Macao International Airport PAC on, Taipa	Tel: +853 8898 2200 Fax: +853 2886 1145	brendahchoi@aod.macao-airport.com
ARC	Mr. Edward Ip Veng Chon	Assistant Safety Officer (AIS) Civil Aviation Authority of Macao		edwardip@aacm.gov.mo
ARC	Mr. Cheang Koi Cheng	Assistant Safety Officer (AIS) Civil Aviation Authority of Macao		cleskeycheang@aacm.gov.mo
ADM	Mr. Simon W. H. Chan	President Civil Aviation Authority, Macao SAR 18/F, Cheng Feng Commercial Centre, 336-342, Alameda Dr. Carlos D’Assumpção, Macao	Tel: +853 (28) 511213 Fax: +853 (28) 338089	aacm@aacm.gov.mo

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ADM	Mr. Lam Tat Ming, Taft	Director of Airport Infrastructure & Air Navigation Civil Aviation Authority, Macao SAR 18/F, Cheng Feng Commercial Centre, 336-342, Alameda Dr. Carlos D'Assumpção, Macao	Tel: +853 8796 4127 Fax: +853 2833 8089	taflam@aacm.gov.mo
ADM	Ms. Wong Pui Man, Cecil	Head of Information Technology, Technical Support, Communication, Nav aids & Surveillance Division Airport Operations Department Macao International Airport Co. Ltd. Macao International Airport, Engineering Building, Taipa, Macao	Tel: +853 8898 2395 Fax: +853 8898 2387	cecilwong@aod.macao-airport.com
ADM	Mr. Lau Chi Hei	ITC Engineer Administration of Airports, Ltd. Macao International Airport, Pac On, Taipa,	Tel: +853 8898 2367 Fax: +853 8898 2387 E-mail: hayeslau@ada.com.mo	
	DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA (DPRK)			
CCT	Mr. An Kyong Hwa	Deputy Director, Air Traffic Management Bureau (ATMB), General Administration of Civil Aviation	Tel: +850 -2-18111 X 8108 Fax: +850-2-3814625 Ext-4625	gaca@silibank.net.kp

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AIS	Mr. Kim Chol Guk	Officer Aeronautical Information Service, ATMD Sunan District, Pyongyang,	Tel: +850 2 18111 ext-8108 Fax: +850 2 381 4625	gaca@silibank.net.kp
ARC	Mr. Rj Yong Chol	Chief of ATS ATMD General Administration of Civil Aviation		gaca@silibank.net.kp
ARC	Mr. Kim Jong Chol	Officer Air Traffic Control Division, ATMD		
ADM	Mr. Rim Kwang Ung	Director General General Administration of Civil Aviation Sunan District Pyongyang	Tel: +850 (2) 18111 Ext. 8108 Fax: +850 (2) 3814410	gaca@silibank.net.kp
ADM	Mr. Mun Hyok Chol	Officer External Relations Department Sunan District, Pyongyang	Tel: +850 2 18111 ext-8108 Fax: +850 2 381 4625	gaca@silibank.net.kp
	FIJI			
SAR	Ms. Alisi Namoro	Air Traffic Management Inspector / Search & Rescue Fiji – Civil Aviation Authority of Fiji Civil Aviation Authority of Fiji, Nap 0354 Private Mail Bag, Nadi Airport	Tel: +67 9 672 1555 Ext. 3373, +67 9 998 4498 Fax: +67 9 672 0261	alisi.namoro@caaf.org.fj

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AIS	Mr. Ilaitia M. Tabakauco	Air Navigation Service Inspector – AIM/Pans-Ops/Charting Civil Aviation Authority of the Fiji Islands Private Mail Bag, NAP 0354 Nadi International Airport	Tel: +679 8923167 +679 8923155 ext 3313 Fax: +679 672 0261	Ilaitia.Tabakauco@caaf.org.fj
ARC	Mr. Ilaitia M. Tabakauco	Air Traffic Management Inspector – AIS/PANS-Ops Civil Aviation Authority of Fiji		ilaitia.tabakauco@caaf.org.fj
ADM	Ms. Alisi Namoro	Air Navigation Service Inspector - ATM/SAR Civil Aviation Authority of Fiji Private Mail Bag, NAP 0354 Nadi International Airport	Tel: +679 8923167 +679 8923155 ext 3373 Mobile: +679 9984498 Fax: +679 672 0261	Alisi.Namoro@caaf.org.fj
ADM	Mr. Sharvada Sharma	Permanent Secretary for Civil Aviation Attorney General's Office Location: Level 3, Suvavou House, Victoria Parade, Suva Mailing address: C/-Attorney General's Office, P.O. Box 2213, Government Buildings, Suva	Tel: +679 330 9866 Fax: +679 331 0807	sharvada.sharma@ag.gov.fj sharvada.sharma@gmail.com
ADM	Mr. Amit Singh	ATM Co-Head Operations & Support Fiji Airports Limited Private Mail Bag Nadi Airport	Tel: +679 6725777 Mobile: +679 9906127 Fax: +679 6731125	AmitS@fijiairports.com.fj
ADM	Mr. Ivan Wong	ATM Co-Head Operations Fiji Airports Limited Private Mail Bag Nadi Airport	Tel: +679 6725777 Mobile: +679 9906128 Fax: +679 6731125	IvanW@fijiairports.com.fj

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	FRANCE (FRENCH POLYNESIA)			
ARC	Mr. Peretti Charles Mr. Nicolas Hinchliffe	Head of ATS Department Head of ATC Department SEAC/PF – DGAC		Charles.peretti@aviation-civile.gouv.fr nicolas.hinchliffe@aviation-civile.gouv.fr
ADM	Mr. PERETTI Charles	Head of ATS Division Department of Civil Aviation BP6011 – 98702 Faaa	Tel: +689 40 86 10 41 +689 782 440 Fax: +689 40 86 13 29	charles.peretti@aviation-civile@gouv.fr Peretti_Charles@seac.pf
	FRANCE (NEW CALEDONIA)			
ATC	M. Thierry HORLAIT	Head of Tontouta Air Traffic Services Head of New Caledonian ARSC	Tel: +687 35.24.01 Mob: +687 78 57 39	thierry.horlait@aviation-civile.gouv.fr
ARC	Mr. Sébastien Chêne Mr. Jean Claude Gouhot	Director of Civil Aviation Department of Civil Aviation Director, Department of Civil Aviation New Caledonia, France		sebastien.chene@aviation-civile.gouv.fr jean-claude.gouhot@aviation-civile.gouv.fr
ARC	Mr. Christophe Verges	Deputy Director, Department of Civil Aviation New Caledonia, France		christophe.verges@aviation-civile.gouv.fr
ARC	Mr. Jude Mariadassou (copy to)	Chef du bureau "coordination multilatérale" Sous direction de l'Europe et de l'international, Direction Générale De L'aviation Civile		jude.mariadassou@aviation-civile.gouv.fr

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ADM	Mr. Delvallee Olivier	Head of ATS Division Department of Civil Aviation, Air Navigation Service, BP H1 Noumea Cedex	Tel: +687 265643	olivier.delvallee@aviation-civile.gouv.fr
ADM	Mr. Calmejane Patrick	Head of Air Navigation Service Department of Civil Aviation Air Navigation Service, BP H1 Noumea Cedex	Tel: +687 26 52 70	patrick.calmejane@aviation-civile.gouv.fr
	INDIA			
SAR	Mr. Davinder Arora	General Manager (ATM-AIS/SAR) Airports Authority of India Rajiv Gandhi Bhawan Safdarjung Airport New Delhi – 110003	Tel: +91 11 24615508 Mobile: +91 9871405220 Fax: +91 11 24615508	gmais@aai.aero
SAR	Mr. M. Ashok Kumar	General Manager (ATM-SAR) Airports Authority of India Rajiv Gandhi Bhawan Safdarjung Airport New Delhi – 110003	Tel: +91 11 24632967 Mobile: +91 9444778703 Fax:	gmsar@AAI.AERO ;
SAR	Mr. Yogendra Kumar Rohilla	Jt. General Manager (ATM-AIS & SAR) Airports Authority of India Rajiv Gandhi Bhawan Safdarjung Airport New Delhi – 110003	Tel: +91 11 24610536 Mobile: +91 9910840303 Fax: +91 11 24615508	yogendra@AAI.AERO ;

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CCT	Mr. Mukesh Dangi	~~ED (Air Space Management)~~ Executive Director (Air Space Management) Airports Authority of India Rajiv Gandhi Bhawan Safdarjung Airport New Delhi – 110003	Tel: +91 11 24632992 Fax: +91 11 24610528 Mob: +91 9650222144	edasm@aai.aero
CCT	Mr. K Vasudevan	~~GM (Air Space Management)~~ General Manager (Air Space Management) Airports Authority of India Rajiv Gandhi Bhawan Safdarjung Airport New Delhi – 110003	Tel: +91 11 24629012 Mob: +91-9920065132 Fax: +91 11 24610528	gmasm@aai.aero
ATC	Watch Supervisory Officer, Chennai FIR	Area Control Centre, Chennai Airport, Chennai	Tel: +91 44 22560894 Mobile: +91 9514074449 Fax: +91 44 22561365 (24 hours)	vomm.wso@aai.aero
ATC	Watch Supervisory Officer, Delhi FIR	Area Control Centre, I.G.I. Airport, New Delhi	Tel: +91 11 25653283 Mobile: +91 9873233050 Fax: +91 11 25653284 (24 hours)	wsoigidelhi@aai.aero

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ATC	Watch Supervisory Officer, Kolkata FIR	Area Control Centre, NSCBI Airport, Kolkata	Tel: +91 33 25119520 Mobile: +91 9831479366 Fax: +91 33 25130134 (24 hours)	vecc.wso@aai.aero
ATC	Watch Supervisory Officer, Mumbai FIR	Area Control Centre, CSI Airport Mumbai	Tel: +91 22 26828088 Mobile: +91 9869062250 Fax: +91 22 26828066 (24 hours)	vabb.wso@aai.aero
AIS	Mr. Deeraj	Assistant General Manager (ATM-AIS) Airports Authority of India Rajiv Gandhi Bhawan, Safdarjung Airport New Delhi 110003	Tel: +91 704 203383	dheerajgupta@aai.aero deerajtc986@gmail.com
AIS	Mr. Davinder Arora	General Manager (ATM-AIS/SAR) Airports Authority of India Rajiv Gandhi Bhawan Safdarjung Airport New Delhi – 110003	Tel: +91 11 24615508 Mobile: +91 9871405220 Fax: +91 11 24615508	gmais@aai.aero
AIS	Mr. Yogendra Kumar Rohilla	Jt. General Manager (ATM-AIS & SAR) Airports Authority of India Rajiv Gandhi Bhawan Safdarjung Airport New Delhi – 110003	Tel: +91 11 24610536 Mobile: +91 9910840303 Fax: +91 11 24615508	yogendra@AAI.AERO
SAF	Mr. A. P. Udayanarayanan	Joint General Manager (ATM) India Bay of Bengal Arabian Sea Indian Ocean Safety Monitoring Agency (BOBASMA)	Tel: +91 44 22561253 Fax: +91 44 22561740	bobasmachennai@gmail.com bobasma@aai.aero

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ARC	Mr. Yogendra Rohilla	Jt. General Manager (AIS & SAR) Airports Authority of India		yogendra@aai.aero
	Mr. K. Vasudevan	General Manager (ATM-Air Space Management) Airports Authority of India Directorate of Airspace Management, CHQ, Airports Authority of India New Delhi 110023 India	Tel.: +91 11 24629012 Fax.: +91 11 2461 0528 Mobile: +91 99 2006 5132	gmasm@aai.aero ;
ADM	Mr. B.S. Bhullar	Director General of Civil Aviation Directorate General of Civil Aviation Civil Aviation Department Technical Centre, Opp. Safdarjung Airport New Delhi 110003	Tel: +91 (11) 24627830, 24620784, 24652491, 24652760 Fax: +91 (11) 24652760	dgoffice.dgca@nic.in dgca.india@nic.in
ADM	Mr. Arun Kumar	Director General of Civil Aviation Directorate of Civil Aviation Department Technical Centre, Opp. Safdarjung Airport New Delhi 110003	Tel: +91 11 24627830, 24620784, 24652491, 24652760 Fax: +91 (11) 24652760	dgoffice.dgca@nic.in dgca.india@nic.in
ADM	Mr. S. V. Satish	Executive Director (ATM) Airports Authority of India, Rajiv Gandhi Bhawan, Safdarjung Airport, New Delhi -110003.	Tel: +91 11 2463 1684 Fax: +91 11 2461 1078 Mobile: +91 9717333896	edatm@aai.aero

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ADM	M C Dangi	Executive Director (ASM) Airports Authority of India, Rajiv Gandhi Bhawan, Safdarjung Airport, New Delhi -110003	Tel: +91 11 2463 2992 Fax: +91 11 2461 0528	edasm@aai.aero
ADM	Sylvester Israel	~~Executive Director (ATFM) Airports Authority of India, Rajiv Gandhi Bhawan, Safdarjung Airport, New Delhi -110003~~	~~Tel: +91 11 2461 0776 Fax: +91 11 24657897~~	~~edatfm@aai.aero~~
ADM	S K Oberoi	~~Executive Director(ATM) Airports Authority of India, Rajiv Gandhi Bhawan, Safdarjung Airport, New Delhi -110003.~~	~~Tel: +91 11 2463 1684 Fax: +91 11 2461 1078~~	~~edatm@aai.aero~~
ADM	Mr. Jitendra Kumar Shukla	DGM (CNS) Airports Authority of India O/O ED (CNS-OM), AAI, Rajiv Gandhi Bhawan, Safdarjung Airport , New Delhi -110003	~~Tel: +91 965 0724 848 Fax: +91 11 2462 0287~~	~~jkshukla@aai.aero~~
	INDONESIA			
SAR	Mr. Otty Rusinarsetyo	Chief, International Organization Technical Cooperation, Planning and International Cooperation Division National Search and Rescue Agency of Republic of Indonesia (BASARNAS)	Tel : +62-21-6570 1116 ext. 1751 Fax : +62-21-654 0638	otty.rs@gmail.com

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AIS	Mr. Ulul Azmi	General Manager AIS Center Airnav Indonesia	Tel: +62 21 5591 5000 Fax: +62 21 5591 5100	azmi@aviasi.org
AIS	Mr. Adi Groho Mangko	AIM Operation Junior Manager Airnav Indonesia	Tel: +62 21 5591 5000 Fax: +62 21 5591 5100	mangko.adi@gmail.com ; aiscenter.indonesia@gmail.com
ARC	Mr. Rahmat	AIS Senior Specialist		dms@airnavindonesia.co.id
ARC	Mr. Yayat Supriyatna			
ADM	Mr. Endaryono	Head of Air Navigation Services Division Directorate of Operation, AirNav Indonesia 2nd floor Support Building of AirNav Indonesia Headquarters Ir. H. Juanda # 1, Tangerang 15121 Banten	Tel : +62 21 55915000, Mobile : +62 81298456731 Fax : +62 21 55915100	endaryono15@gmail.com
ADM	Mr. HarisAchadi	Deputy Director for International Cooperation Planning and International Cooperation Division	Tel : +62 21 6570 1116 ext. 1751 Fax : +62 21 654 0638	habasarnas@gmail.com
ADM	Mr Tian Kusdinar	Chief of ATM Section Directorate of Air Navigation, DGCA Indonesia, MOT 23rd Floor Karya Building Medan Merdeka Barat No. 8 Jakarta 10110	Tel: +62 21 3506451, 3506617 Mobile: +62 813 8449 7414 Fax : +62 21 3507569	tian231182@gmail.com

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ADM	Mr. Hermawan Novitriyanto	Manager of Area Control Center and Terminal Control Area Directorate of Operation, AirNav Indonesia 2nd floor Support Building of AirNav Indonesia Headquarters Ir. H. Juanda # 1, Tangerang 15121Banten	Tel : +62 21 55915000, Mobile : +62 81284173391 Fax : +62 21 55915100	hermawan.novitriyanto@gmail.com
ADM	Mr. Hedriansyah	Air Navigation Inspector Karya Building 23 rd Floor Ministry of Transportation, Medan Merdeka Barat st. No. 8 Jakarta	Tel: +62 878 2422 2263 Fax: +62 21 350 7569	hedriansyah@dephub.go.id
ADM	Mr Nur Sa'id Eko Nugroho	Air Navigation Inspector and ATM Officer Directorate of Air Navigation, DGCA Indonesia, MOT 23rd Floor Karya Building Medan Merdeka Barat No. 8 Jakarta 10110	Tel: +62 21 3506451, 3506617 Mobile: +62 813 2546 9339 Fax : +62 21 3507569	ecko.atc@gmail.com
ADM	Mrs Yanuar Jinu Satiti	Air Navigation Inspector Directorate of Air Navigation, DGCA Indonesia, MOT 23rd Floor Karya Building Medan Merdeka Barat No. 8 Jakarta 10110	Tel: +62 21 3506451, 3506617 Mobile: +62 813 8449 7414 Fax : +62 21 3507569	ties.tisan@gmail.com
ADM	Mr. I Made Sutamayasa	Air Navigation Inspector Airport Authority Region IV Bali Juanda St. No.1 Tuban Bali	Tel: +62 813 373 93413 Fax: +62 361 935 710	imade050278@gmail.com

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ADM	Mr. Muji Subagyo	Head of Service Development Division Directorate of Operation, AirNav Indonesia 2nd floor Support Building of AirNav Indonesia Headquarters Ir. H. Juanda # 1, Tangerang 15121 Banten	Tel : +62 21 55915000, Mobile : +62 81383034781 Fax : +62 21 55915100	muji_subagyo@yahoo.com ;
ADM	Mrs. Dina Yunita	Air Navigation Inspector DGCA – Indonesia Karya Building 7th Floor Ministry of Transportation, Medan Merdeka Barat st. No. 8 Jakarta,	Tel: +62 812 960 75249 Fax:	dina_yunita@dephub.go.id
ADM	Mrs. Ida Yuniarti	Head of Air Traffic Control Services Division Directorate of Operation, AirNav Indonesia 2nd floor Support Building of AirNav Indonesia Headquarters Ir. H. Juanda # 1, Tangerang 15121 Banten	Tel : +62 21 55915000, Mobile : +62 81318202181 Fax : +62 21 55915100	ida.yuniarti63@gmail.com
ADM	Mr. Angga Wiguna	Air Navigation Inspector DGCA – Indonesia Karya Building 23 rd Floor Ministry of Transportation, Medan Merdeka Barat St. No. 8 Jakarta	Tel: +62 813 1651 9005 Fax: +62 21 350 7569	angga_wiguna@dephub.go.id
	IRAN			
CCT	Mr. Ahmad Kaveh Firouz	Deputy of Tehran ACC	Tel: +982144544119 Tel: +982144544119 (H) Mob: +982144433100 Fax: 989123230447	ahmadkavehfiroz@gmail.com

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	JAPAN			
SAR	Mr. Takahiro Okagami	Special Assistant to the Director, Operations and Flight Inspection Division, Japan Civil Aviation Bureau (JCAB), Ministry of Land, Infrastructure, Transport and Tourism 2-1-3 Kasumigaseki, Chiyodaku, Tokyo 100-8918	Tel: +81 3 5253 8111 ext. 51332 Fax: +81 3 5253 1664	okagami-t2di@mlit.go.jp
SAR	Mr. Hiroaki Kuwabata	Air Traffic Services Flight Information Officer, Tokyo airport office, Japan Civil Bureau (JCAB), 3-3-1 Haneda-kuko Otaku, Tokyo 144-0041	Tel: +81 3 5757 3022 Fax: +81 3 5756 1512	kuwabata-h10fi@cab.mlit.go.jp cab-hnd-rcc@mlit.go.jp
CCT ATC	Mr. Toshiya Shigenobu	Special Assistant to the Director, Air Traffic Control Division, ~~Air Navigation Services Department, Civil Aviation Bureau,~~ MLIT Japan Civil Aviation Bureau (JCAB), Ministry of Land, Infrastructure, Transport and Tourism 2-1-3 Kasumigaseki, Chiyodaku, Tokyo 100-8918	Tel: +81 3 5253 8749 Fax: +81 3 5253 1664	shigenobu-t07sa@mlit.go.jp
CCT	~~Ms. Tomoko Ebisu~~ Ms. Aya Obata	Special Assistant to the Director ATC Division Japan Civil Aviation Bureau Ministry of Land, Infrastructure, Transport and Tourism 2-1-3 Kasumigaseki, Chiyodaku, Tokyo 100-8918	Tel: +81 3 5253 8749 Fax: +81 3 5253 1663 +81 3 5253 1664	ebisu-t07x2@mlit.go.jp obata-a03dg@mlit.go.jp

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AIS	Ms. Takako Sakamoto	Deputy Chief Aeronautical Information Service Officer Aeronautical Information Service Center 133 Kanemae Furugome, Narita-shi Chiba 282-0004	Tel: +81 476 33 5506 Fax: +81 476 33 5509	sakamoto-t41zd@mlit.go.jp
AIS	Mr. Takahiro Tokui	Special Assistant to the Director, Operations and Flight Inspection Division, Japan Civil Aviation Bureau (JCAB), Ministry of Land, Infrastructure, Transport and Tourism 2-1-3 Kasumigaseki, Chiyodaku, Tokyo 100-8918	Tel: +81 3 5253 8751 Fax: +81 3 5253 1664	tokui-t02vi@mlit.go.jp
SAF	Mr. Yasuhiro Marutsuka	Special Assistant to the Director, Flight Procedures and Airspace Program Office, Japan Civil Aviation Bureau, Japan Airspace Safety Monitoring Agency (JASMA)	Tel: +81 3 5253 8750 Fax: +81 3 5253 1664	marutsuka-y0799@mlit.go.jp hqt-JASMA@ml.mlit.go.jp
SAF	Mr. Hiroyuki Wada	Special Assistant to the Director, Air Navigation Services Planning Division, Japan Civil Aviation Bureau (JCAB), Ministry of Land, Infrastructure, Transport and Tourism 2-1-3 Kasumigaseki, Chiyodaku, Tokyo 100-8918		wada-h22t5@mlit.go.jp
SAF	Mr. Masaki Kobayashi	~~Special Assistant to the Director~~ ~~Flight Procedures and Airspace Program Office~~ ~~Japan Civil Aviation Bureau, Japan Airspace~~ ~~Safety Monitoring Agency (JASMA)~~		RVSM_report@mlit.go.jp hqt-JASMA@ml.mlit.go.jp

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ADM = Administration, AIS = Aeronautical Information Service, ARC = Asia/Pacific Region ATS Route Catalogue ATC = Air Traffic Control, CCT = Contingency Coordination Team, SAF = Safety, SAR = Search and Rescue				
SAF	Mr. Natsuki Ibe	Special Assistant to the Director Air Navigation Services Planning Division, Civil Aviation Bureau of Japan (JASMA)		ibe-n24hy@mlit.go.jp
ARC	Mr. Fumio Sato	Special Assistant to the Director Air Traffic Control Division Japan Civil Aviation Bureau (JCAB), Ministry of Land, Infrastructure, Transport and Tourism 2-1-3 Kasumigaseki, Chiyodaku, Tokyo 100-8918		satoh-f05tv@mlit.go.jp
ADM	Mr. Kotaro Shimura	Special Assistant to the Director, Air Traffic International Affairs Office, Japan Civil Aviation Bureau (JCAB), Ministry of Land, Infrastructure, Transport and Tourism 2-1-3 Kasumigaseki, Chiyodaku, Tokyo 100-8918	Tel: +81 3 5253 8740 Fax: +81 3 5253 1663	shimura-k06f@mlit.go.jp
ADM	Mr. Kuniharu Ebina	Director General Japan Civil Aviation Bureau (JCAB) Ministry of Land, Infrastructure, Transport and Tourism 2-1-3 Kasumigaseki Chiyoda-ku Tokyo 100-8918	Tel: +81 (3) 52538703 (JCAB), +81 (3) 5253 8692 Fax: +81 (3) 52531656 (JCAB)	hqt-g-cab-knr-kkk@ml.mlit.go.jp g-CAB-KNR-KKK@mlit.go.jp

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ADM	Ms. Hideko Mishima	Special Assistant to the Director Japan Civil Aviation Bureau Ministry of Land, Infrastructure, Transport and Tourism 2-1-3 Kasumigaseki Chiyodaku, Tokyo 100-8918	Tel: +81 3 5253 8740 Fax: +81 3 5253 1663	mishima-h46dg@mlit.go.jp
ADM	Mr. Takahiro Tokui	Special Assistant to the Director of Operations and Flight Inspection Division Japan Civil Aviation Bureau Ministry of Land, Infrastructure, Transport and Tourism 2-1-3 Kasumigaseki, Chiyodaku, Tokyo 100-8918,	Tel: +81 3 5253 8751 Fax: +81 3 5253 1664	tokui-t02vi@mlit.go.jp
	KIRIBATI			
ATC	Ms. Muraea Tiaoti	ATS Manager Airport Service Kiribati Bonriki International Airport	Tel: +686 752 28092 Fax: +686 28280	mtiaoti@gmail.com
ARC	Ms. Aako Teikake	Acting Director of Civil Aviation Directorate of Civil Aviation Ministry of Communications, Transport and Tourism Development		dca@mcttd.gov.ki
ADM	Mr. Tiamwa Teaiwa	ICAO National Compliance Co-ordinator Civil Aviation Authority of Kiribati P.O. Box 487, Betio, Tarawa	Tel: +686 730 55574 +686 26003 ext 34 Fax: +686 26192 +686 26195	icao_ncc@mcttd.gov.ki
	KUWAIT			

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CCT	Shaine Al-Ghanim	Director Safety		sm.alghanim@dgca.gov.kw
CCT	Musatfa Al -ararh	Director ANS Safety		ma.altarrah@dgca.gov.kw
	KYRGYZ REPUBLIC			
CCT	Mr. Dmitriy Chetvertak	Head of ATM Department SE Kyrgyzaeronavigatsia	Tel: +996-312393130 Fax: +996-312-393093	kan_atm@kan.kg
CCT	Mr.Ulukbek Rakhamanov	Director General	Tel: +996-312393559 Fax: +996-312-393 093	kan_atm@kan.kg
	LAO PDR			
SAR	Mr. Vixay Vorlachit	Chief of SAR Section Department of Civil Aviation of Lao PDR	Tel: +856 21 513 163-4 Fax: +856 21 520 237 Mob: +856 20 998 14951	november.victor1991@gmail.com
ATC	Mr. Amdounla Salinthone	Director of Air Traffic Services Division Lao Air Traffic Management Wattay International Airport, Laungpabang Road, P.O. Box 2985, Vientiane	Tel.: +856 21 512006 Fax: +856 21 512216 E-mail:	asalinthone@gmail.com ;
ATC	Mr. Bountaeng Symoon	Deputy Director General Department of Civil Aviation of Laos Wattay International Airport, PO Box 119, Vientiane, Lao PDR	Tel: +856 21 512163 Fax: +856 21 520237	bountaeng@dcal.gov.la ; bountaeng@gmail.com ;
AIS	Mr. Manasavanh Kounlath	Director of Aeronautical Information Service Division Lao Air Traffic Management Wattay International Airport P.O. Box 2985 Vientiane	Tel: +856 20 2220 2598 Fax: +856 21 512 216	manasavanh@gmail.com

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ARC	Ms. Davone Vilayseng			davone.vs@gmail.com
ARC	Mr. Manasavanh Kounlath			manasavanh@gmail.com
ADM	Mr. Vanpheng Chanthaphone	Director General Department of Civil Aviation Vientiane/Wattay International Airport P. O. Box 119 Vientiane	Tel: +856 (21) 512163, 512006 Fax: +856 (21) 512163, 512044	laodca@laotel.com
ADM	Mr. Thanongdeth Nalisak	Chief of ATM Section Department of Civil Aviation Wattay International Airport P.O. Box 119, Vientiane	Tel: +856 21 513 163 Fax: +856 21 520 237	tnalisak@gmail.com Thanongdeth.nalisak@gmail.com
ADM	Mr. Khonekham Suvongsa	Deputy Director of Air Navigation Division Department of Civil Aviation of Lao PDR	Tel: +856 21 513 163-4 Fax: +856 21 520 237	keodungdy@yahoo.com
ADM	Ms. Davone Vilayseng	Deputy Director of Air Navigation Division Department of Civil Aviation of Lao Wattay International Airport P.O. Box 119 Vientiane	Tel: +85 6 21 513163 Fax: +85 6 21 520237 E-mail :	davone.vs@gmail.com laodca@laotel.com
	MALAYSIA			
SAR	Mr. Mohd Rodzi bin Salleh	Principal Assistant Director, SAR Division Air Traffic Management Sector Civil Aviation Authority of Malaysia	Tel: +60 3 8871 4262 Fax: +60 3 8881 0530	rodzi@caam.gov.my

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SAR	Mr. Mani Vannan a/l Ketena Samy	-Senior Assistant Director, SAR Division, Air Traffic Management Sector, Civil Aviation Authority of Malaysia	Tel: +60 3 8871 4285 Fax: +60 3 8881 0530	mani@caam.gov.my
AIS/ADM	Mr. Tan Kim Sin	Senior Assistant Director Civil Aviation Authority of Malaysia Air Traffic Management Sector Civil Aviation Authority of Malaysia No. 27, Persiaran Perdana, Level 4, Podium Block B, Precinct 4, 62618 Putrajaya	Tel: +603 8871 4284 Fax: +603 8881 0530	tanks@caam.gov.my
AIS/ADM	Mr. Amir Zulhairi Md Yusof	Assistant Director Civil Aviation Authority of Malaysia Air Traffic Management Sector Civil Aviation Authority of Malaysia No. 27, Persiaran Perdana, Level 4, Podium Block B, Precinct 4, 62618 Putrajaya	Tel: +603 8871 4264 Fax: +603 8881 0530	amirzulhairi@caam.gov.my
AIS	Mr. Mohd Razmin Sham Mazlan	AIM Project Manager Civil Aviation Authority of Malaysia No. 4, Jalan Sri Kenari 9, Taman Sri Kenari 4300 Kajang, Selangor	Tel: +603 8737 0585 Fax: +603 8734 0585	mrzamins@microtel.my
ARC	Mr. Bahrin Tahir	Air Traffic Inspectorate Civil Aviation Authority of Malaysia		bahrin.tahir@caam.gov.my
ARC	Mr. Tan Kim Sin	Senior Assistant Director Civil Aviation Authority of Malaysia		tanks@caam.gov.my

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ADM	Mr. Nasuruddin Bin Zainol Abidin	Deputy Director, Air Traffic Management Sector 47200 Subang, Selangor Darul Ehsan Civil Aviation Authority of Malaysia	Tel: +60 3 8871 4210 Fax: +60 3 8881 0530	nasuruddin@caam.gov.my
ADM	Mr. Zulkefli Harun	Senior Deputy Director Air Traffic Management Sector Department of Civil Aviation No. 27 Persiaran Perdana, Level 4, Podium Block B, Precinct 4 62618 Putrajaya	Tel: +60 3 8871 4225 Fax: +60 3 8881 0530	zulkefliharun@caam.gov.my
ADM	Mr. Ahmad Nizar Zolfakar	Chief Executive Officer Civil Aviation Authority of Malaysia No. 27, Persiaran Perdana, Level 3 Block Podium B, Precinct 4 Federal Government Administration Centre 62618 Putrajaya	Tel: +60 (3) 8871 4000 Fax: +60 (3) 8871 1640	ahmad_nizar@caam.gov.my
	MALDIVES			
ATC		Watch Manager Male Area Control Centre, Velana International Airport	Tel: +960 332 2071 Mobile: +960 7977802 (24 hrs)	sup_matcc@macl.aero
AIS	Mrs. Haseena Hadee	Assistant Manager, AIS Maldives Airports Company Limited Aeronautical Information Services, Air Traffic Management Section, Ibrahim Nasir International Airport, Hulhule'22000	Tel: +960 919 1266 Fax: +960 331 3258 Email: hasyna@macl.aero	hasyna@macl.aero

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AIS	Ms. Fathimath Samiya	Associate General Manager, AIS Maldives Airports Company Limited Aeronautical Information Services, Air Traffic Management Section, Ibrahim Nasir International Airport, Hulhule'22000	Tel: +960 777 9586 Fax: +960 331 3258	samiya@macl.aero
ARC	Ms. Fathimath Samiya	Associate General Manager, AIS Maldives Airports Company Limited		samiya@macl.aero
ARC	Mrs. Haseena Hadi	Assistant Manager, AIS Maldives Airports Company Limited		hasyna@macl.aero
ADM	Mr. Ibrahim Thoha	General Manager, Air Traffic Management Maldives Airports Company Limited	Tel: +960 333 1711 Mob: +960 777 1963	thiha@macl.aero
ADM	Mr. Ibrahim Hameed	Associate General Manager, Air Traffic Services, Air Traffic Management, Maldives Airports Company Limited, Velana International Airport	Tel: +960 333 7114 Mobile: +960 7739100	i.hameed@macl.aero ;
ADM	Mr. Hussein Jaleel	Chief Executive Civil Aviation Authority Ministry of Transport and Communication 11 th Floor, Velaanaage Ameeru Ahmed Magu Malé 20096	Tel: +960 (3) 324992 Fax: +960 (3) 323039	dgca@aviainfo.gov.mv jaleel@aviainfo.gov.mv
ADM	Mr. Ahmed Naseem	Air Navigation Services Inspector Air Navigation & Aerodromes Maldives Civil Aviation Authority	Tel: +960 3324983 Fax: +960 332 3039	ahmed.naseem@caa.gov.mv

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ADM	Ms. Fathimath Ramiza	Director Air Navigation & Aerodromes Maldives Civil Aviation Authority	Tel: +960 3342984 Mobile: +960 7774838	ramiza@caa.gov.mv
	MARSHALL ISLANDS			
ARC	Mr. Stanley Myazoe	Director Directorate of Civil Aviation Ministry of Transport and Communications		rmidca@yahoo.com
	MICRONESIA			
ARC	Mr. Massy Halbert	Assistant Secretary (Minister) Division of Civil Aviation Department of Transportation, Communications and Infrastructure		mas.halbert@gmail.com
	MONGOLIA			
SAR	Mr. Dorjnyam Batkhaan	Coordinator of Aeronautical Rescue Coordination Center ATS Division Civil Aviation Authority of Mongolia Chinggis Khaan International Airport, Ulaanbaatar	Tel: +976 11 281622 Tel: +976 11 281691 Fax: +976 11 281154	ub-rc@mcga.gov.mn batkhaan@mcga.gov.mn
SAR	Mr. Khadbayar Tumurbaatar	Specialist Air Navigation Policy Department, Civil Aviation Authority of Mongolia, Buyant-Ukhua, Khan-Uul district, Ulaanbaatar 17120	Tel: +976 11 282220 Fax: +976 11 282109	khadbayar.tu@mcga.gov.mn

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SAR	Mr. Batkhaan Dorjnyam	Officer Search and rescue coordination unit, ATS Division, Civil Aviation Authority of Mongolia, Buyant-Ukhaa, Khan-Uul district, Ulaanbaatar 17120	Tel: +976 11 281622 Tel: +976 11 281691 Fax: +976 11 281154	ub_rcc@mcaa.gov.mn ; batkhaan@mcaa.gov.mn ;
CCT	Mr. Urantugs Badambazar	Specialist Air Navigation Policy Department, Civil Aviation Authority of Mongolia, Buyant-Ukhaa, Khan-Uul district, Ulaanbaatar 17120	Tel: +976 11 282108 Fax: +976 11 282109	b.urantugs@mcaa.gov.mn ;
CCT	Mr. Urtnasan Doljin	Specialist Air Navigation Policy Department, Civil Aviation Authority of Mongolia, Buyant-Ukhaa, Khan-Uul district, Ulaanbaatar 17120	Tel: +976 11 282050 Fax: +976 11 282109	d_urtnasan@mcaa.gov.mn ;
ATC	Mr. Khadbayar Tumurbaatar	Specialist Air Navigation Policy Department, Civil Aviation Authority of Mongolia, Buyant-Ukhaa, Khan-Uul district, Ulaanbaatar 17120	Tel: +976 11 282220 Fax: +976 11 282109	khadbayar.tu@mcaa.gov.mn ;

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ATC	Mr. Purevsukh Purev	Director ATS Division, Civil Aviation Authority of Mongolia, Buyant-Ukhaa, Khan-Uul district, Ulaanbaatar 17120	Tel: +976 11 281700	purevsukh@mcaa.gov.mn ;
AIS	Mr. Odkhuu Khalzan	Specialist Air Navigation Policy Department, Civil Aviation Authority of Mongolia, Buyant-Ukhaa, Khan-Uul district, Ulaanbaatar 17120	Tel: +976 11 282229 Fax: +976 11 282109	odkhuu.kh@mcaa.gov.mn ;
AIS	Mrs. Ariungerel Purev	Director AIS Division Civil Aviation Authority of Mongolia Chinggis Khaan International Airport, AIS Headquarter, Ulaanbaatar (IFAIMA RD) Buyant-Ukhaa, Khan-Uul district, Ulaanbaatar 17120	Tel: +976 11 283131 Fax: +976 70049838	ariungerel@mcaa.gov.mn
AIS	Mr. Boldbayer Batbold	AIM Specialist AIS Division Civil Aviation Authority of Mongolia Chinggis Khaan International Airport, AIS Headquarter, Ulaanbaatar	Tel: +976 11 283137 Fax: +976 70049838	boldbayer.b@mcaa.gov.mn
ARC	Mrs. Ariungerel Purev	Deputy Director Department of Civil Aviation		ariungerel@mcaa.gov.mn

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ARC	Mr. Nyambayar Batkhuu	Assistant Director Department of Civil Aviation		nyambayar.b@mcaa.gov.mn
ARC	Mr. Lkhagvajav Dashdorj	Senior Specialist Air Navigation Policy Department, Civil Aviation Authority of Mongolia, Buyant-Ukhua, Khan-Uul district, Ulaanbaatar 17120	Tel: +976 11 282060 Fax: +976 11 282109	Lkhagvajav.d@mcaa.gov.mn ;
ARC	Mr.Batsaikhan Tserenjav	Head of ACC unit ATS division, Civil Aviation Authority of Mongolia, Buyant-Ukhua, Khan-Uul district, Ulaanbaatar 17120	Tel: +976 11 281614	batsaikhan.ts@mcaa.gov.mn ;
SAF	Mr.Batsaikhan Nyamsambu	Manager Air Navigation Policy Department, Civil Aviation Authority of Mongolia, Buyant-Ukhua, Khan-Uul district, Ulaanbaatar 17120	Tel: +976 11 282020 Fax: +976 11 282109	n_batsaikhan@mcaa.gov.mn ;
SAF	Mr.Odgerel Davaadorj	Head of Safety unit ATS Division, Civil Aviation Authority of Mongolia, Buyant-Ukhua, Khan-Uul district, Ulaanbaatar 17120	Tel: +976 11 281174	odgerel@mcaa.gov.mn ;

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ADM	Mr. Lkhagvajav Dashdorj	Senior Specialist Air Navigation Services Department Civil Aviation Authority of Mongolia Buyant-Ukhua, Khan-Uul district, Ulaanbaatar-17120 (Coordinator of ATM & MET SG)	Tel: +976 11 282060 Fax: +976 11 282109	Lkhagvajav.d@mcaa.gov.mn
ADM	Mr. Odgerel Davaadorj	Head of Safety Assurance Section ATS Division Civil Aviation Authority of Mongolia Chinggis-Khaan International Airport, Ulaanbaatar (Coordinator of RASMAG)	Tel: +976 11 281174 Fax: +976 11 282109	odgerel@mcaa.gov.mn
ADM	Mr. Urtnasan Doljin	Senior Specialist Air Navigation Services Department Civil Aviation Authority of Mongolia Buyant-Ukhua, Khan-Uul district, Ulaanbaatar-17120 (Coordinator of CNS SG)	Tel: +976 11 282050 Fax: +976 11 282109	d-urtnasan@mcaa.gov.mn
ADM	Mr. Odkhuu Khalzan	Specialist Air Navigation Services Department Civil Aviation Authority of Mongolia Buyant-Ukhua, Khan-Uul district, Ulaanbaatar-17120 (Secretary of CNS SG, Team leader of APUAS)	Tel: +976 11 282229 Fax: +976 11 282109	odkhuu.kh@mcaa.gov.mn

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ADM	Mr. Byambasuren Luvsansambuu	Director General Civil Aviation Authority of Mongolia Buyant Ukhaa, Khan Uul district, Ulaanbaatar-17120	Tel: —+976 11 282001 ——+976 11 282051, ——282236, 282247 Fax: —+976 11 7004 9825; ——+976 11 7004 9555	byambasuren.l@mcaa.gov.mn oyut.m@mcaa.gov.mn
ADM	Mr. Erdenesukh Magsarjav	Specialist Air Navigation Services Department Civil Aviation Authority of Mongolia Buyant Ukhaa, Khan Uul district, Ulaanbaatar-17120 (Secretary of MANPING)	Tel: —+976 11 282040 Fax: —+976 11 282109	erdenesukh.m@mcaa.gov.mn
ADM	Mr. Batsaikhan Nyamsambuu	Manager Air Navigation Services Department Civil Aviation Authority of Mongolia Buyant Ukhaa, Khan Uul district, Ulaanbaatar-17120 (Head of Mongolian Air Navigation Planning Implementation National Group (MANPING))	Tel: —+976 11 282020 Fax: —+976 11 282109	n-batsaikhan@mcaa.gov.mn
ADM	Mr. Khadbayar Tumurbaatar	Specialist Air Navigation Services Department Civil Aviation Authority of Mongolia Buyant Ukhaa, Khan Uul district, Ulaanbaatar-17120 (Secretary of ATM & MET SG, Team leader PBNICG)	Tel: —+976 11 282220 Fax: —+976 11 282109	khadbayar.tu@mcaa.gov.mn

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ADM	Mr. Erdenebat Yondon	Director of Air Navigation Services Department Air Navigation Policy Department Civil Aviation Authority of Mongolia Buyant-Ukhua, Khan-Uul district, Ulaanbaatar-17120	Tel: +976 11 282003 Fax: +976 11 282109	yo_erdenebat@mcaa.gov.mn
	MYANMAR			
SAR	Mr. Tike Aung Mr. Aung Zaw Thein	Director Department of Civil Aviation Assistant General Manager (ATM) Air Traffic Management Division Department of Civil Aviation Yangon International Airport Mingaladon 11021, Yangon	Tel: +95 1 533 008 Fax: +95 1 533 016 Tel: +959 533041 Fax: +951 533000	ats@dca.gov.mm azawthein@gmail.com ;
AIS	Mr. Than Lwin	Deputy General Manager (AIS) Department of Civil Aviation, Myanmar ATC Building, Yangon International Airport, Yangon 11021	Tel: +959 533085 Fax: +951 533016	aiso@ais.gov.mm thanlwin.ais@gmail.com
ARC	Mr. Nyunt Win	Deputy Director Department of Civil Aviation		aiso@ais.gov.mm

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ARC	Mr. Than Lwin	Assistant Director Department of Civil Aviation Deputy General Manager (AIS) Department of Civil Aviation, Myanmar ATC Building, Yangon International Airport, Yangon 11021	Tel: +959 533085 Fax: +951 533016	aiso@ais.gov.mm ; thanlwin.ais@gmail.com
ARC	Mr. Tint Wai	Assistant General Manager (ATM) Air Traffic Management Division Department of Civil Aviation Yangon International Airport Mingaladon 11021, Yangon	Tel: +951 533 043 Fax: +951 533 000	dcattint@gmail.com ;
ADM	Mr. Min Lwin Mr. Aung Kyaw Tun	Director General Department of Civil Aviation DCA Headquarters Building Yangon International Airport P.O.Box 11021, Mingaladon Yangon	Tel: +95 (1) 533015 Fax: +95 (1) 533016	dgdca@dca.gov.mm ~~dydg-dca@mot.gov.mm~~ (DDG) ~~ddcom-dca@mot.gov.mm~~ (CNS)

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ADM	Mr. Soe Paing	~~Director~~ ~~Air Navigation Safety Division~~ ~~Department of Civil Aviation~~ ~~Headquarters Building~~ ~~Yangon International Airport~~ ~~Mingaladon 11021, Yangon~~ General Manager (ANSP) Air Navigation Service Provider Department of Civil Aviation Yangon International Airport Mingaladon 11021, Yangon	Tel: +951 533 008 Fax: +951 533 000	soepng1@gmail.com ansd.myanmar@gmail.com
ADM	Mr. Aung Myint Thein	Deputy General Manager (ATMD) Air Traffic Management Division Department of Civil Aviation Yangon International Airport Mingaladon 11021, Yangon	~~Tel: +951 533 458~~ Tel: +951 533 043 Fax: +951 533 000	ansd.myanmar@gmail.com aungmyintthein.dca@gmail.com ;
ADM	Mr. Aung Zaw Thein	Assistant Director (ATM) ~~Department of Civil Aviation~~ Air Traffic Management Division Department of Civil Aviation Yangon International Airport Mingaladon 11021, Yangon	~~Tel: +95 1 533 008~~ ~~Fax: +95 1 533 016~~ Tel: +959 533041 Fax: +951 533000	ats@dca.gov.mm azawthein@gmail.com ;

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ADM	Mr. Tint Wai	Assistant General Manager (ATM) Air Traffic Management Division Department of Civil Aviation Yangon International Airport Mingaladon 11021, Yangon	Tel: +951 533 043 Fax: +951 533 000	dcatint@gmail.com
ADM	Mr. Nyunt Win	Director Department of Civil Aviation, Myanmar DCA H.Q., Yangon International Airport, Yangon 11021	Tel: +959 541 9117 Fax: +951 533 016	aiso@ais.gov.mm ais.myanmar@gmail.com
	NAURU			
ARC ADM	Ms. Melaney Bill	Director of Civil Aviation Department of Civil Aviation		melaney.bill@naurugov.nr
ARC	Ms. Li-May Uera	Secretary for Transport & Telecommunications		secretary.transport@naurugov.nr
ADM	J. Lesi Olsson			jlesio@hotmail.com
	NEPAL			
SAR	Mr. Sanjay Kumar	Manager, Air Traffic Services/ Search and Rescue Division Tribhuvan Int'l Airport, Civil Aviation Authority of Nepal Dy. Director, Rescue Coordination Centre (RCC) Civil Aviation Authority of Nepal, Head Office, Babarmahal, Kathmandu	Tel: +977 14113033# 2238 Mob: +977 9841343995 Tel: +977 1 4113000 Mob: +977 9851223000 Fax: +977 1 4113222	sk.tiao@gmail.com rcc@caanepal.gov.np

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CCT	Mr. Madam Lal Kafle	Director, CNS P & D Department Civil Aviation Authority of Nepal, Head Office, Babarmahal, Kathmandu	Tel: +977 1 4249379 Mob: +977 9841207892 Fax: +977 1 4262516	mlkafle@gmail.com
ATC	Mr. Deepak Baral	Director, ATM Department, Civil Aviation Authority of Nepal, Head Office, Babarmahal, Kathmandu	Tel: +977 1 4266139 Mob: +977 9851071819 Fax: +977 1 4262516	Deepak.baral@caanepal.gov.np
AIS	Mr. Sudhir Kumar Chaudhary	Director, AIM Department, Civil Aviation Authority of Nepal, Head Office, Babarmahal, Kathmandu	Tel: +977 1 4257667 Mob: +977 9841320087 Fax: +977 1 4262516	Chaudhary.sudhir754@gmail.com
SAF	Mrs. Nabina Karmacharya	Director, ANS Safety & Standard Department, Civil Aviation Authority of Nepal, Head Office, Babarmahal, Kathmandu	Tel: +977 1 4267784 Mob: +977 9841485092 Fax: +977 1 4262516	Nabina2008@live.com
ARC	Mr. Dahal Mukesh Raj	Manager Civil Aviation Authority of Nepal		onepeshifirst@gmail.com
ARC	Ms. Manju Paudyal Gyawali	Civil Aviation Authority of Nepal		manju_paudyal2003@yahoo.com
ADM	Mr. Sanjiv Gautam	Director General Civil Aviation Authority of Nepal Head Office Babar Mahal Kathmandu	Tel: +977 (1) 4262387, 4262518 +977 (1) 4257667 (DG direct) Fax: +977 (1) 4262516	dgca@caanepal.org.np ensatm@mos.com.np
ADM	Mr. Mohammad Ali Hasan	Deputy Director Civil Aviation Authority of Nepal Babar mahal, Kathmandu	Tel: +977 1 426 2387 Fax: +977 1 426 2516	ensatm@mos.com.np adalihasan@gmail.com atcalihasan@gmail.com.com

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ADM	Mr. Purusotam Sakya	Deputy Director, ATM Department, Civil Aviation Authority of Nepal, Head Office, Babarmahal, Kathmandu	Tel: +977 977 14262923 Mob: +977 9803180474	purushakya59@gmail.com
ADM	Mr. Rajan Pokherel	Director General, Civil Aviation Authority of Nepal, Head Office, Babarmahal, Kathmandu	Tel: +977 1 4262387, 4262518 Mob: +977 9851071814 Fax: +977 1 4262516	dgca@caanepal.gov.np ; cnsatm@mos.com.np
	NEW ZEALAND			
SAR ADM	Mr. Paul Craven	Operations Officer Rescue Coordination Centre New Zealand (RCCNZ) Maritime New Zealand	Tel: +64 4 577 8032 Mob: +64 27 491 8013 Fax:	Paul.craven@maritimenz.govt.nz
AIS	Mr. Matt Day	Manager - Aeronautical Information Management Aeropath Level 7, 100 Willis Street Wellington 6011	Tel: +64 4 471 4795 Mob: +64 27 437 0107	matt.day@aeropath.aero
ARC	Mr. Matt Day	Manager AIM Group EAD Asia/Pacific		matt.day@groupead.co.nz
ADM	Mr. Alister Buckingham	National Continuous Monitoring Coordinator ICAO USOAP Civil Aviation Authority of New Zealand PO Box 3555 Wellington 6140	Tel: +64 4 560 9459 Mob: +64 27 224 0122	alister.buckingham@caa.govt.nz

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ADM	Ms. Kate Madden	Aeronautical Services Officer Air Traffic Services Civil Aviation Authority of New Zealand P.O. Box 3555 Wellington 6140	Tel: +64 4 560 9645 Fax: +64 4 560 2024 Mob: + 64 27 556 1512	Kate.Madden@caa.govt.nz
ADM	Mr. Jerry Nicholas (ANSP)	ATS Policy and Standards Team Leader, Policy, Standards and Safety Improvement, Airways New Zealand, Level 7, Majestic Centre, 100 Willis Street, P.O. Box 294, Wellington 6140,	Tel: +64 4 4715695	Jerry.nicholas@airways.co.nz
ADM	Mr. David Wills	Aeronautical Services Officer Telecommunications Civil Aviation Authority of New Zealand P.O. Box 3555 Wellington 6140	Tel: +64 4 560 9583 Fax: +64 4 560 2024	david.wills@caa.govt.nz
	OMAN			
CCT	Mr. Saleh Al Harthy	Director of CNS	Tel: +968-24519789	saleh@paca.gov.om
CCT	Mr. Mubarak Al Ghelani	Director of ATC	Tel: +968-24518646	m.alghelani@paca.gov.om
CCT	Mr. Nasser Al Mazroui	Chief of ACC	Tel: +968-24518646	n.almazroui@paca.gov.om
	PAKISTAN			

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SAR	Mr. Fayyaz Ahmed	Additional Director SAR, HQCAA, Terminal 1, Jinnah Intl Airport, Karachi	Tel: +92 21 99249153 +92 21 99072069 Fax: +922199249154 Mobile: + 92321 2534744	adid.sar@caapakistan.com.pk
SAR	Mr Taqi Nasir	Officer-in Charge, Lahore RCC, Area Control Centre Radar Building Allama Iqbal Intl Airport Lahore	Tel:: + 9242 36611618 Fax: + 9242 99240516	taqinasir64@gmail.com
SAR	Mr. Junaid Mahmood	Chief of RCC Karachi	Tel: +922199248173 Fax: +922199248210 Mobile: +923028221877	oojiap@caapakistan.com.pk ;
SAR	Muhammad Riazuddin	Director Operations Headquarters, Pakistan Civil Aviation Authority Terminal No.1, Jinnah International Airport Karachi 75200	Tel: +92-2199242742 Fax: +92-2134604323 Mobile:+923018267932	Director.ops@caapakistan.com.pk
CCT	Mr. Iftikhar Ahmed	Additional Director ATS Headquarters, Pakistan Civil Aviation Authority Terminal No.1, Jinnah International Airport Karachi 75200	Tel: +92 21 99242044 Fax: +92 21 99242045	AdlDops.atm@caapakistan.com.pk
AIS	Ms. Shaheen Mehmood	Additional Director Aeronautical Information Management Headquarters, Pakistan Civil Aviation Authority, Terminal-1 Jinnah International Airport, Karachi	Tel: +92 21 99242155 +92 21 99072288 Fax: +92 21 99242089	AdlDOPS.AIM@caapakistan.com.pk shaheen.mahmood@caapakistan.com.pk

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ARC	Minister in-charge on Aviation	Minister in-charge on Aviation		secyavn@gmail.com
ARC	Mr. Muhammad Ayaz Jadoon	Director Operations Pakistan Civil Aviation Authority		dops@caapakistan.com.pk
ADM	Mr. Iftikhar Ahmed	Additional Director ATS Headquarters, Pakistan Civil Aviation Authority, Terminal-1 Jinnah International Airport, Karachi 75200	Tel: +92 21 99242044 +92 21 99072281 Fax: +92 21 99242045	AdlDOPS.ATM@caapakistan.com.pk
ADM	Mr. Javed Aziz Farooqi	Additional Director Airspace and Air Navigation Standards Headquarters, Pakistan Civil Aviation Authority Inspectorate Building, Jinnah International Airport Karachi 75200	Tel: +92 21 99242748 +92 21 99072665 +92 21 99242757	AdlDAAR.AANS@caapakistan.com.pk
	PALAU			
ARC	Mr. Peter N. Polloi	Administrator Director General of Civil Aviation Palau National Aviation Administration		pnaa@palaunet.com
ADM	Mr. Peter N. Polloi	Administrator (DGCA) Palau National Aviation Administration P.O. Box 6051 Koror, Palau 96940	Tel: +680 587 2944, +680 587 4363 Mobile: +680 775 1828 Fax: +680 587 2945	pnaa@palaunet.com
	PAPUA NEW GUINEA			

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AIM	Mr. Robin Damo	Chief Cartographer of AIS PNG Air Services Ltd. P.O. Box 273 Boroko NCA, Port Moresby	Tel: +675 3121582 Fax: +675 3250749	rdamo@pngairservices.com.pg
AIS	Ms. Collette B Karang	Manager AIS PNG Air Services Ltd. P.O. Box 273 Boroko NCA, Port Moresby	Tel: +675 7615 5319 Fax: +675 325 0749	ckarang@pngairservices.com.pg
ARC	Mr. Roy Mumu	Secretary Department of Transport		rmumu@transport.gov.pg
ARC	Mr. Wilson Sagati	Chief Executive Officer and Director Civil Aviation Safety Authority of Papua New Guinea		wsagati@casapng.gov.pg
ADM	Mr. Roy Mumu	Secretary Department of Transport P.O.Box 1489 Port Moresby National Capital District	Tel: + (675) 325 7500/3236186 Fax: + (675) 323 3339	rmumu@transport.gov.pg
	PHILIPPINES			

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SAR	Mr. Braulio I. Meneses	Air Traffic Management Officer IV Philippines Aeronautical Rescue Coordination Center (PARCC) Civil Aviation Authority of the Philippines	Tel: +632 6727705 Tel: +632 6727706 Tel: +632 8517137 Mob: +63917 76502302 AMHS: RPLLYCYX VSCS: 522810/522820	caaphil.rcc@gmail.com
SAR	Ms. Joyce B. Santos	Air Traffic Management Officer IV Philippines Aeronautical Rescue Coordination Center (PARCC) Civil Aviation Authority of the Philippines	Tel: +632 6727705 Tel: +632 6727706 Mob: +63917 76502302 AMHS: RPLLYCYX VSCS: 522810/522820	caaphil.rcc@gmail.com
ATC	Ms. Maria Theresa L. Olpindo	Department Manager, III Air Traffic Control and Management Department Air Traffic Service, Civil Aviation Authority of the Philippines	Tel: +632 944 2221	Limavic2000@yahoo.com
ATC	Mr. Ferdinand A. Tienzo	Chief, Enroute Division Air Traffic Control and Management Department Air Traffic Service, Civil Aviation Authority of the Philippines	Tel: +632 944 2215	fatienzo@caap.gov.ph
AIS	Ms. Remedios M. Gomez	Acting Division Chief, AIS/MAPS Air Traffic Services Civil Aviation Authority of the Philippines	Tel : +632 944 2269	Rem_gomez@yahoo.com

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AIS	Ms. Alicia C. Bagot	Facility-In-Charge, AIS OPS Air Traffic Service Civil Aviation Authority of the Philippines	Tel: +632 672 7730, +632 672 7732	alicebagot@yahoo.com
AIS	Mr. George Don M. Narvaez	Assistant Facility-In-Charge, AIS OPS Air Traffic Service Civil Aviation Authority of the Philippines Aeronautical Information Service Ops, Gnd Floor Air Traffic Management Center Civil Aviation Authority of the Philippines CAAP Compound, Mia Road Pasay City, 1300	Tel : +632 672 7785	phil.aisops@gmail.com gdnarvaez@yahoo.com
ARC	Ms. Maria Rumela G. Cortes	Facility in Charge, AIS-OPS Civil Aviation Authority of the Philippines		phil.aisops@gmail.com
ARC	Mr. Jose D De Vera	Acting Division Chief III AIS/MAP Aeronautical Information Service/MAP Civil Aviation Authority of the Philippines		devevajose18@gmail.com
ADM	Ms. Amneris G. Gabriel	Department Manager, III Aeronautical Information and Communications Department Air Traffic Service Civil Aviation Authority of the Philippines	Tel: +632 944 2221	vannieggabriel@gmail.com
ADM	Ms. Melba S. Acurantes	Acting Division Chief, Progression Division Air Traffic Service Civil Aviation Authority of the Philippines	Tel: +632 944 2211	Ms_acurantes@yahoo.com

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ADM	Mr. Michael E. Mapanao	Assistant Director General 1 Air Traffic Service Civil Aviation Authority of the Philippines	Tel: +63 2 944 2218	mikeecho905@yahoo.com ;
ADM	Ms. Anna Joy C. Papag	Acting Division Chief Air Traffic Service Planning Division Civil Aviation Authority of the Philippines	Tel: +63 2 944 2209	ae_jae0627@yahoo.com
ADM	Atty. Antonio G. Gonzales	Acting Chief, Air Traffic Service Air Traffic Service Civil Aviation Authority of the Philippines	Tel: +63 2 944 2218	antoniogonzales2003@yahoo.com ;
ADM	Captain Jim C. Sydiongco	Director General Civil Aviation Authority of the Philippines Old MIA Rd., Pasay City Metro Manila	Tel: +632 944-2002 Fax: +632 944-2168	jcsydiongco@caap.gov.ph caap.odgnet@gmail.com
	REPUBLIC OF KOREA			
SAR	Mr Song Woo Tae	~~Search and Rescue Division Senior Policeman~~ ~~Ministry Of Public Safety and Security Korea~~ ~~Coast Guard~~ ~~#13 Jeongbu 2 Cheongsa-ro, Sejong Special Self~~ ~~Governing City~~ ~~Republic of Korea~~	Tel: +82 44 205 2847 Fax: +82 44 205 8973	cross0707@korea.kr

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SAR	Mr. Sang-cheol Kim	Fire Fighting Equipment & Aviation Division Assistant Director Ministry of Public Safety and Security National Fire Service HQ SM Tower, #503, 10 Jeongbu 2 Cheongsu-ro, Sejong Special Self Governing City	Tel: +82 44 205 7388 Fax: +82 44 205 7326	godwater@korea.kr ;
SAR	Mr. Jik Hur	Senior Police Officer, Search and Rescue Division, Korea Coast Guard, 130, Haedori-ro, Yeosu-gu, Incheon, 21995, Republic of Korea	Tel: +82 32 835 2647 Fax: +82 32 835 2846	gjwlr@korea.kr ;
SAR	Mr. Dong-sun Yoo	Assistant Director Air Traffic Management Office 50-12, Maeyou-ro 1 gil, Dong-gu, Daegu City, 41059	Tel.: +82 53 668 0256 Fax: +82 53 668 0277	yds1992@korea.kr ;
CCT	Ms. Hye-in Jang Jung	Deputy Director Air Traffic Command Center Air Traffic Management Office 50-12, Maeyou-ro 1 gil, Dong-gu, Daegu City, 41059	Tel: +82 53 668 0232 Fax: +82 53 668 0275	hyen@korea.kr hyein@korea.kr ;
CCT	Ms. So-hyun Park	Assistant Director Air Traffic Division Korea Office of Civil Aviation Ministry of Land, Infrastructure and Transport #11 Doum-ro 6, Sejong Special Self-governing City, 30103	Tel.: +82 44 201 4196 Fax: +82 44 201 5631	psohyon@korea.kr ;

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AIS	Mr. Hyungjin Park	Assistant Director of AIS/AIM Ministry of Transport 50-12, Maeyeo-ro 1-gil, Dong-gu, Daegu	Tel: +82 53 668 0254 Fax: +82 53 668 0255	galahad@korea.kr phj420@naver.com
AIS	Mr. Seong-min Lee	Assistant Director Air Traffic Management Office 50-12, Maeyeu-ro 1 gil, Dong-gu, Daegu City, 41059	Tel.: +82 53 668 0254 Fax: +82 53 668 0277	dolphin326@korea.kr ;
ARC	Mr. Jinseob An	Deputy Director		alfa9029@korea.kr
ARC	Mr. Seongyong Jo	Assistant Director		sun9sang@korea.kr
ARC	Mr. Koh Han Seung	Assistant Director Air Traffic Management Division		koh119@korea.kr
ARC	Mr. Young-ho Kim	Deputy Director Air Traffic Division Korea Office of Civil Aviation Ministry of Land, Infrastructure and Transport #11 Doum-ro 6, Sejong Special Self-governing City, 30103	Tel.: +82 44 201 4303 Fax: +82 44 201 5631	kimyh24@korea.kr ;
ARC	Mr. Jun-ho Lee	Assistant Director Air Traffic Division Korea Office of Civil Aviation Ministry of Land, Infrastructure and Transport #11 Doum-ro 6, Sejong Special Self-governing City, 30103	Tel.: +82 44 201 4301 Fax: +82 44 201 5631	garund9@korea.kr ;

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ARC	~~Mr. Kwon Hyungcheol~~ Mr. Hyung-cheol Kwon	~~Assistant Director~~ ~~ATFM Center~~ Assistant Director Air Traffic Management Office 50-12, Maeyeou-ro 1 gil, Dong-gu, Daegu City, 41059	Tel.: +82 53 668 0253 Fax: +82 53 668 0277	cheol89@korea.kr ;
ADM	~~Mr Kim Sang Cheol~~	~~Fire Fighting Equipment & Aviation Division~~ ~~Assistant Director~~ ~~Ministry of Public Safety and Security National~~ ~~Fire Service HQ~~ ~~SM Tower, #503, 10 Jeongbu 2 Cheongsa-ro,~~ ~~Sejong Special Self-Governing City~~	Tel: +82 44 205 7388 Fax: +82 44 205 7326	godwater@korea.kr
ADM	Mr. Lee, Hojin	~~Deputy Director~~ ~~Ministry of Land, Infrastructure and Transport~~ ~~#11 Doum-ro 6,~~ ~~Sejong Special Self governing City, 30103~~	Tel.: +82 44 201 4303 Fax: +82 44 201 5631	jlnlee@korea.kr
ADM	Ms. Cha, Si Hyun	~~Assistant Director~~ ~~Ministry of Land, Infrastructure and Transport~~ ~~#11 Doum-ro 6,~~ ~~Sejong Special Self governing City, 30103~~	Tel.: +82 44 201 4298 Fax: +82 44 201 5631	chash2011@korea.kr
ADM	Mr. Bon Hwan Koo	~~Deputy Minister for Civil Aviation~~ ~~Ministry of Land, Infrastructure and Transport~~ ~~(MOLIT)~~ ~~11 Doum 6th Street~~ ~~Sejong City 339-012~~	Tel: +82 44 201 4213 +82 44 201 4214 Fax: +82 44 201 5624	jewelry@korea.kr jenkim@korea.kr

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ADM	Mr. Koh, Han-Seung	Assistant Director Ministry of Land, Infrastructure and Transport #11 Doum-ro 6, Sejong Special Self-governing City, 30103 Republic of Korea	Tel.: +82 44 201 4301 Fax: +82 44 201 5631	Koh119@korea.kr
ADM	Mr. Nam-kuk Kim	Deputy Director Air Traffic Division Korea Office of Civil Aviation Ministry of Land, Infrastructure and Transport #11 Doum-ro 6, Sejong Special Self-governing City, 30103	Tel: +82 44 201 4299 Fax: +82 44 201 5631	nkkim70@korea.kr ;
ADM	Ms. Sang-mo Jung	Assistant Director Air Traffic Division Korea Office of Civil Aviation Ministry of Land, Infrastructure and Transport #11 Doum-ro 6, Sejong Special Self-governing City, 30103	Tel: +82 44 201 4300 Fax: +82 44 201 5631	april24th@korea.kr ;
ADM	Ms. So-hyun Park	Assistant Director Air Traffic Division Korea Office of Civil Aviation Ministry of Land, Infrastructure and Transport #11 Doum-ro 6, Sejong Special Self-governing City, 30103	Tel.: +82 44 201 4196 Fax: +82 44 201 5631	psohyon@korea.kr ;
	QATAR			
CCT	Qatar FLS			aalhammadi@caa.gov.qa

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CCT	Qatar MFP			ahmed@caa.gov.qa Ahmed@caa.gov.qa
	SAUDI ARABIA			
CCT	Mr. Ibrahim Al-Jabri			ialjabri@gaca.gov.sa
	RUSSIAN FEDERATION			
CCT	Mr. Sergey Pogrebnov	Deputy Director General, State ATM Corporation HQ	Tel: Fax:	Pogrebnov@matfmc.ru
CCT	Mr. Peter Shipil	Director, International Relations and Protocol, State ATM Corporation HQ	Tel: Fax:	shipil@gkovd.ru
CCT	Mr. Alexey Buevich	Head of ATFM & Strategic Planning, Main ATM Center of Russia, State ATM Corporation	Tel: +7 495 6010643 Fax: +7 495 601 07 64	matcc@aviacom.ru
CCT	Mr. Konstantin Starostin,	Deputy Branch Director for ATM, Far East Air Navigation Branch (Khabarovsk), State ATM Corporation	Tel: Fax:	sko@dv.gkovd.ru
CCT	Mr. Viktor Trikola,	Head of ATM unit, North East Air Navigation Branch (Magadan)	Tel: Fax:	trikopa@sv.gkovd.ru acc@sv.gkovd.ru
CCT	Mr. Alexey Khrabrov	Chief of ATM Services, PK ACC	Tel: +7 914 788 1874 Fax:	
	SAMOA			
ARC	Mr. Su'a Poumulinuku Onesemo	Secretary for Transport/Chief Executive Officer Ministry of Works, Transport and Infrastructure		pou.onesemo@mwti.gov.ws

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ARC	Mr. Nanai Junior Saaga	Director of Civil Aviation/Assistant Chief Executive Officer Civil Aviation Division Ministry of Works, Transport and Infrastructure		njsaaga@mwti.gov.ws
	SINGAPORE			
SAR	Mr. Tai Kit	Head Air Traffic Control Specialist (SAR/Contingency Planning) Singapore Air Traffic Control Centre Civil Aviation Authority of Singapore	Tel: +65 6 595 4084 Fax: +65 6 545 6252	tai_kit@caas.gov.sg
SAR	Mr. Goh Seng Peng Brian	Senior ATC Specialist Singapore Air Traffic Control Centre Civil Aviation Authority of Singapore	Tel: +65 6 4227051 Fax: +65 6 545 6252	brian_goh@caas.gov.sg
ATC AIS	Mr. Balasupparamaniam S/O R. Gurusamy	Deputy Chief (Operations) Civil Aviation Authority of Singapore Singapore Air Traffic Control Centre 60 Biggin Hill 509950	Tel: +65 6576 5337 Fax: +65 6545 6252	bala_r_gurusamy@caas.gov.sg
AIS	Ms. Lee Tock Eng	~~Senior Air Traffic Control Watch Support Officer~~ ~~Civil Aviation Authority of Singapore~~ Aeronautical Information Services, Civil Aviation Authority of Singapore, Singapore Changi Airport ~~918141~~ , P.O. Box 1 Singapore 918141	Tel: +65 6596 6051 Fax: +65 6441 0221	lee_tock_eng@caas.gov.sg

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AIS	Ms. Wong Liang Fen	~~Chief, Aeronautical Information Services~~ ~~Specialist (Aeronautical Information Services)~~ Civil Aviation Authority of Singapore ~~Aeronautical Information Services, Civil Aviation~~ ~~Authority of Singapore, Singapore Changi Airport~~ ~~918141 P.O. Box 1 Singapore 918141~~	Tel: +65 6595 6051 Fax: +65 6441 0221	wong_liang_fen@caas.gov.sg
AIS	Mr. Vevaganandam Ravichandran	~~Deputy Chief, Aeronautical Information Services~~ ~~Head (Aeronautical Information Services)~~ Civil Aviation Authority of Singapore ~~Aeronautical Information Services, Civil Aviation~~ ~~Authority of Singapore, Singapore Changi Airport~~ ~~918141 P.O. Box 1 Singapore 918141~~	Tel: +65 64227036 Fax: +65 64410221	vevaganandam_ravichandran@caas.gov.sg
SAF	Ms Valerie Sim	Air Traffic Manger (ANS Safety & Security), Air Navigation Group South East Asia Safety Monitoring Agency (SEASMA) - Civil Aviation Authority of Singapore (CAAS)		Valerie_sim@caas.gov.sg
ARC	~~Ms. Wong Liang Fen~~ Mr. Michael Shee	~~Chief~~ ~~Aeronautical Information Services~~ ~~Civil Aviation Authority of Singapore~~ Chief (ATM1) Civil Aviation Authority of Singapore		~~wong_liang_fen@caas.gov.sg~~ michael_shee@caas.gov.sg
ADM	Mr. Randy Ong	Head of Air Navigation Services Safety & Security, Civil Aviation Authority of Singapore Singapore Changi Airport 918141, P.O. Box 1	Tel: +65 6422 7065 Fax: +65 6441 0221	randy_ong@caas.gov.sg

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ADM	Mr. Balbir Singh	Head of Safety & Standards, Air Traffic Services Division Civil Aviation Authority of Singapore Singapore Changi Airport 918141, PO Box 1	Tel: +65 6541 2456 Fax: +65 6441 0221	balbir_singh@caas.gov.sg
ADM	Mr. Andrew Wee	Deputy Director of Safety & Standards, Air Traffic Services Division, Civil Aviation Authority of Singapore Singapore Changi Airport 918141, P.O. Box 1	Tel: +65 6541 3467 Fax: +65 6441 0221	andrew_wee@caas.gov.sg
ADM	Mr. Shum Jin-Chyi Kevin	Director General of Civil Aviation Civil Aviation Authority of Singapore Singapore Changi Airport 918141 P. O. Box 1	Tel: +65 65421122 Fax: +65 65421231	CAAS_Registry@caas.gov.sg
ADM	Mr. Victor Lee Hoong Kwan	Senior Manager (CNS Regulation) Civil Aviation Authority of Singapore Singapore Changi Airport 918141, P.O. Box 1	Tel: +65 6541 2476 Fax: +65 6542 3869	victor_lee@caas.gov.sg
ADM	Mr. Andy Lim Eng Soon	Executive Engineer (Air Traffic Management Systems) Civil Aviation Authority of Singapore Air Traffic Management Systems (Engineering Operations) Section, Aeronautical Telecommunications & Engineering Division Civil Aviation Authority of Singapore Singapore Changi Airport 918141, P.O. Box 1	Tel: +65 6541 2011 Fax: +65 6542 2447	andy_lim@caas.gov.sg

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	Mr. Ahmadul Fatta Noor	Assistant Engineer (Air Traffic Management Operations Planning) Air Traffic Services Division Civil Aviation Authority of Singapore Singapore Changi Airport 918141, P.O. Box 1	Tel: +65 6422 7037 Fax: +65 6441 0221	ahmadul_fatta_noor@caas.gov.sg
	SOLOMON ISLANDS			
ARC	Mr. James Apaniai	Director of Civil Aviation Civil Aviation Authority of Solomon Islands		george.satu@gmail.com
ARC	Mr. Brian Halisanau	Civil Aviation Authority of Solomon Islands		halisanau_b@caasi.com.sb
	SRI LANKA			
SAR	Mr. Nishan Abeywardena	Senior Air Traffic Controller (Safety & Search and Rescue) Airport & Aviation Services (SL) Ltd/AASL Colombo Airport Ratmalana Sri Lanka	Tel: +94 112635105 Mobile: +94 725101975	nishanatc.ans@airport.lk
AIS	Mr. M.P. Bowatte	Manager AIS Aeronautical Information Services Airport & Aviation Services (SL) Ltd. Bandaranaike International Airport, Katunayake	Tel: +94 11 226 4229 Fax: +94 11 225 9916	mpb.ais.ans@airport.lk
ARC	Ms. Vineetha Senanayake	Senior Civil Aviation Inspector (AIS) Civil Aviation Authority of Sri Lanka		scaiais@caa.lk
ARC	Mr. Manjula Parakrama Bowatte	Officer-in-Charge/AIS Airport and Aviation Service Sri Lanka		mpb.ais.ans@airport.lk

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ADM	Mr. M. A. K. Prasanna	Director Air Navigation Services, Civil Aviation Authority of Sri Lanka No. 4, No.152/1, Minuwangoda Road Katunayake	Tel: +94 11 2253863, +94 11 2358849 Fax: +94 11 2257159	dans@caa.lk
ADM	Mr. Mahinda Mahamithawa	Head of Air Navigation Services Air Navigation Services Complex Bandaranaike International Airport, Katunayake	Tel: +94 11 2252062 Fax: +94 11 2252062	head.ans@airport.lk
ADM	Mr. H. M. C. Nimalsiri	Director General & Chief Executive Officer Civil Aviation Authority of Sri Lanka 152/1, Opposite Radar Hill Katunayake –Minuwangoda Road Katunayake	Tel: +94 (11) 22 52 017 (direct line) Fax: +94 (11) 22 52 038	sldgca@slt.lk ; sldgca@caa.lk
ADM	Mr. Asanga Senarath Bandara	Senior Electronics Engineer (Surveillance/ATM/AIM) / Project Manager of AIM System Implementation Project of Sri Lanka Airport & Aviation Services (Sri Lanka) Limited Electronics & Air Navigation Engineering Division Navigational Services Complex Bandaranaike International Airport, Katunayake	Tel: +94 76 824 2654, +94 11 226 3619 Fax: +94 11 225 2400	asanga.eane@airport.lk asangasenarath@gmail.com
ADM	Ms. Vineetha Senanayake	Senior Civil Aviation Inspector Civil Aviation Authority of Sri Lanka No.152/1, Minuwangoda Road Katunayake	Tel: +94 11 2358851 Fax: +94 11 2253627	scaiais@caa.lk
	TAJIKISTAN			

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CCT	Mr. Alisher A. Shambiev,	First Deputy of Director General, SUE “Tajikairnavigation”	Tel: +992 48 701-17-20	a.shambiev@airnav.tj
	THAILAND			
SAR	Mr. Punlop Sungsilert (Principle SAR Contact)	Chief of Technical and Standard Group Transport Technical Officer, Professional Level Office of the Search and Rescue Commission Ministry of Transport	Tel: +66 2 287 4717 Mobile: +6689 7960 368 Fax: +66 2 286 2925	punlopsung@yahoo.com spunlop@aviation.go.th punlop.s@mot.go.th
SAR	Ms. Natkitta Srithaweeapan	Transport Technical Officer, Professional Level Office of the Search and Rescue Commission Ministry of Transport	Tel: +66 2 285 5451 Fax: +66 2 286 2925	natkitta.s@mot.go.th
SAR	Mr. Thanatip Jantarapakde	Chief of Vessel Traffic Control Section, Vessel Traffic Control and Maritime Security Office Marine Department of Thailand	Tel/Fax: +66 38 400271, +66 38 495161-3	thanatipj@hotmail.com thanatip.j@md.go.th
SAR	Mr. Damrongkiat Kiatopas	~~Navigator~~ ~~Vessel Traffic Control and Maritime Security~~ ~~Center~~ Harbour Master Harbour Master Section Marine Safety and Environment Bureau The Marine Department, Thailand	~~Tel: +6638 400 270~~ ~~Fax: +6638 400 271~~ Tel: +66 2 2341070 Fax: +66 2 2382309	admin@vtsmd.com k.damrongkiat@gmail.com

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SAR	Mr. Supat Laohakit	Senior Transport Technical Officer, Professional Level Airport Standards Bureau Department of Civil Aviation	Tel: +66 2 285 5450 Fax: +66 2 286 2925	laohakit_boom@hotmail.com
CCT	Mr. Piyawut Tantimekabut,	Engineering Manager Network Operations ATM Centre	Tel: +66 (2) 287 8616 Fax : +66 (2) 287 8375	piyawut@gmail.com piyawut@aerothai.co.th
ATC	Ms. Suppanat Hannarongsag	Senior Director, Bangkok Area Air Traffic Control Management Bureau Aeronautical Radio of Thailand Ltd (AEROTHAI) 102 Soi Ngamduplee Tungmahamek, Sathorn, Bangkok 101420	Tel: +66 2 287-8808 Mobile: +66 85 481 1646	suppanat.ha@aerothai.co.th
AIS	Mr. Anurak Chankana	Chief of Aeronautical Information and Chart Standards Division 333/105 9 th Floor Laksi Plaza Building, Khampheng Phet 6 Rd., Talat Bangkhen, Laksi, Bangkok 10210	Tel: +66 2 568 8825 Fax:	anurak.c@caat.or.th
AIS	Ms. Nartnaree Chartchuanchom	Aeronautical Information Officer The Civil Aviation Authority of Thailand 333/105 7 th Floor Laksi Plaza Building, Khampheng Phet 6 Rd., Talat Bangkhen, Laksi, Bangkok 10210	Tel: +66 63 205 8830 Fax: +66 2 576 1903	nartnaree.c@caat.or.th
AIS	Ms. Papasrin Jirawiwatkul	Chief of Aeronautical Information Division The Civil Aviation Authority of Thailand 333/105 7 th Floor Laksi Plaza Building, Khampheng Phet 6 Rd., Talat Bangkhen, Laksi, Bangkok 10210	Tel: +66 63 205 8830 Fax: +66 2 576 1903	papasrin.j@caat.or.th

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AIS	Mr. Jakrin Kutantham	Aeronautical Information and Chart Standards Officer 333/105 9 th Floor Laksi Plaza Building, Khampheng Phet 6 Rd., Talat Bangkheng, Laksi, Bangkok 10210	Tel: +66 2 568 8825 Fax:	jakrin.k@caat.or.th
AIS	Ms. Sujin Promduang	Director, Aeronautical Information and Flight Data Management Centre Aeronautical Radio of Thailand Limited 102 Ngarmduplee, Rama IV Road Tungmahamek, Sathorn Bangkok 10120	Tel: +66 2 285 9083 Fax:	sujin.pr@aerothai.co.th
AIS	Ms. Pattaporn Thanachai	Aeronautical Chart Officer The Civil Aviation Authority of Thailand 333/105 7 th Floor Laksi Plaza Building, Khampheng Phet 6 Rd., Talat Bangkheng, Laksi, Bangkok 10210	Tel: +66 63 205 8831 Fax: +66 2 576 1903	pattaporn.t@caat.or.th
AIS	Ms. Piriya Korn Tungaroonsanti	Aeronautical Information Officer The Civil Aviation Authority of Thailand 333/105 7 th Floor Laksi Plaza Building, Khampheng Phet 6 Rd., Talat Bangkheng, Laksi, Bangkok 10210	Tel: +66 63 205 8831 Fax: +66 2 576 1903	piriyakorn.t@caat.or.th

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AIS	Mrs. Phawana Wongphathi	Manager of Aeronautical Information Service Department The Civil Aviation Authority of Thailand 333/105 7 th Floor Laksi Plaza Building, Khampheng Phet 6 Rd., Talat Bangkheng, Laksi, Bangkok 10210	Tel: +66 63 205 8831 Fax: +66 2 576 1903	phawana.w@caat.or.th
SAF	Mr. Theeravut Sungseemek	Director, Safety Management Department & Monitoring Agency for the Asia Region (MAAR) Aeronautical Radio of Thailand LTD (AEROTHAI)		maar@aerorhai.co.th
ARC	Mr. Apiwat Chanrueang	Air Navigation Services Standards Officer Civil Aviation Authority of Thailand		apiwat.c@caat.or.th
ARC	Mr. Sunun Nimfuk Mr. Winyou Sriwong	Senior Director Air Traffic Management Network Bureau Aeronautical Radio of Thailand Limited		sunun.ni@aerorhai.co.th winyou.sr@aerorhai.co.th
ADM	Mr. Pongabha Abhakara	Air Navigation Services Specialist The Civil Aviation Authority of Thailand 333/105 9 th Floor Laksi Plaza Building, Khampheng Phet 6 Rd., Talat Bangkheng, Laksi, Bangkok 10210	Tel: +66 2 568 8800 ext. 3102, +6689 788 9717 Fax:	pongabha@caat.or.th

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ADM	Ms. Tawika Huayhongtong	Manager, Air Navigation Services Standards Department the Civil Aviation Authority of Thailand (CAAT) 333/105 Lak Si Plaza, Khamphaeng Phet 6 Road, Talat Bang Khen, Lak Si, Bangkok 10210	Tel: +66 2 568 8825 Fax: +66 2 568 8844	tawika.h@caat.or.th
ADM	Mr. Somboon Saelim	Air Traffic Engineering Manager Aeronautical Radio of Thailand Limited 102 Ngarmduplee, Rama IV Road Tungmahamek, Sathorn Bangkok 10120	Tel: +66 2 287 8703 Fax:	somboon.sa@aerothai.co.th
ADM	Mr. Chula Sukmanop	Director General Civil Aviation Authority of Thailand (CAAT) 333/105, 7th floor, Lak Si Plaza Khamphaeng Phet 6 Road Talat Bang Khen, Lak Si, Bangkok 10210	Tel: +66 (2) 568 8800 Fax: +66 (2) 568 8844 E-mail:	fad@caat.or.th
ADM	Ms. Siree Vatanavigkit	Strategic Planning Manager (Engineering) Aeronautical Radio of Thailand Limited 102 Ngarmduplee, Rama IV Road Tungmahamek, Sathorn Bangkok 10120	Tel: +66 2 287 8508 Fax:	siree.va@aerothai.co.th
	TONGA			

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ATC	Mr. Tino Fuka	Chief Operating Officer Tonga Airports Limited Fua'amotu International Airport P.O. Box 876 Nuku'alofa	Tel: +676 35212 Mobile: +676 7767264	tfuka@tongaairports.com
ARC	Hon. Semisi K L Sika	Deputy Prime Minister and Minister for Infrastructure and Tourism		misisika@gmail.com
ARC	Mr Ringo K Fa'oliu	Chief Executive Officer for Infrastructure		rfaoliu0708@gmail.com ringo.faoliu@moi.gov.to
	TURKEY			
CCT	Mr. Ayhan Öztekin	Air Traffic Manager, DHMI HQ, Ankara	Tel: +90 312 2042290 Fax: +903122220976	Ayhan.Oztekin@dhmi.gov.tr
CCT	Mr. Sıtkı Kağan Ertas	Air Navigation Department General Directorate of State Airports Authority	Tel: +90 312 2042592 Fax: +90 3122220976	Kagan.Ertas@dhmi.gov.tr
	TURKMENISTAN			
CCT	Mr. Batyr Chikayev	Chief of Ashgabat ACC, "Turkmenhowayollary", State Civil Aviation Department	Tel: + 99 312233880 Fax: + 99 312230199	
	UAE			
CCT	Mr. Hamad Rashid Al Belushi	Director Air Traffic Management GCAA P.O Box 666, Abu Dhabi	Tel.: +971 2 5996830, +971 50 6164350 Fax: +971 2 5996836	hbelushi@szc.gcaa.ae

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CCT	Mr. Ahmed Al Jallaf	Assistant Director General Air Navigation Services Sector GCAA P.O Box 666, Abu Dhabi	Tel.: +971 2 5996888, +971 50 6599242 Fax: +971 2 5996883	aljallaf@szc.gcaa.ae
ATC	UAE ANS			aldossari@gcaa.gov.ae
	UNITED STATES OF AMERICA			
SAR	Mr. David Edwards	Chairman, ICAO/IMO Joint Working Group SAR U.S. Coast Guard U.S. Coast Guard Search and Rescue	Tel: +1 202 372 2087 Fax: +1 202 372 8384	david.l.edwards@uscg.mil
SAR	Mr. Richard A. Roberts	Deputy Chief, Incident Management Branch Commander (drm) Fourteenth Coast Guard District 300 Ala Moana Blvd, Suite 9-240 Honolulu Hawaii 96850-4982	Tel: +1 808 535 3328 Fax: +1 202 372 8357	richard.a.roberts2@uscg.mil
ATM/ CCT	Mr. Michael Watkins	Senior ATO Representative Asia/Pacific Region Air Traffic Organization, International Office Federal Aviation Administration Air Traffic Representative US Embassy 27 Napier Road Singapore 258508	Tel: +65 6476 9462 Fax: +65 9228 6216 Mob: +65 9228 2612	michael.w.watkins@faa.gov
ATM/ CCT	Mr. Greg Byus		Tel: +1 540 422 4570 Mob: +1 202 281 6513	Greg.Byus@faa.gov

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CCT	Mr. Robert Roxbrough			robert.roxbrough@faa.gov
SAF	Ms. Christine Falk	Operations Research Analyst Separation Standards Analysis Team (PARMO RMA) Federal Aviation Administration William J. Hughes Technical Center Atlantic City, NJ 08405	Tel: +1 609 485 6877	christine.falk@faa.gov parmo@faa.gov
ADM AIS	Ms. Jodi Brainard	International Aero Representative NGA Aeronautical Office 3838 Vogel Rd. Mail Stop L-27 Arnold, Missouri 63010	Tel: +1 314 676 0595 Fax: +1 314 676 3044	Jodi.A.Brainard@nga.mil
ARC	Mr. Jerry Torres	Manager U.S. NOTAM Office Operations and Policy Group		jerry_torres@faa.gov
ARC	Mr. Gary Bobik	FAA Contractor Senior Program Analyst		gary.ctr.bobik@faa.gov
ADM	Mr. James Duke	Chief, Airspace Management Branch Command Airspace Manager HQ Pacific Air Forces Hickam AFB, HI 9685	Tel: +1 808 449 1948	James.duke@us.af.mil
ADM	Mr. Admad Usmani	International Office, Asia Pacific Region Air Traffic Organization, Systems Operations Federal Aviation Administration 800 Independence Ave. S.W. Washington, D.C. 20591	Tel: +1 202 267 0913	Ahmad.usmani@faa.gov

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ADM	Ms. Victoria M. Williams	Principal Staff Officer Interagency Group on International Aviation (IGIA) Office of International Aviation AIA-115, Department of Transportation Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591	Tel: +1 (202) 385 8866 Fax: +1 (202) 267 5499	9-AWA-API-IGIA@faa.gov
ADM	Mr. Sam El-Zoobi	International Office, Asia Pacific Region Air Traffic Organization, Systems Operations Federal Aviation Administration 800 Independence Ave. S.W. Washington, D.C. 20591	Tel: +1 202 3858089	sam.el-zoobi@faa.gov
	VANUATU			
ARC	Joseph Niel	Director General Civil Aviation Authority of Vanuatu		jniel.civav@vanuatu.com.vu
	VIET NAM			
CCT/ SAR	Mr. Duong Van Khe	Director Aviation Search and Rescue Coordination Centre - VATM 5/200 Nguyen Son street, Long Bien District, Ha Noi	Tel/Fax: +8424 3872 7797 Mob: +0962137685	duongvankhe@vatm.vn ; sar@vatm.vn

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CCT/ SAR	Mr. Nguyen The Hung	Director Air Navigation Department Civil Aviation Authority of Viet Nam 119 Nguyen Son Street, Long Bien District Ha Noi, Viet Nam	Tel: +8424 3872 3600 Mob: +84 936 700 729 Fax: +8424 3927 4194	hungand@caa.gov.vn ; hungand_caav@yahoo.com ;
CCT	Mr. Nguyen The Hung	Director Air Navigation Department Civil Aviation Authority of Viet Nam 119 Nguyen Son Street, Long Bien District Ha Noi, Viet Nam	Tel: +8424 3872 3600 Mob: +84 936 700 729 Fax: +8424 3927 4194	hungand@caa.gov.vn ; hungand_caav@yahoo.com ;
CCT	Mr. Bui Thanh Ha	Deputy Director ATS Department – VATM 5/200 Nguyen Son street, Long Bien District, Ha Noi	Tel: +8424 3872 5282 Mob: +84915913899 Fax: +8424 3872 5281	habt@vatm.vn ; buithanhhaatc@yahoo.com ;
ATC	Mr. Nguyen The Hung	Director Air Navigation Department Civil Aviation Authority of Viet Nam 119 Nguyen Son Street, Long Bien District Ha Noi, Viet Nam	Tel: +8424 3872 3600 Mob: +84 936 700 729 Fax: +8424 3927 4194	hungand@caa.gov.vn ; hungand_caav@yahoo.com ;
ATC	Mr. Bui Thanh Ha	Deputy Director ATS Department – VATM 5/200 Nguyen Son street, Long Bien District, Ha Noi	Tel: +8424 3872 5282 Mob: +84915913899 Fax: +8424 3872 5281	habt@vatm.vn ; buithanhhaatc@yahoo.com

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AIS	Mrs. Tran Duc Hoai Phuong	Deputy Director Air Navigation Department Civil Aviation Authority of Viet Nam 119 Nguyen Son street, Long Bien District, Ha Noi	Tel: +8424 3873 1611 Fax: +8424 3827 4194	phuongtd@caa.gov.vn
AIS	Mrs. Ngo Thi Thuy Van	Deputy Director Viet Nam Aeronautical Information Centre (VNAIC) - VATM 5/200 Nguyen Son street, Long Bien District, Ha Noi	Tel: +8424 3872 8778 Fax: +8424 3872 5687	thuyvanais@gmail.com
ARC	Mr. Nguyen The Hung	Director Air Navigation Department Civil Aviation Authority of Viet Nam		hungand@caa.gov.vn
SAF	Mr. Nguyen The Hung	Director Air Navigation Department Civil Aviation Authority of Viet Nam 119 Nguyen Son Street, Long Bien District Ha Noi, Viet Nam	Tel: +8424 3872 3600 Mob: +84 936 700 729 Fax: +8424 3927 4194	hungand@caa.gov.vn ; hungand_caav@yahoo.com ;
SAF	Mr. Ngo The Vinh	Director, Safety – Quality - Security Department - VATM 5/200 Nguyen Son street, Long Bien District, Ha Noi	Tel/Fax: +8424 3872 7797 Mob: +84975658899 Fax: +8424 3872 5281	ngothevinh@vatm.vn ;

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ADM	Mr. Dinh Viet Thang	Director General Civil Aviation Authority of Viet Nam Address ~~119 Nguyen Son Str.~~ ~~Long Bien District~~ ~~Hanoi 10000~~ 119 Nguyen Son Street, Long Bien District, Ha Noi	Tel: +8424 38272241/38272352 Fax: +8424 38271933/38272240	thangdv@caa.gov.vn iad@caa.gov.vn
	EUROCONTROL			
CCT	Mr. Tihomir Todorov	EUROCONTROL Network Management Directorate Airspace and Capacity Division Operations Planning Unit Head of Section Airspace Design	Tel: +32 2 729 31 34	Tihomir.TODOROV@eurocontrol.int
CCT	Mr. Razvan Bucuroiu	EUROCONTROL Network Management Directorate Head of Network Strategy and Development Airspace and Capacity Division/Acting Head of Operations Planning Unit	Tel: +32 (0)2 729 36 48	razvan.bucuroiu@eurocontrol.int
	IATA			
CCT	Mr. David Rollo	Assistant Director – Safety, Operations & Infrastructure – Asia/Pacific (ASPAC) International Air Transport Association 111 Somerset Road, #14-05 238164 Singapore	Tel: +65 6499 2251 Fax: +65 6233 9286	rollod@iata.org

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ADM = Administration, AIS = Aeronautical Information Service, ARC = Asia/Pacific Region ATS Route Catalogue ATC = Air Traffic Control, CCT = Contingency Coordination Team, SAF = Safety, SAR = Search and Rescue				
CCT	Mr. George Rhodes	MENA Office, Jordan	Tel: 96 26 580 4200 X 1215 Fax: 962 (6) 593 9912	rhodesg@iata.org with copy to SFOMENA@iata.org
CCT	Mr. John Moore	IATA APAC, Singapore	Tel: +65 6499 2529 Mob: Fax:	moorej@iata.org ;
CCT	Mr. Yoshiki Imawaka	Executive Advisor, ANA	Tel: +81 80 7977 8554 Mob: Fax: +81 3 6735 1455	y.imawaka@ana-ri.co.jp
CCT	Mr. Aric Oh	Senior Vice President, Asiana	Tel: +822 2669 5120 Mob: Fax: +822 2669 5560	aricoh@flyasiana.com
CCT	Mr Kim Jung Sik	Korean Air	Tel: +822 2656 6249 Mob: +82 10 97516551 Fax: 822 2656 8289	jungsikkim@koreanair.com
ADM	Mr. Owen Dell	Manager, International Operations Cathay Pacific Airways Limited International Affairs Department 9/F, Central Tower, Cathay Pacific City 8 Scenic Road Hong Kong International Airport Lantau Island Hong Kong, China	Tel: +852 2747 8829 Fax: +852 2141 8829	Owen_dell@cathaypacific.com
	ICAO			

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CCT	Mr. Chris Dalton	Chief, Airspace Management and Organization ICAO HQ	Tel:+ 1514 954-6711 Mob: +1 514 9510283 Fax:+1-514-954 8197	cdalton@icao.int
CCT	Mr. Raphael Guillet	Chief, ICAO APAC Regional Sub-Office, Beijing	Tel: +86 10 64557179 Mob: +86 18510853925 Fax: +86 10 64557164	rguillet@icao.int
CCT	Mr. Sven Halle	Regional Officer, ICAO Paris	Tel: Fax:	shalle@icao.int
CCT	Mr. Elie El Khoury	Regional Officer, ICAO Cairo	Tel: Fax:	ekhoury@icao.int icaomid@icao.int
CCT	Mr. Shane Sumner	Regional Officer, ICAO Bangkok	Tel: + 66 2 537 8189 X 159 Mob: +66 9 707 3 2424 Fax: +66 2 5378199	ssumner@icao.int
CCT	Mr. Hiroyuki Takata	Regional Sub-Office, Beijing	Tel: Fax: +86 10 64557164	htakata@icao.int
CCT	Mr. Leonard (Len) Wicks	Regional Officer, ICAO Bangkok	Tel: + 66 2 537 8189 X 152 Mob: +66 8 49073260 Fax: +66 2 5378199	lwicks@icao.int
	ICCAIA			

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ADM	Warren BEESTON	ATM Expert - Operational Authority Director Thales Air Systems 3, avenue Charles Lindbergh 94628 Rungis Cedex	Tel: +33 (0)1 79 6123 49 Mobile: +33 (0)6 37 49 12 34	warren.beeston@thalesgroup.com
	IFALPA			
ADM	Capt. Amornvaj Mansumitchai	Executive Vice President, Asia/Pacific, IFALPA 484 Rachadinivet Soi 12 Pracharajbampen Rd Huaykhwang Bangkok 10320, Thailand	Tel: +66 02 274 3673 +66 81 3446055 Fax: +66 02 513 0030	amornvaj@gmail.com
ADM	SFO Thasan Bureechana	Regional Vice President, Asia East IFALPA 3 rd Floor, 5 th Building Thai Airways International Public Company 89 Vibhavadi – Rangsit Road Chatuchak Bangkok 10900 Thailand	Tel: +66 2 5454046 Mobile: +66 81 935 0126 Fax: +66 2 5130030	thasancom@yahoo.com
	IFATCA			
ADM	Mr. John Wagstaff	IFATCA Asia Pacific Representative ATMD/CAD, ATCX 1 Control Tower Road Hong Kong International Airport Hong Kong, China	Tel: +852 2910 6543 Fax: +852 2910 0186	john.wags@gmail.com
	IMO			

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SAR	Mr. Hans Van Der Graaf	Senior Technical Officer Operational Safety Section Maritime Safety Division International Maritime Organization	Tel: +44 20 7587 3111 Mob: +44 781 443 4991 Fax: +44 20 7587 3210	hvandergr@imo.org
	SITA			
ADM	Mr. Diego Albert	ATM Senior Business Development Manager SITAONAIR, SITA 11 Loyang way Singapore	Tel.: + 65 9017 7895	diego.albert@sitaonair.aero