APANPIRG/34 Conclusions/Decisions – Action Plan

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target Date	Status [As of Nov. 2024]	Action by ANC [AN-WP/9768, 31 May 2024]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
C 34/1 A & B	**APAC Regional Seamless ANS Reporting Form 3.0 and Cloud-based Seamless ANS Implementation Progress Reporting**	a) That, the APAC Regional Seamless ANS Reporting Form 3.0 with reference to Seamless ANS Plan V3.0, contained in **Appendix A to Agenda Item 3.0**, be endorsed by APANPIRG. b) That, States/Administrations be urged to report on their Seamless ANS implementation progress through the cloud-based reporting portal by not later than 30 June 2024, and then at least once a year by not later than 28 February each year.	ICAO RO APAC States and Administrations	State Letter Action in accordance with the Conclusion.	February 2024	SL Ref.: T8/5.1 – AP013/24 (CNS) on 17 January 2024, and SL Ref.: T 8/5.1 – AP060/24 (CNS) on 25 April 2024. **[Completed]** As of 2 Aug, only 5 Administrations submitted progress to the tool, namely Hong Kong China, Indonesia, Mongolia, New Zealand and Singapore	Noted
C 34/2 A & B	**ICAO HQ Support for Regional ANS Implementation**	That, ICAO HQ is invited to: (1) provide required resources to develop the application to present	ICAO RO	IOM to HQ	February 2024	IOM to HQ, Ref T8/5.1: AP-CNS0018/24 was sent on 1 April 2024. ANB agreed	Noted

Conclusion/ Decision No --- Strategic Objective*	**Title of Conclusion/Decision**	**Text of Conclusion/Decision**	**Responsibility**	**Deliverable**	**Target Date**	**Status [As of Nov. 2024]**	**Action by ANC** [AN-WP/9768, 31 May 2024]
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
		the reported data in graphical mode; (2) support and facilitate a workshop in Q1 2024 on the use of Seamless ANS Reporting Portal for APAC States; and (3) assist on necessary update to the Portal to incorporate changes for the Seamless ANS Plan V4.0				to follow the proposal along with relevant project. Workshop was held on 17 to 19 April 2024 at ICAO APAC. **[Completed]**	
C 34/3 **A & B**	**Runway Turn Pad Design and Marking**	That, the design of runway and taxiway widths is linked to the outer main gear wheel span (OMGWS) of the design aircraft and the size of the runway turn pad depends on aircraft wheelbase, OMGWS and maximum nose wheel steering angle. On the other hand, SARPs on runway turn pad markings are linked to aerodrome reference code (ARC) numbers (5.2.9 of Annex 14, Volume I refer). Therefore, ICAO is requested to review: 1) Annex 14, volume I SARPs 3.3.1 & 3.3.2, where they have provided reference to ARC (code letters);	ICAO RO	IOM to HQ	February 2024	IOM to HQ (Ref.: AN 3/3 – AP-AGA0018/24) dated 21 Feb. 2024 Reminded to ANC SRP WG on 15 May 2024. **[Completed]**	Noted

Conclusion/ Decision No --- Strategic Objective*	**Title of Conclusion/Decision**	**Text of Conclusion/Decision**	**Responsibility**	**Deliverable**	**Target Date**	**Status [As of Nov. 2024]**	**Action by ANC** [AN-WP/9768, 31 May 2024]
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
		2) Figure 1-3 of Aerodrome Design Manual (ADM, Doc 9157), Part 2 and Figure 4-1 of Aerodrome Design Manual, Part 1 for consistency with Annex 14, Volume I SARPs as specified in 5.2.9 (5.2.9.3 & 5.2.9.7 refer) regarding the runway turn pad marking.					
C 34/4 **A & B**	**ICAO Asia-Pacific Aerodrome Assistance Go-Team Methodology**	That, as a follow up on *Conclusion APANPIRG 33/3 - Assistance to APAC States that require assistance in AGA area including certification and surveillance of aerodromes*: • The needs for technical assistance in the area of AGA for ICAO APAC States be periodically reviewed; • States with such needs be encouraged and invited to host Aerodrome Assistance Go-Team missions; and • The methodology for conducting such Assistance Go Teams	ICAO RO APAC States and Administrations	State Letter Action in accordance with the Conclusion. Upload the document on the	February 2024	State Letter Ref.: AN 3/3 – AP032/24 dated 23 Feb. 2024 Uploaded on ICAO APAC Website e-Documents **[Completed]**	Noted

Conclusion/ Decision No --- Strategic Objective*	**Title of Conclusion/Decision**	**Text of Conclusion/Decision**	**Responsibility**	**Deliverable**	**Target Date**	**Status [As of Nov. 2024]**	**Action by ANC** [AN-WP/9768, 31 May 2024]
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
		Missions provided in **Appendix B** to the Report on Agenda Item 3.1 be posted on ICAO APAC Website.		ICAO APAC Website			
C 34/5 **A & B**	**ICAO Asia/Pacific WHM Go-Team Methodology**	That, • The needs for technical assistance in the area of WHM for ICAO APAC States be periodically reviewed; • States with such needs be encouraged and invited to host WHM missions; and • The methodology for running such Go-Team missions provided in **Appendix C** to the Report of AOP/SG/7 be adopted by APANPIRG/34.	ICAO RO APAC States and Administrations	State Letter Action in accordance with the Conclusion. Upload the document on the ICAO APAC Website	February 2024	State Letter Ref.: AN 3/3 – AP033/24 dated 23 Feb. 2024 Uploaded on ICAO APAC Website e-Documents **[Completed]**	Noted
C 34/6 **A & B**	**Development of 5LNC pronunciation phonetic guidance and harmonised pronunciation at**	That, noting the global concern regarding the challenges of 5LNC pronunciation as referenced at the ICAO 41st Assembly,	ICAO RO	IOM to HQ and State Letter	February 2024	IOM to HQ Ref: T 3/10.0 - AP-ATM0004/24 dated 22 February 2024	Noted

Conclusion/ Decision No --- Strategic Objective*	**Title of Conclusion/Decision**	**Text of Conclusion/Decision**	**Responsibility**	**Deliverable**	**Target Date**	**Status [As of Nov. 2024]**	**Action by ANC** [AN-WP/9768, 31 May 2024]
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
	transfer of control (TOC) points	1. ICAO be urged to develop 5LNC pronunciation phonetic guidance; and 2. States be urged to ensure that operational agreements between neighbouring States include agreed pronunciation of 5LNCs at transfer of control points.	APAC States and Administrations	Action in accordance with the Conclusion.		State Letter Ref. T 3/10.0, T 3/10.1.17 - AP030/24 (ATM) dated 22 February 2024 **[Completed]**	
D 34/7 **A & B**	**Update AAITF Terms of Reference**	That, the updated AAITF Terms of Reference at **APANPIRG/34 WP/10 Attachment A** be adopted.	ICAO RO	State Letter Notify to AAI TF Meeting	February 2024	State Letter Ref. T 3/10.0, T 3/10.1.17 - AP030/24 (ATM) dated 22 February 2024 **[Completed]**	Noted
C 34/8 **A & B**	**Formal Service Arrangements with CRA**	That, States are urged to ensure that formal service arrangements are made with an APANPIRG-recognized, competent Central Reporting Agency for the submission and analysis of data link problem reports.	ICAO RO APAC States and Administrations	State Letter Action in accordance with the Conclusion.	February 2024	State Letter Ref. T 3/10.0, T 3/10.1.17 - AP030/24 (ATM) dated 22 February 2024 **[Completed]**	Noted

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target Date	Status [As of Nov. 2024]	Action by ANC [AN-WP/9768, 31 May 2024]
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
C 34/9 **A & B**	**Asia/Pacific Regional FIXM version 4.2 Extension**	The FIXM version 4.2 Extension provided in **Appendix A to Agenda Item 3.4** be: a) adopted as the Asia/Pacific FIXM version 4.2 Extension; b) uploaded to the ICAO Asia/Pacific Regional Office website for immediate use by Asia/Pacific Administrations, where the capability to do so exists, for cross-border ATFM information exchange and to support ATFM/A-CDM integration; and c) presented to the FIXM CCB for review and publication on the FIXM official website.	ICAO RO APAC States and Administrations	Upload to the ICAO APAC Website Action in accordance with the Conclusion.	February 2024	a) Uploaded on e-docs SL AP037/24: Asia/Pacific Regional FIXM version 4.2 Extension sent on 27 Feb 2024 b) Done c) Done **[Completed]**	Noted
C 34/10 **A & B**	**Revised Navigation Strategy - APAC**	Draft Revised Navigation Strategy-APAC in view of the latest development in GNSS navigation provided in **Appendix B to Agenda Item 3.4** be adopted.	ICAO RO	State Letter	February 2024	Ref.: T 8/5.1 – AP051/24 (CNS) 28 March 2024 Subject: Revised Navigation Strategy for the Asia/Pacific Region and General Strategy on	Noted

Conclusion/ Decision No --- Strategic Objective*	**Title of Conclusion/Decision**	**Text of Conclusion/Decision**	**Responsibility**	**Deliverable**	**Target Date**	**Status [As of Nov. 2024]**	**Action by ANC** [AN-WP/9768, 31 May 2024]
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
						Assignment of and Migration to SI Code in the APAC Region Action Required: To note and consider the Strategies during implementation Uploaded on ICAO APAC Website e-Documents **[Completed]**	
C 34/11 **A & B**	**General Strategy on Assignment of and Migration to SI Code in the APAC Region**	The General Strategy on Assignment of and Migration to SI Code in the APAC Region provided in **Appendix C to Agenda Item 3.4** be adopted.	ICAO RO	State Letter	February 2024	SL Ref: T 8/2.15 – AP137/23 (CNS) 20 September 2023 Subject: Publication of Regional guidance materials for implementation of Air Navigation Facilities and Services in the Asia and Pacific Region	Noted

Conclusion/ Decision No --- Strategic Objective*	**Title of Conclusion/Decision**	**Text of Conclusion/Decision**	**Responsibility**	**Deliverable**	**Target Date**	**Status [As of Nov. 2024]**	**Action by ANC** [AN-WP/9768, 31 May 2024]
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
						Uploaded on ICAO APAC Website e-Documents **[Completed]**	
C 34/12 **A & B**	**IWXXM version compatibility**	That, States are requested to ensure that MET service providers, air navigation service providers (ANSPs), airlines and other end users do the following: a) make the necessary system upgrades to support the IWXXM version, which complies with the latest amendment to Annex 3 as stated in the IWXXM compatibility table*; and b) prepare for future system upgrades to support future IWXXM versions driven by further amendments to Annex 3. (*Link to the IWXXM capability table: https://github.com/wmo-im/iwxxm/wiki/Package-Compatibility)	ICAO RO APAC States and Administrations	State Letter Action in accordance with the Conclusion.	February 2024	SL Ref. AP098/24 (MET), 22/08/2024 **[Completed]**	Noted

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target Date	Status [As of Nov. 2024]	Action by ANC [AN-WP/9768, 31 May 2024]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
C 34/13 **A & B**	**Global Dissemination of IWXXM**	Expedite the implementation of network circuits and communication services necessary to enable the required global dissemination of meteorological information in the ICAO Meteorological Information Exchange Model (IWXXM) form, both intra-regionally and inter-regionally between APAC Inter-regional OPMET Gateways (IROGs) and IROGs in the ICAO AFI, MID, NAM and SAM Regions (through inter-regional consultation), including support for the Air Traffic Services Message Handling System (AMHS) with File Transfer Body Part (FTBP) and Interpersonal Message Heading Extension (IHE), and backup paths for redundancy purposes.	ICAO RO APAC States and Administrations	State Letter Action in accordance with the Conclusion.	February 2024	SL Ref. AP099/24 (MET), 22/08/2024 and IOM AP-MET0004/24, 22/08/2024 **[Completed]**	Noted
D 34/14 **A & B**	**Replacement of the VOLCEX Steering Group by the MET Exercise Advisory Group**	That, the Volcanic Ash Exercises Steering Group (VOLCEX SG) be disestablished, and instead, MET SG includes in its work plan the establishment of a Meteorological Exercises Advisory Group to provide advice and guidance to States undertaking exercises on volcanic ash, space weather and other aeronautical	ICAO RO	State Letter	February 2024	SL Ref. AP100/24 (MET), 22/08/2024 **[Completed]**	Noted

Conclusion/ Decision No --- Strategic Objective*	**Title of Conclusion/Decision**	**Text of Conclusion/Decision**	**Responsibility**	**Deliverable**	**Target Date**	**Status [As of Nov. 2024]**	**Action by ANC** [AN-WP/9768, 31 May 2024]
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
		meteorological hazards, reporting back (as necessary) under a new MET SG agenda item for MET exercises. Further, States are encouraged to report on their aviation-focused MET exercises activities under this agenda item.					
C 34/15 **A & B**	**Adherence to ICAO Principles and Recommendations for Setting Air Navigation Charges**	That, States are urged to: 1) Incorporate the four key charging principles from ICAO Docs 9082 and 9161 into national legislation, regulation or policies, and air services agreements; and 2) Provide direction to ANSPs, airport operators and other service-provider entities to comply with the Doc 9082 and 9161 guidance and intent, particularly the provisions relating to consultation with airspace users.	ICAO RO APAC States and Administrations	State Letter Action in accordance with the Conclusion.	February 2024	State Letter Ref.: AN 3/3 – AP034/24 (AGA) dated 23 February 2024 **[Completed]**	Noted
C 34/16 **A & B**	**Update of Information in APANPIRG Air Navigation Deficiencies Reporting Form**	That, 1) ICAO to update the APANPIRG Air Navigation Database to reflect the information as	ICAO RO	State Letter	February 2024	State Letter Ref.: AN 3/3 – AP035/24 dated 23 Feb. 2024	Noted

Conclusion/ Decision No --- Strategic Objective*	**Title of Conclusion/Decision**	**Text of Conclusion/Decision**	**Responsibility**	**Deliverable**	**Target Date**	**Status [As of Nov. 2024]**	**Action by ANC** [AN-WP/9768, 31 May 2024]
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
		presented in **Appendices A to D to the Report on Agenda Item 4**. 2) States/Administrations be urged to: a) establish action plan with defined target dates for resolution of deficiencies, update the status on the corrective action taken and report progress in the Reporting Form of Air Navigation Deficiencies identified in ATM and Airspace Safety, AOP, CNS and MET fields as detailed in **Appendices A to D to the Report on Agenda Item 4**; and b) update contact details of a Focal Point to coordinate actions to resolve the Deficiencies.	APAC States and Administrations	Action in accordance with the Conclusion.		Followed up through Letter to State(s) Ref.: T 11/8 – AP-AGA0033/24 dated 27 May 2024 State Letter Ref. T 3/10.0, T 3/10.1.17 - AP030/24 (ATM) dated 22 February 2024 **[Completed]** **Resolution of AN DEF:** ▪ AOP - 7 ▪ ATM - 8	

— END —

Status of Outstanding Conclusions/Decisions up to APANPIRG/33 – Action Plan

Conclusion / Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Responsibility	Deliverable	Target date	Status as of 18 September	Action by ANC (AN-WP/9652 dated 24/03/2023 and AN Min. 222-9 dated 24/04/2023)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
C 33/5 **A & B**	**Provide clear direction on Doc 7030 Regional SUPPs publication requirements**	That, ICAO provides clear direction on which separation minima require Doc 7030 Regional SUPPS publication to provide consistency in the information published in the different ICAO Regions.	ICAO RO	IOM to HQ	January 2023	State Letter Ref.: T 3/10.0 – AP158/22 (ATM) dated 30 December 2022 **COMPLETED** State Letter Ref: T 3/2.1, T 3/10.1 – AP118/24 (ATM) dated on 18 September 2024.	- Request the Secretariat to develop proposals for review. - Consider listing the misalignment of Doc 7030 and areas of applicability of air navigation plans as a global challenge in the 2023 Consolidates Annual Repot to Council

— END —

INTERNATIONAL CIVIL AVIATION ORGANIZATION

ASIA/PACIFIC SEAMLESS ANS PLAN

Version 4.0, November 2024

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

Approved by APANPIRG/35 and published by the
ICAO Asia and Pacific Office, Bangkok

CONTENTS

SCOPE OF THE PLAN

Plan Structure

1.1 The Seamless Air Navigation Service (ANS) Plan (hereinafter referred to as the 'Plan') references different levels of ANS planning. At the upper level is a global perspective, which is guided mainly by references to the *Global Air Navigation Plan* (GANP, ICAO Doc 9750) and its global technical planning frameworks, viz., the *Global Air Traffic Management (ATM) Operational Concept* (ICAO Doc 9854) and the *Global Aviation Safety Plan* (GASP). Beneath this level is regional planning primarily provided by the *Asia/Pacific Regional Air Navigation Plan*, this Plan and other guidance material, to define goals and means of meeting State planning objectives, such as:

- Asia/Pacific Regional Air Navigation Plan requirements and objectives;
- the Seamless ANS performance framework, with a focus on technological and human performance within the GANP's Aviation System Block Upgrade (ASBU) Block 0, Block 1 and Block 2 elements, non-ASBU elements, 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 Key components of this Plan, as updated, are expected to be migrated into the *Asia/Pacific Regional Air Navigation Plan Volume III,* under a future project to be initiated by ICAO.

1.3 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 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 both direct [not dependent on a Communication Service Provider (CSP)] ATS communications and surveillance; or

c) Category T: terminal operations serviced by both direct ATS communications and surveillance.

1.4 The word 'States' in the Plan includes Special Administrative Regions and territories.

1.5 **DISCLAIMER:** The presentation of material in this Plan does not imply the expression of any opinion whatsoever on the part of ICAO or APANPIRG concerning the legal status of any country, territory, city or area of its authorities, or concerning the delimitation of its frontiers or boundaries.

1.6 The operational improvements addressed in the Plan are expected to be implemented in phases:

- Phase I – expected implementation by 12 November 2015 (past);
- Phase II – expected implementation by 07 November 2019 (past);
- Phase III – expected implementation by 03 November 2022 (past);
- Phase IV – expected implementation by 27 November 2025; and
- Phase V – expected implementation by 23 November 2028.

1.7 No phase, nor any element, is binding on any State, but should be considered as a planning framework. The Plan itself is therefore guidance material.

1.8 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 example of the implementation of Reduced Vertical Separation Minimum (RVSM). In that case, there was a potential major regional problem if all States did not implement at the same time by the specific agreed date, which was clearly not the case for the start of the Plan's Phases I, II or III.

1.9 In that regard, although it would have been ideal if all States achieved capability on day one of each Phase, this was probably not realistic. However, States should consider the impact on stakeholders and improving capacity of the ANS system overall by not achieving target implementation dates. The Plan's 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 ANS improvements required by the Director's General of Civil Aviation and the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG).

Plan Review

1.10 The Plan needs to be updated to take into account ASBU threads in Block 1 and 2 elements, when these elements and their associated technology become mature.

1.11 Periodic updates to the Plan are also required in respect of the economic information contained therein.

1.12 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 of the Plan 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.

1.13 The previous practice of scheduling Plan updates to coincide with the GANP cycle and the approval of the GANP update by the ICAO Assembly presented a significant challenge to the Asia/Pacific Region in terms of fully analyzing and comprehending GANP changes which may be still under final development quite late in the cycle, and then identifying and prioritizing GANP elements for regional implementation while developing any proposed regional planning elements in parallel. The 2019 update of the Plan included consideration of the major GANP update which was still being finalized during that year and had not yet been approved by the ICAO Assembly.

1.14 APANPIRG/33 (December 2022) agreed that the three-year update cycle of the Plan continue to be aligned with GANP updates, with each Plan update to be developed and endorsed in the year immediately following the scheduled meetings of the ICAO Assembly (**Figure 1**).

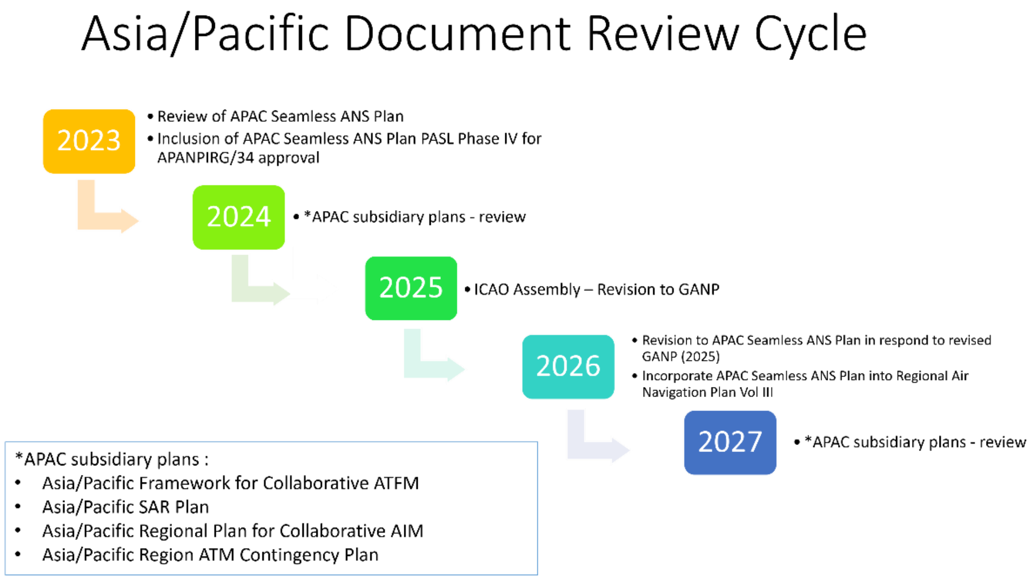

Figure 1: Planned Review and Update Process

1.15 Review of the Navigation and Surveillance strategies needs to result in the update to the Plan to ensure consistency.

1.16 The review of the Plan during 2019 deleted reference to 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 Preferred Aerodrome/Airspace and Route Specifications (PARS) and Preferred ANS Service Levels (PASL) items align with the commencement of ASBU Block 1, whereas Phase III is a mid-Block 1 update.

1.17 Due to the unavailability of an implementation reporting mechanism since 2019, Phase II elements are retained in this version of the Plan. With the availability of an updated reporting mechanism from 2024, the uncompleted elements from Phase II will be incorporated in Phase III in the 2026 update of the Plan.

1.18 The 2023/2024 update of the Plan introduces new ASBU Block 1 elements in Phase IV, and some Block 2 elements in Phase V. Phase IV and Phase V of the PARS and PASL implementation framework are 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 ANS 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 pursue 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 *Asia/Pacific Regional Collaborative Air Traffic Flow Management (ATFM) Framework*, *Asia/Pacific Plan for Collaborative Aeronautical Information Management (AIM), Regional 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 2**).

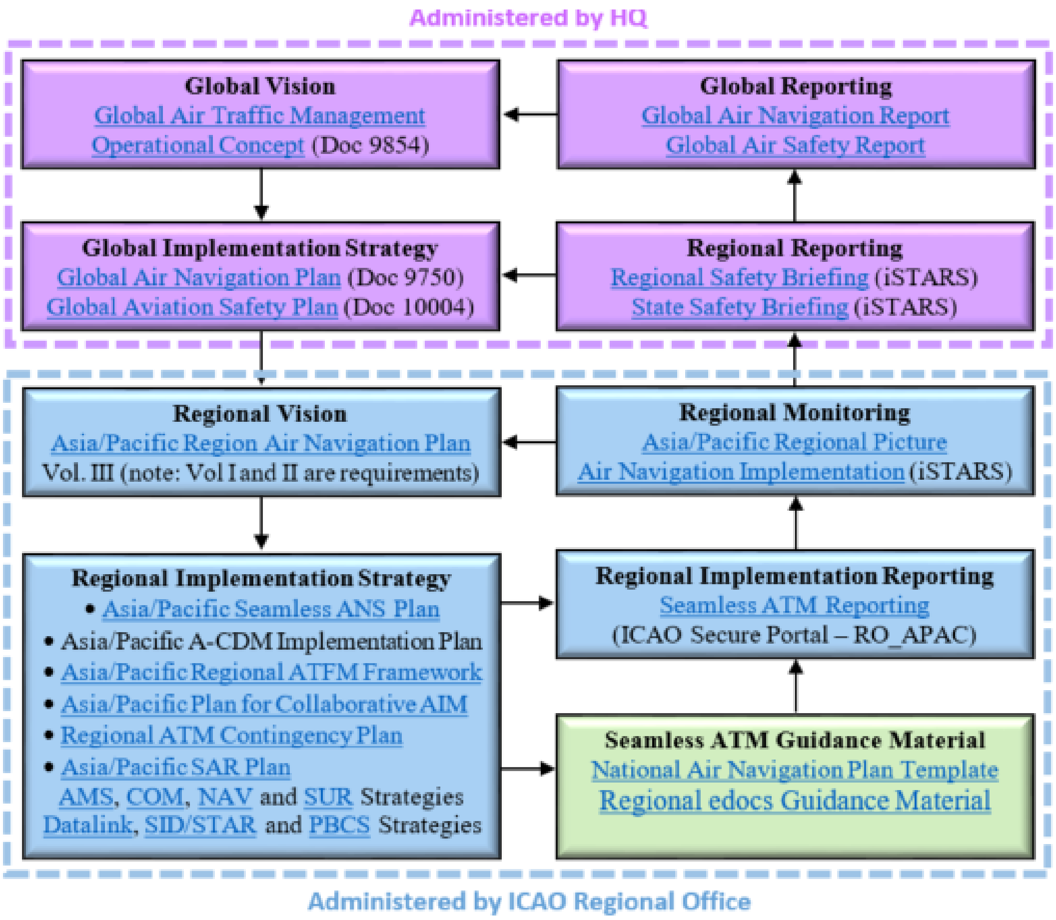

Figure 2: Structure of Global and Regional Planning and Reporting

2.5 The Plan should also be read in conjunction with the *Asia/Pacific Regional Aviation Safety Plan* (RASP-AP), to ensure the safety initiatives related to ANS are taken into account.

2.6 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.

2.7 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.

2.8 ASBU Block 0 modules contained technologies, systems and procedures which were expected to be available from 2013. The Plan also references ASBU Block 1 and 2 elements, available from 2019 and 2025 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 to provide the earliest possible benefits.

2.9 The 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 11 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 Asia/Pacific Seamless ATM Planning Group (APSAPG) adopted the following categories of operational improvements to facilitate Seamless ANS operations:

a) Preferred Aerodrome/Airspace and Route Specifications (PARS); and

b) Preferred ANS Service Levels (PASL).

2.10 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.

2.11 The PASL contain the expectations for ANSPs 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.

2.12 The PARS/PASL introduced two categories of operational improvements, which incorporate system expectations, such as general performance-oriented requirements. Each operational improvement is composed of a list of expectations of different aspects of the aviation system.

2.13 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.

2.14 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.

2.15 The PARS and PASL were/are expected to be implemented in five phases: Phase I by 12 November 2015 (past); Phase II by 07 November 2019 (past); Phase III by 03 November 2022 (past); Phase IV by 27 November 2025; and Phase V by 23 November 2028.

2.16 The planned migration of this Plan into the *Asia/Pacific Regional Air Navigation Plan Volume III* may require a review of the PARS/PASL structure.

Seamless ATM Definition

2.17 The objective of Seamless ATM ~~ANS (previously 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.

2.18 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.

2.19 The ICAO Twelfth Air Navigation Conference (AN-Conf/12, Montreal, Canada, 19-30 November 2012) endorsed ten 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 USD 684 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 Strong demand for air travel continued to propel the recovery of passenger markets in 2023. The total industry achieved a remarkable 36.9 per cent year-on-year (YoY) growth, as traffic, measured in Revenue Passenger Kilometres (RPKs), reached 94.1 per cent of 2019 levels, a significant increase from 2022 when it stood at 68.7 per cent. While the airline industry had recovered the majority of its traffic 2019 levels as of December 2023, network restoration remained relatively uneven as connectivity and passenger demand to and from Asia/Pacific has not yet reached its pre-pandemic status (source: IATA monthly statistics).

3.3 The Asia/Pacific Region is showing the largest passenger recovery in 2023, expected to reach close to 3 billion passengers. In 2024, the region will continue its growth, yet at a slower pace, and is expected to attain 3.5 billion or 103 per cent of the 2019 level. In the current scenario, the region is forecasted to be near 3.9 billion passengers by the end of 2025 (source: ACI).

3.4 The global air cargo industry is forecasted to grow at a four per cent per year from 2020 through to 2039 **(Figure 3**). The domestic China region is expected to have the highest growth rate at 5.8 per cent. They are followed by the Intra-East Asia and Oceania region with an expected growth of 4.9 per cent.

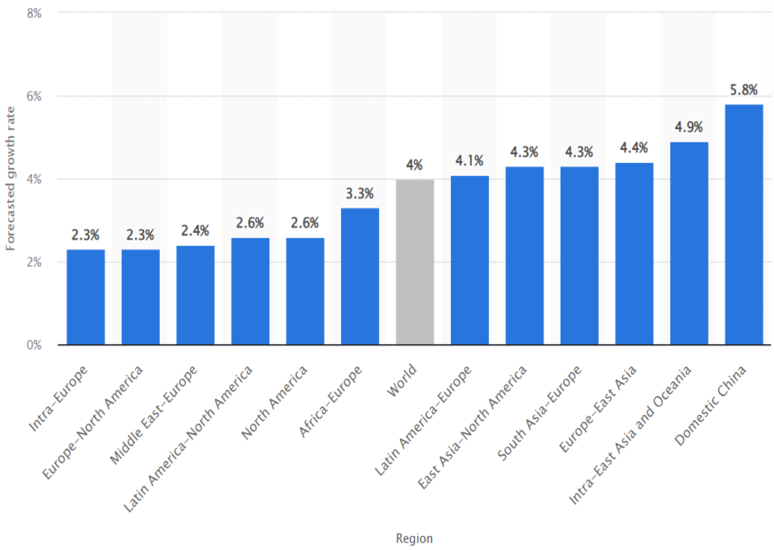

Figure 3: World Cargo Growth Forecast by Region (Source: Statista)

3.5 From 2023 to 2042, total passenger traffic worldwide is predicted to grow at a Compound Annual Growth Rate (CAGR) of 4.3 per cent, with a steep recovery gradient observed in the first three years (9.1 per cent CAGR for 2023 to 2026), then converging to the pre-COVID-19 growth rate (3.6 per cent CAGR for 2023 to 2052). Global passenger traffic is expected to reach nearly 20 billion in 2042, double the 2024 projection (source: ACI).

3.6 In 2052, global passenger traffic is expected to reach close to 25 billion, approximately 2.5 times the 2024 projection (source: ACI).

COVID-19 Impact

3.7 Global passenger traffic in 2024 is predicted to surpass the 2019 level for the first time since COVID-19, reaching 9.7 billion passengers or 106 per cent of the 2019 level (12 per cent YoY growth rate). The growth rate is expected to gradually decelerate in succeeding years, as more markets recover from the effects of COVID-19.

3.8 The COVID-19 pandemic had a severe impact on the aviation industry in the Asia/Pacific Region during 2020-2023. In 2019, international travel within Asia represented 13.3 per cent of global international travel, ranking it as second biggest market after the intra-Europe market. In 2021, Asia's share fell to 1.5 per cent. Air traffic in Asia/Pacific Region was predicted to record only slow improvement in 2022, achieving only 62 per cent of 2019 levels.

3.9 "Lost" travel between 2020 and 2022 was equivalent to 1.8 x 2019 RPKs and by 2040, if 2022 forecasts are realized, traffic may still be 6 per cent below pre-pandemic forecasts. However, after a slow start, post COVID-19 recovery remains on track despite several obstacles, both predicted and unforeseen. Overall RPKs are currently (2023) at 84 per cent of 2019 levels.

3.10 The aviation industry is expected to recover to 2019 levels in 2024. Domestic and international passenger numbers are expected to recover to 2019 levels in 2024 and 2025 respectively. Asia/Pacific lags behind other regions' recovery in the short term with the regional split showing North America in the lead, in 2023, followed by Europe and the Middle East in 2024, and Latin America, Africa, and Asia/Pacific in 2025. Asia/Pacific is forecast to lead traffic growth in the longer term (2040 horizon) surpassing other regions by 2028 (source: IATA).

3.11 At the beginning of the COVID-19 pandemic, the international passenger market had more impact than the domestic passenger market due to international travel restrictions. The international passenger market has recovered significantly in 2023, expected to reach 3.5 billion with 42 per cent YoY growth. In 2024, international passenger traffic is forecasted to be four billion with 14 per cent YoY growth. Domestic passenger traffic is forecasted to be 5.2 billion in 2023 with 25 per cent YoY growth, then slowing down to 5.7 billion in 2024 with 10 per cent YoY growth (source: ACI).

3.12 Given the size and diversity of the region, ANS 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 ANS solutions should be driven by analysis of costs and benefits and performance requirements appropriate to the traffic demands.

3.13 The diverse operating environments also mean that the implementation situation varies significantly across States. As such, the economic analysis of implementation activities such as ASBUs should be undertaken by States, and assisted by the Plan.

3.14 **Figure 4**, **Figure 5 and Figure 6** indicate the projected economic and air traffic growth which necessitated the Seamless ANS approach.

World Economic Outlook Growth Projections

(Real GDP, annual percent change)	2023	PROJECTIONS 2024	2025
World Output	3.2	3.2	3.2
Advanced Economies	1.6	1.7	1.8
United States	2.5	2.7	1.9
Euro Area	0.4	0.8	1.5
Germany	-0.3	0.2	1.3
France	0.9	0.7	1.4
Italy	0.9	0.7	0.7
Spain	2.5	1.9	2.1
Japan	1.9	0.9	1.0
United Kingdom	0.1	0.5	1.5
Canada	1.1	1.2	2.3
Other Advanced Economies	1.8	2.0	2.4
Emerging Market and Developing Economies	4.3	4.2	4.2
Emerging and Developing Asia	5.6	5.2	4.9
China	5.2	4.6	4.1
India	7.8	6.8	6.5
Emerging and Developing Europe	3.2	3.1	2.8
Russia	3.6	3.2	1.8
Latin America and the Caribbean	2.3	2.0	2.5
Brazil	2.9	2.2	2.1
Mexico	3.2	2.4	1.4
Middle East and Central Asia	2.0	2.8	4.2
Saudi Arabia	-0.8	2.6	6.0
Sub-Saharan Africa	3.4	3.8	4.0
Nigeria	2.9	3.3	3.0
South Africa	0.6	0.9	1.2
Memorandum			
Emerging Market and Middle-Income Economies	4.4	4.1	4.1
Low-Income Developing Countries	4.0	4.7	5.2

Source: IMF, *World Economic Outlook*, April 2024

Note: For India, data and forecasts are presented on a fiscal year basis, with FY 2023/24 (starting in April 2023) shown in the 2023 column. India's growth projections are 6.9 percent in 2024 and 6.5 percent in 2025 based on calendar year.

Figure 4: World Economic Growth Outlook (Source: IMF)

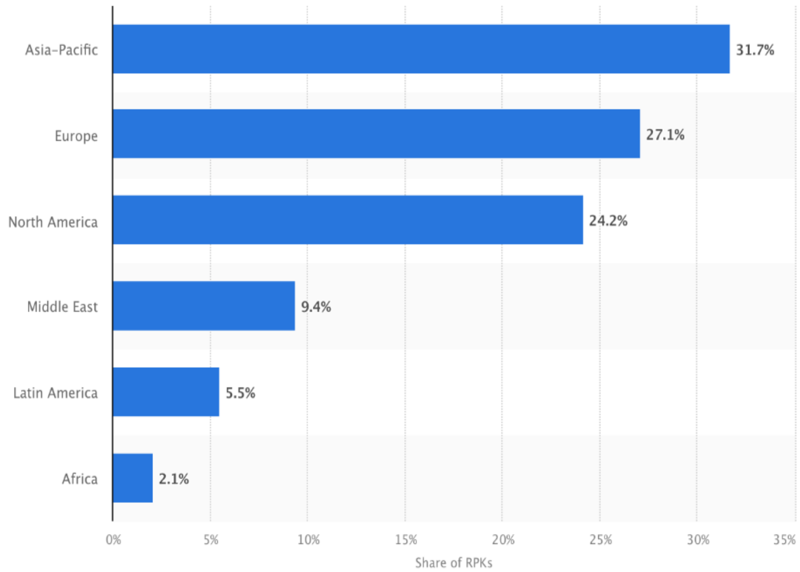

Figure 5: Worldwide Passenger Air Traffic by Region, in 2023 (Source: Statista)

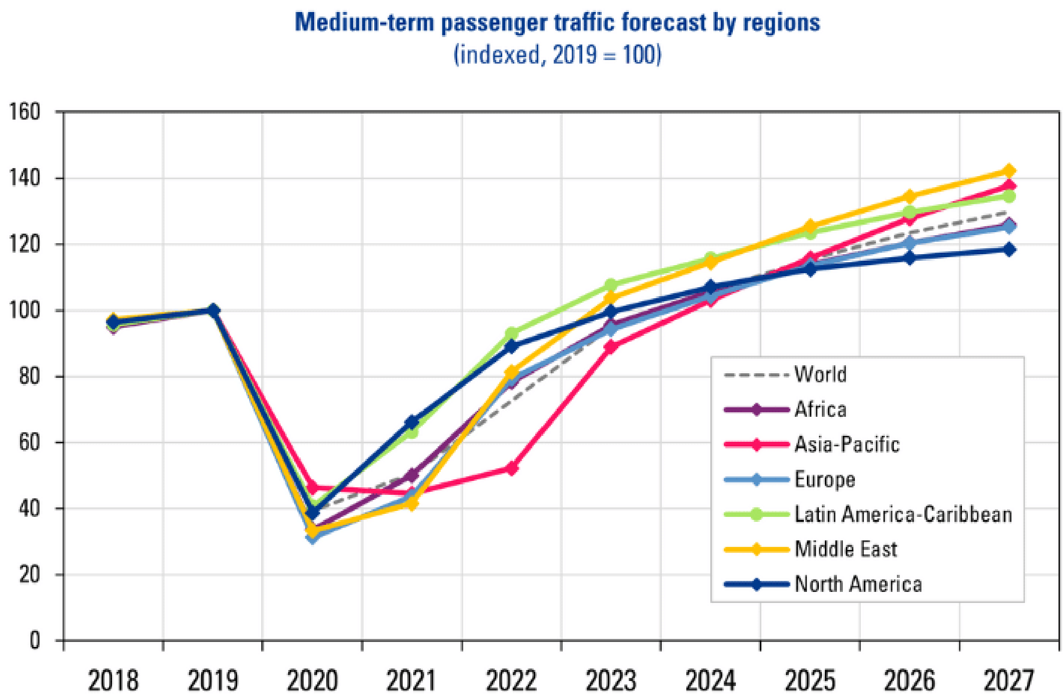

Figure 6: Medium Term Passenger Traffic Forecast by Region (Source: ACI)

3.15 The 46th Directors General Civil Aviation Conference (DGCA/46, Osaka, Japan, October 2009) was the genesis of Asia/Pacific Seamless ANS discussion. The DGCA Conference requested that APANPIRG to take a lead role in development of Seamless ATM in the Asia/Pacific Region.

3.16 APANPIRG/22 created the APSAPG in 2011 under Decision 22/56, with a primary goal to develop an Asia/Pacific Seamless ATM Plan. APANPIRG/24 (2013) adopted version 1 of the Plan.

3.17 The Global Air Navigation Industry Symposium (GANIS, Montreal, Canada, 20-23 September 2011) introduced the ASBU concept. This inferred an iterative improvement, from Block 0 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.

3.18 Subject to several recommendations, the AN-Conf/12 endorsed the ASBU concept and the consequential changes to the GANP. The AN-Conf/12 stressed that ASBU 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 ANS planning.

3.19 At the First ICAO APAC Ministerial Conference on Civil Aviation, held in Beijing, China in January 2018, the Ministers in charge of civil aviation representing 36 Asia/Pacific governments endorsed the Beijing Declaration, formalizing their shared commitments to high-priority aviation safety and efficiency objectives. They agreed to pursue cooperative progress on objectives relating to aviation safety oversight, State Safety Programme (SSP) implementation, airport certification, independence of accident investigation authority, the timely implementation of the Asia/Pacific Seamless ATM Plan (now Seamless ANS Plan), and the sharing of information and best practices for air navigation and SAR services.

> *Note: Beijing Declaration commitments to ANS implementation have been updated by the declaration of the Second ICAO APAC Ministerial Conference on Civil Aviation, held in New Delhi, India in September 2024. Excerpts from both the Beijing Declaration and the Delhi Declaration are provided in* ***Appendix A****.*

Air Navigation Service Provider Summary

3.20 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.

3.21 Given the size and diversity of the region, ANS 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 ANS solutions should be driven by analysis of costs and benefits and performance requirements appropriate to the traffic demands.

Aerodrome Operator Summary

3.22 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, air traffic management, 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.

3.23 Short-, medium- and long-term aerodrome planning needs to take into account the seamless system so that capital investment is aligned to ANS 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)
ADIZ	Air Defence Identification Zone
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
AIRB	Basic Airborne Situational Awareness
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)
AOP	Airport Operations Plan
AOP SG	Aerodrome Operations and Planning Sub-Group of APANPIRG
APAC	Asia/Pacific
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
APCH	Approach
APOC	Airport Operations Centre
APSAPG	Asia/Pacific Seamless ANS Planning Group
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
ATFM	Air Traffic Flow Management
ATIS	Automatic Terminal Information Service
ATM	Air Traffic Management
ATM SG	Air Traffic Management Sub-Group of APANPIRG
ATN/IPS	Aeronautical Telecommunication Network/Internet Protocol Suite
ATN/OSI	Aeronautical Telecommunication Network/Open System Interconnection
ATS	Air Traffic Services
BOB	Bay of Bengal
CAGR	Compound Annual Growth Rate
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
CLAM	Cleared Level Adherence Monitoring
COM	Communication
CONOPS	Concept of Operations
CNS	Communications, Navigation, Surveillance
CNS SG	Communications, Navigation and Surveillance Sub-Group of APANPIRG
CPAR	Conflict Prediction and Resolution
CPDLC	Controller Pilot Data-link Communications
CPWG	Cross-Polar Working Group
CSP	Communication Service Provider
DARP	Dynamic Airborne Re-route Planning
DCL	Data-link Departure Clearance
DFMC	Dual Frequency Multi Constellation
DGCA	Conference of Directors General of Civil Aviation
DMAN	Departure Manager
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
FL	Flight Level
FLAS	Flight Level Allocation Scheme
FLOS	Flight Level Orientation Scheme
FRA	Free Route Airspace
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
GLS	GBAS Landing System
GNSS	Global Navigation Satellite System
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
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
MET	Meteorological
MET SG	Meteorology Sub-Group of APANPIRG
MLAT	Multilateration
MON	Minimal Operating Networks
MSAW	Minimum Safe Altitude Warning
MTCD	Medium Term Conflict Detection Tool
MTF	Major Traffic Flow

NANP	National Air Navigation Plan
NAV	Navigation
NextGen	Next Generation Air Transportation System
NOPS	Network Operations
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
PinS	Point in Space
RAM	Route Adherence Monitoring
RPAS	Remotely Piloted Aircraft System
RPK	Revenue Passenger Kilometres
RNAV	Area Navigation
RNP	Required Navigation Performance
RVSM	Reduced Vertical Separation Minimum
SATVOICE	Satellite Voice Communications
SAR	Search and Rescue
SB ADS-B	Space Based ADS-B
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
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
TBO	Trajectory Based Operations
TCAS	Traffic Collision Avoidance System
TOC	Transfer of Control
UAS	Unmanned Aircraft Systems
UPR	User Preferred Routes
VHF	Very High Frequency
VDL	VHF Data Link
VMC	Visual Meteorological Conditions
VNAV	Vertical Navigation
VOLMET	Meteorological information for aircraft in flight
VSA	Visual Separation on Approach
VSAT	Very Small Aperture

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 B**.

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 elements organised into flexible and scalable building blocks, where each element 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 elements were required in all airspaces. ASBUs described a way to apply the concepts defined in the ICAO 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 ASBU are comprised of a suite of elements, 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.

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

- Information;
- Operational; and
- Technology.

Asia/Pacific ASBU Implementation

5.5 **Table 1** provides a summary of the Block 0, Block 1 and Block 2 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 universally implemented in the Asia/Pacific Region.

5.6 A cost-benefit or economic analysis before implementation was identified as essential to determine whether to implement certain elements such as SURF-B0/1 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	Description	Priority	Responsibility for Review
Information	AMET-B0/1 to B0/4	Meteorological observations, forecast, warning, climatological and historical products, and dissemination (PASL 7.44)	1	MET SG
	AMET-B1/1 to B1/4	Meteorological products supported by automated decision systems or aids using IWXXM (PASL 7.59, 7.61)	2	
	AMET-B2/1 to B2/4	Integrated meteorological observations in support of enhanced ATM and airport decision-making processes, particularly in the near-term (PASL 7.69, 7.70, 7.72)	3	
	DAIM-B1/1 to B1/6	Provision of quality-assured digital aeronautical data and information, including AIP, terrain and obstacle, aerodrome and instrument flight procedure data sets (PASL 7.43)	1	ATM SG
	DAIM-B1/7	Provision of digital NOTAM improvements (PASL 7.58)	2	
	DAIM-B2/1 to B2/5	Integrated aeronautical information service in a SWIM environment in support of enhanced operational ground and air decision-making processes for all phases of flight (PASL 7.72)	3	
	FICE-B0/1	Automated basic AIDC (PASL 7.29)	1	CNS SG
	FICE-B2/2	Filing Service (PASL 7.72)	2	ATM SG CNS SG
	FICE-B2/4	Flight Data Request Service (PASL 7.72)	2	
	SWIM-B2/1	Information service provision (PASL 7.62)	2	
	SWIM B2/2	Information service consumption (PASL 7.62)	2	
Operational	ACDM-B0/1	Airport CDM Information Sharing (ACIS) (PARS 7.3, 7.18)	1	AOP SG ATM SG
	ACDM-B0/2	Airport CDM integration with ATM Network (PARS 7.3, 7.18)	2	
	ACDM-B1/1 to B1/2	Airport CDM Integration with ATM Network, AOP and APOC (PARS 7.25)	2	
	ACDM-B2/1 to B2/3	AOP, APOC and Total Airport Management (PARS 7.25)	3	AOP SG
	APTA-B0/1	PBN non-precision approaches (with basic capability) (PARS 7.4, 7.5, 7.10, 7.13, 7.14, 7.21)	1	CNS SG

	APTA-B0/2	Basic PBN SID and STAR procedures (with basic capability) (PARS 7.4, 7.5, 7.10, 7.13, 7.14, 7.21)	1	
	APTA-B0/3	SBAS/GBAS CAT I precision approach procedures (PARS 7.5, 7.6, 7.10, 7.14, 7.21)	3	
	APTA-B0/4	CDO (Basic) (PARS 7.14, 7.19, 7.21)	2	
	APTA-B0/5	CCO (Basic) (PARS 7.14, 7.19, 7.21)	2	
	APTA-B0/6	PBN Helicopter Point in Space (PinS) Operations (PARS 7.5, 7.6, 7.10, 7.14, 7.21)	3	
	APTA-B0/7	Performance-based aerodrome operating minima for advanced aircraft (PARS 7.14, 7.19, 7.21)	2	
	APTA-B0/8	Performance-based aerodrome operating minima for basic aircraft (PARS 7.14, 7.19, 7.21)	2	
	APTA-B1/1	PBN approaches (with advanced capability) (PARS 7.14, 7.21, 7.22, 7.23)	3	
	APTA-B1/2	PBN SID and STAR procedures (with advanced capability) (PARS 7.14, 7.21, 7.22, 7.23)	3	
	APTA-B1/4	CDO (Advanced) (PARS 7.14, 7.21, 7.22, 7.23)	3	
	APTA-B1/5	CCO (Advanced) (PARS 7.14, 7.21, 7.22, 7.23)	3	
	APTA-B2/1	GBAS CAT II/III precision approach procedures	3	
	APTA-B2/2	Simultaneous operations to parallel runways	3	
	APTA-B2/3	PBN Helicopter Steep Approach Operations	3	
	APTA-B2/4	Performance-based aerodrome operating minima for advanced aircraft with SVGS (PARS 7.14, 7.21, 7.22, 7.23, 7.26)	3	
	CSEP-B1/1 to B1/4	basic airborne situational awareness AIRB and VSA, and performance-based horizontal separations (PARS 7.20)	2	ATM SG
	CSEP-B2/1 to B2/3	Interval management procedure; cooperative separation at low altitudes and higher airspace	3	
	DATS-B1/1	Digital Aerodrome Air Traffic Services (PASL 7.60)	3	AOP SG ATM SG CNS SG
	FRTO-B0/1 to B0/4	Direct routing, airspace planning and FUA, flexible routings, and basic conflict detection and conformance monitoring (PASL 7.32, 7.34, 7.39)	1	ATM SG

	FRTO-B1/1 to B1/7	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 7.32, 7.54)	2	
	FRTO-B2/1 to B2/4	Integrated ATFM and ATC Planning, Dynamic Airspace Configuration, Cross-border FRA, Enhanced Conflict Resolution Tools (PASL 7.65, 7.66, 7.67)	3	
	NOPS-B0/1 to B0/5	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 7.41)	1	
	NOPS-B1/1 to B1/10	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 7.55)	2	
	NOPS-B2/1 to B2/2	Optimised ATFM in initial TBO context and enhanced dynamic airspace configuration (PASL 7.65, 7.68)	3	
	NOPS-B2/3	Collaborative Network Operation Planning (PASL 7.68)	3	
	NOPS-B2/4	Multi ATFM slot swapping and Airspace User priorities (PASL 7.68)	3	
	NOPS-B2/5	Further airport integration (PASL 7.68)	3	
	NOPS-B2/6	ATFM for cross border FRA (PASL 7.68)	3	
	NOPS-B2/7	UTM Network operations	3	
	NOPS-B2/8	High upper airspace network operations	3	
	OPFL-B0/1	ITP	3	
	OPFL-B1/1	CDP	3	
	OPFL-B2/1	Separation minima using ATS surveillance where VHF not available	3	
	RSEQ-B0/1 to B0/2	Arrival and Departure Management (PASL 7.35)	1	
	RSEQ-B0/3	Point merge (PARS 7.24)	3	AOP SG ATM SG CNS SG

	RSEQ-B1/1	Extended arrival metering (PASL 7.49)	2	ATM SG
	RSEQ-B2/1	Integration of arrival and departure management (PASL 7.64)	3	
	SNET-B0/1 to B0/4	STCA, MSAW, APW, APM (PASL 7.34)	1	ATM SG CNS SG
	SNET-B1/1 to B1/2	Enhanced STCA with aircraft parameters and in complex TMAs (PASL 7.53)	2	
	SURF-B0/1 to B0/3	Basic ATC surface operations tools, comprehensive situational awareness, situational awareness and alerting service (PASL 7.50)	2	
	SURF-B1/1 to B1/5	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 7.51)	2	
	SURF-B2/1 to B2/3	Enhanced surface guidance for pilots and vehicle drivers and conflict alerting for pilots for runway operations (PASL 7.63)	3	
	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 7.55, 7.68)	2	
	TBO-B2/1-B2/2	Pre departure trajectory synchronization and extended time-based management across multiple FIRs.	3	
	WAKE-B2/1 to B2/2	Wake turbulence separation minima based on 7 aircraft groups and time-based wake separation minima on final approach	3	
Technology	ASUR-B0/1 to B0/3	ADS-B, MLAT, SSR-DAPS (PARS 7.8, 7.9, 7.11, 7.12; PASL 7.30, 7.31, 7.33)	1	CNS SG
	ASUR-B1/1	Reception of aircraft ADS-B signals from space (SB ADS-B) (PASL 7.57)	2	
	ASUR-B2/1	Evolution of ADS-B and Mode S	3	
	ASUR-B2/2	Community based surveillance system for airborne aircraft (low and higher airspace)	3	
	COMI-B0/1, B0/2, B0/4, B0/5, B0/6	ACARS, ATN/OSI, VDL Mode 2 Basic, SATCOM Class C Data, HFDL (PARS 7.21, PASL 7.56)	2	
	COMI-B0/3, B0/7	VDL Mode O/A, AMHS (PASL 7.28)	1	

	COMI-B1/1	Ground-Ground Aeronautical Telecommunication Network/Internet Protocol Suite (ATN/IPS) (PARS 7.21, PASL 7.56)	1	
	COMI-B1/1 to B1/4	VDL Mode 2 Multi-Frequency, SATCOM Class B (SB-S) Voice and Data, ATN/IPS and AeroMACS Ground-Ground (PASL 7.56)	2	
	COMI-B2/1	Air Ground ATN/IPS (PASL 7.71)	3	
	COMI-B2/2	AeroMACS, aircraft mobile connection (PASL 7.71)	3	
	COMI-B2/3	Links meeting requirements for non-safety critical communication (PASL 7.71)	3	
	COMS-B0/1 to B0/2	CPDLC (FANS 1/A & ATN B1) for domestic and procedural airspace and ADS-C (FANS 1/A) for procedural airspace (PASL 7.56)	2	
	COMS-B1/1 to B1/3	PBCS approved CPDLC (FANS 1/A+), ADS-C and SATVOICE for domestic and procedural airspace (PASL 7.56)	2	
	COMS-B2/1 to B2/3	PBCS approved CPDLC, ADS-C, SATVOICE (PASL 7.71)	3	
	NAVS-B0/1 to B0/4	SBAS, GBAS, ABAS, MON (PARS 7.5, 7.7)	2	
	NAVS-B1/1	Extended GBAS	3	
	NAVS-B2/1 to B2/3	DFMC – GBAS, SBAS, ABAS	3	

Table 1: Asia/Pacific ASBU Block 0, Block 1 and Block 2 Priority

Implemented Elements

5.7 The following ASBU Block 0 elements were considered to be almost universally implemented within the Asia/Pacific 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 to B1/2**: Aircraft Tracking and Contact directory service (PASL 7.42).

Regional Elements

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

5.9 **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 7.15)	2
	Civil-Military Special Use Airspace (SUA) management (PARS 7.16)	1
	Unmanned Aircraft Systems (PARS 7.17)	2
	Adjacent ATS sector coordination (PASL 7.27)	2
	Airspace classification (PASL 7.36)	2
	ATC horizontal separation (PASL 7.37)	2
	Flight Level Allocation Schemes (FLAS) (PASL 7.38)	2
	ATC sector capacity (PASL 7.40)	2
	Electronic Flight Progress Strips (PASL 7.42)	2
	Enhanced SAR systems (PASL 7.45)	1
	ANSP human and simulator performance (PASL 7.46)	1
	Civil-Military strategic and tactical coordination (PASL 7.47)	1
	Civil-Military common procedures and training (PASL 7.47)	2
	Space object launch and re-entry management (PASL 7.48)	1
Technology	ATS surveillance data sharing (PASL 7.31)	2
	Civil-Military integrated systems and facilities (PASL 7.47)	2
	Data-Link Departure Clearance (DCL) (PASL 7.52)	2

Table 2: Asia/Pacific Seamless Regional Elements Priority

5.10 There are 18 Priority 1 elements as follows:

a) Aeronautical Meteorology: AMET-B0/1 to B0/4;

b) Aeronautical Information Management: DAIM-B1/1 to B1/6*;

c) Airport CDM: ACDM-B0/1;

d) ANSP human and simulator performance (Regional);

e) ATS Inter-facility Datalink Communications: FICE-B0/1;

f) Space object launches and re-entry management (Regional);

g) Civil-Military SUA management (Regional);

h) Civil-Military strategic and tactical coordination (Regional);

i) Core data communications: COMI-B0/3, B0/7 and B1/1;

j) Direct and Free Route Operations: FRTO-B0/1 to B0/4;

k) Enhanced SAR systems (Regional);

l) Ground-based Surveillance: ASUR-B0/1 to B0/3;

m) Network Operations: NOPS-B0/1 to B0/5;

n) Performance-based Navigation Approach Procedures: APTA-B0/1 and B0/2;

o) Runway Sequencing: RSEQ-B0/1 to B0/2; and

p) Safety Nets SNET-B0/1 to B0/4.

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

Human Performance

5.11 The Global ATM Operational Concept (ICAO 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.

5.12 The AN-Conf/12 emphasised the importance of human performance considerations by endorsing Recommendation 6/4, 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.

5.13 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.

5.14 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).

5.15 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.

5.16 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.

5.17 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.

5.18 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.

5.19 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.

5.20 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.

5.21 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 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 7**):

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 7: Optimal Aviation Culture Factors

Civil-Military Cooperation

5.22 One of the key enablers for improvement of ATM efficiencies supported by *Global ATM Operational Concept* (ICAO Doc 9854) 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 SUA, but could also include controlled airspace.

5.23 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.

5.24 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.

> *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 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.

5.26 The Asia/Pacific Civil-Military Cooperation Seminar/Workshop (Bangkok, Thailand, 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.

5.27 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.

5.28 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.

5.29 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.

5.30 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 tactical coordination element. 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 for the daily, safe and efficient tactical management of operations. 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) **Airspace Review**. The regular review of SUA and controlled airspace, to ensure that the means and notice of activation provide adequate warning for other airspace users, the SUA types reflect the usage, and the lateral and vertical limits are the minimum required to safely contain the activity therein (Annex 11 2.19.2.1 (b) refers). The review of airspace should be conducted by an airspace authority independent or a collaboration of civil and military airspace users.

d) **Flexible Use Airspace**. Mechanisms to ensure the minimisation of airspace being exclusively assigned for civil or military use in accordance with FUA principles, assessed by the percentage of military SUA within a Flight Information Region (FIR).

e) **International Airspace**. The minimisation of SUA and other military entities that may adversely affect international airspace. Restricted and prohibited areas must not be designated within international airspace or airspace of undefined sovereignty.

f) **Integrated Civil-Military ATM Systems**. The integration of civil and military ATM systems where practicable, including the management of civil and State UAS aircraft, policies and procedures to manage State aircraft that are non-compliant with civil requirements, systems to manage civil and military SAR units, and 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 minimising 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 with 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) **Space Object Launch and Re-entry**. Effective coordination mechanisms established by States responsible for space object launch and 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 in terms of safety and efficiency.

5.31 The efficient management of space object launch and space re-entry activity by both State and civil agencies is critical to minimise disruption to other airspace users. Increasingly, space object 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:

a) coordination agreements between the State civil aviation authority, the ANSP, and the launch/re-entry agency concerned; and

b) strategic coordination conducted between the State civil aviation authority prior the activity and tactical management of the launch/re-entry activity.

Note: the Asia/Pacific Regional Guidance for Space Object Launch and Re-Entry Activities Coordination is available on the ICAO Asia/Pacific eDocuments webpage at: https://www.icao.int/APAC/Pages/eDocs.aspx.

Airspace Equipage Mandates

5.32 From 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 Aeronautical Information Service (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

5.33 ICAO Headquarters, supported by the Unmanned Aircraft Systems Advisory Group (UAS-AG), developed a global resource of information and guidance material, 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.

5.34 The UAS Toolkit, UTM framework and other relevant information is available on the ICAO Unmanned Aviation webpages at: https://www.icao.int/safety/UA/Pages/default.aspx.

5.35 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 last three decades, aerodrome operators in Asia/Pacific Region invested billions of dollars to enhance capacity of existing aerodromes and to build new aerodromes to meet increasing air traffic demand. Notable examples are the opening of Siem Reap-Angkor, Beijing Daxing, Chengdu Tianfu and Kertajati airports and the expansion of Hong Kong and Suvarnabhumi 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 operator, 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 To cater for *Asia/Pacific Seamless ANS Plan Version 3.0*, the new ICAO APAC Seamless ANS Reporting Tool was developed to enable States to report on their Seamless ANS implementation progress. The status of the reporting process as of October 2024 is depicted in **Figure 8**.

Important note: the new ICAO APAC Seamless ANS Reporting Tool (accessible via the ICAO APAC SharePoint Platform using the pre-registered secure login credential at https://oaci.sharepoint.com/sites/ATM_reporting/SitePages/ANS-Reporting-Implementation.aspx) had been developed by ICAO HQ to take into account the changes to the latest version of the Global Air Navigation Plan and the 2019 (version 3.0) update of the Asia/Pacific Seamless ANS Plan. According to State letter Ref.: T 8/5.1 – AP060/24(CNS), States/Administrations were required to complete the reporting over this new platform by 31 May 2024.

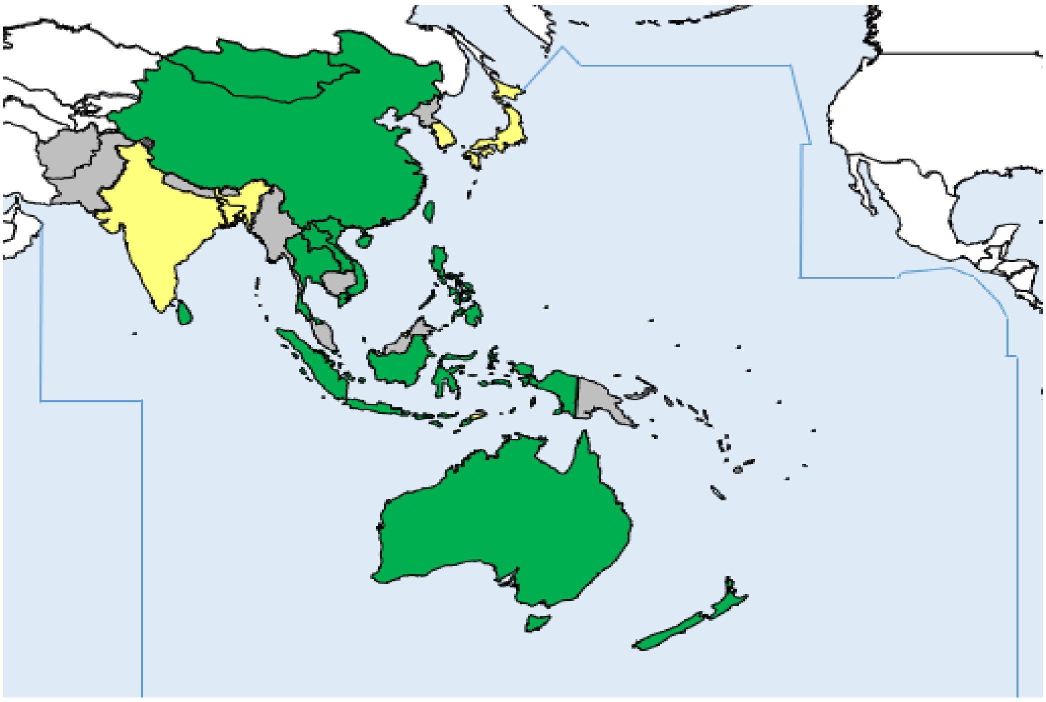

Figure 8: Seamless ANS Reporting (2024)

6.4 A total of 19 States, i.e. 44 per cent of the Asia/Pacific States, had submitted some form of reporting on the new ICAO APAC Seamless ANS Reporting Tool. Among those 19, only 13 States had submitted a comprehensive report. Hence, there was insufficient information to carry out effective evaluation on the implementation progress.

6.5 Seamless ANS implementation data is used to support an iSTARS tool intended to illustrate ANS planning and implementation (https://istars.icao.int/Sites).

6.6 The progress of implementation of the Plan had been unacceptably slow, with the Plan having been endorsed by APANPIRG in 2013, and the Phase I elements expected to be at least partly implemented by the start of Phase I in November 2015, to ensure a matching of ground-based capability with that on modern aircraft systems. However, as of March 2019, the implementation progress by States and Administrations that had been reporting was illustrated in **Figure 9**.

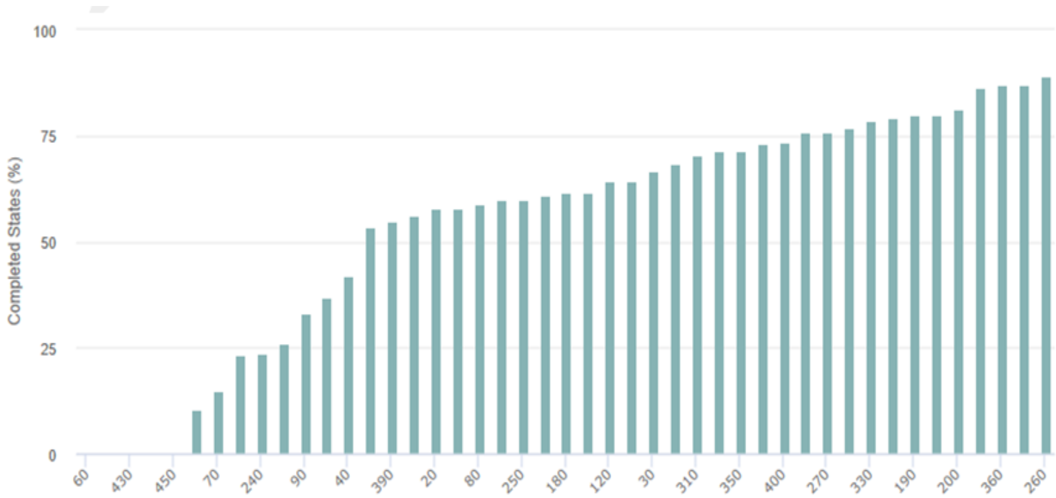

Figure 9: Percentage of Completed Seamless ATM Elements (March 2019)

6.7 The following APANPIRG Conclusions are related to implementation actions that Asia/Pacific States 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.

6.8 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.

6.9 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.

6.10 The *Asia/Pacific Regional Air Navigation Plan Volume II* requires that States shall establish and maintain a NANP that supports implementation of the Global Air Navigation Plan and regional air navigation planning[1]. It further states that States shall report their implementation progress and status of the applicable global and regional air navigation planning elements at least once each year, and provides a list of Basic Planning Elements (BPE) that should be included in the NANP.

6.11 Few States have reported their NANP status, and a NANP reporting template proposed by ICAO in 2021 did not reach consensus agreement.

<u>Airspace and FIR Analysis</u>

6.12 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 Transfer of Control (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;

[1] Asia/Pacific Regional Air Navigation Plan Volume II Section 3 *Specific Regional Requirements*

- 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 ICAO 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) non-universal implementation of AIDC.

6.13 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.

6.14 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.

6.15 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 Kuala

Lumpur/Bangkok) in the region, resulting from bilateral efforts between ANSPs.

6.16 **Figure 10 and Figure 11** provide information on ground-based ATS surveillance and communication gaps in the South China Sea (SCS).

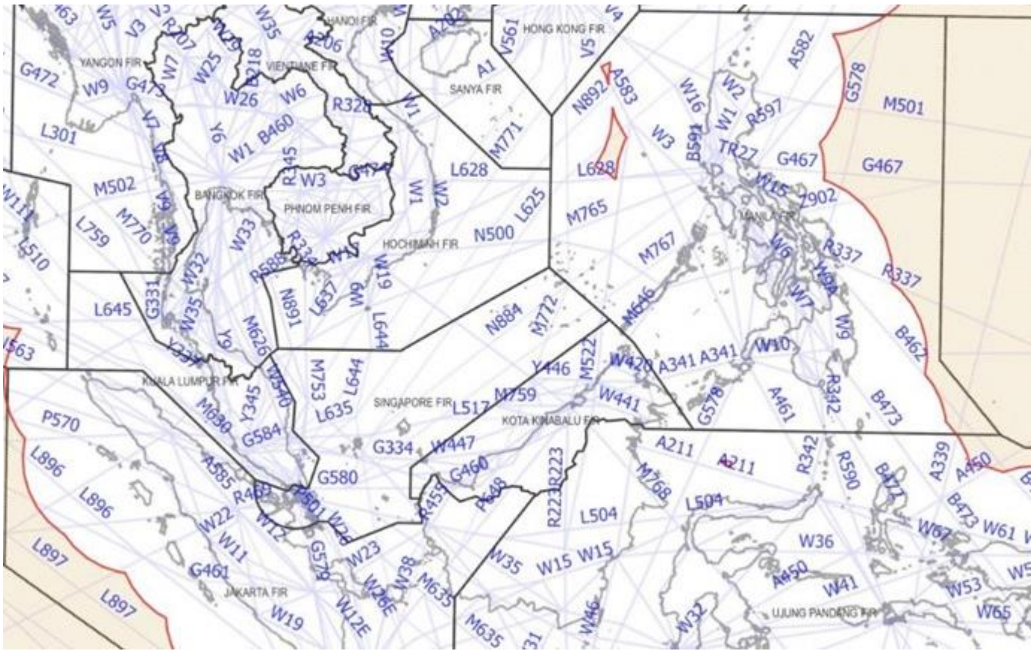

Figure 10: SCS Ground-based ATS Surveillance Gaps (as of 2022)

Note: Figure 10 only considers ground-based surveillance infrastructures and does not include other forms of space-based interrogation.

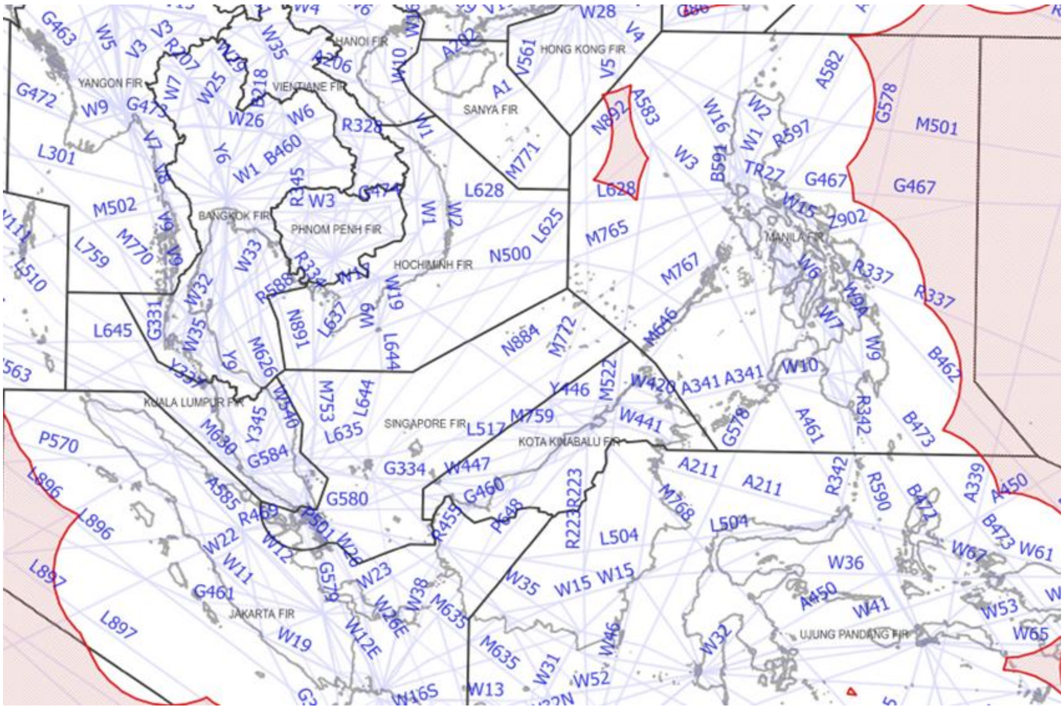

Figure 11: SCS ATS DCPC VHF Gaps (as of 2022)

Note: Figure 11 only considers DCPC VHF communications and does not include other forms of DCPC communications.

6.17 **Figure 12 and Figure 13** provide information on Ground Based ATS surveillance and communication gaps in the Bay of Bengal (BOB).

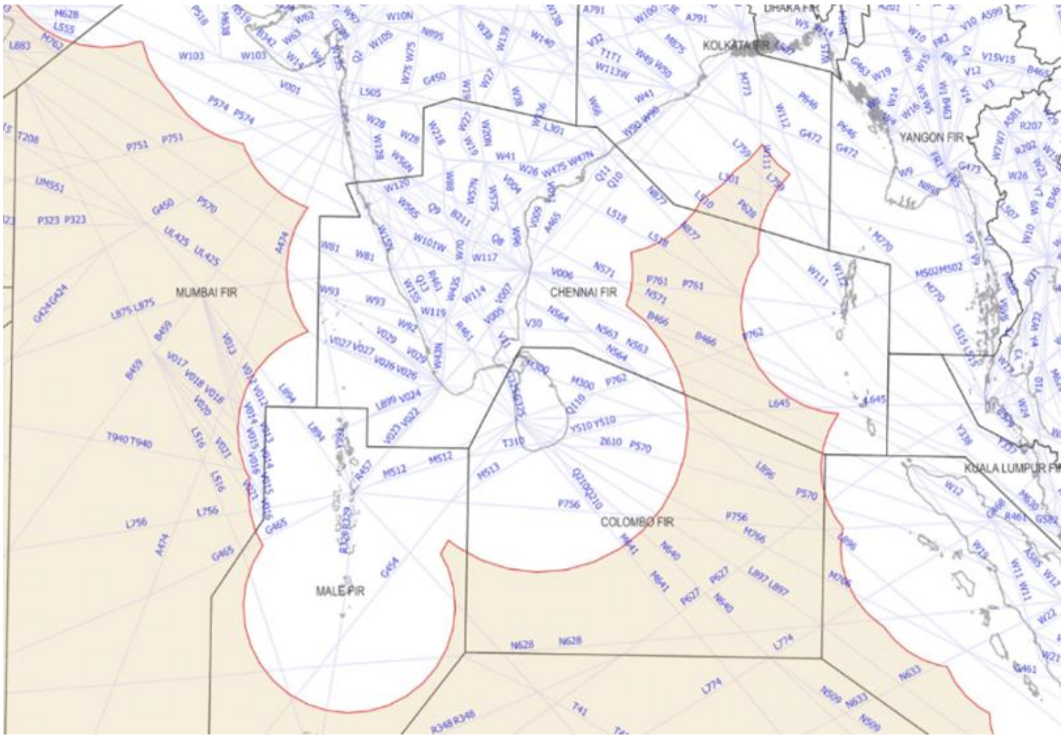

Figure 12: Bay of Bengal ATS Surveillance Gaps (as of 2022)

Note: Figure 12 only considers ground-based surveillance infrastructures and does not include other forms of space-based interrogation.

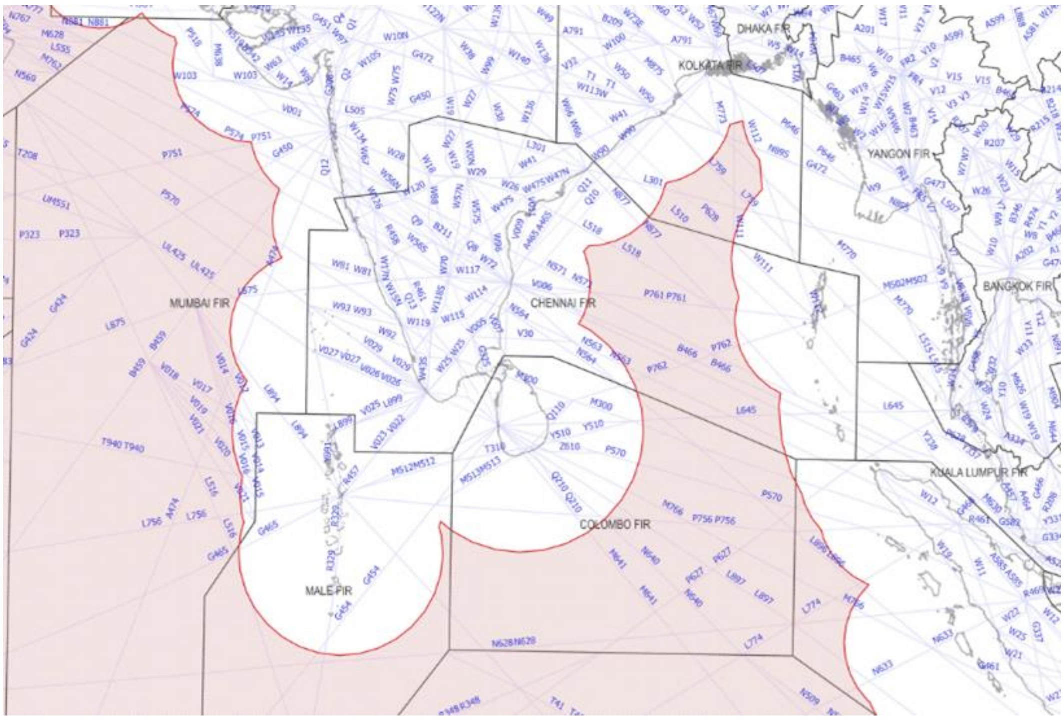

Figure 13: Bay of Bengal ATS DCPC VHF Gaps (as of 2022)

Note: Figure 13 only considers DCPC VHF communications and does not include other forms of DCPC communications.

6.18 The main areas of the Asia/Pacific Region lacking ATS surveillance and DCPC VHF only 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: SCS airspace and the northwestern portion of the Manila FIR (**Figure 10** and **Figure 11**);

b) high priority: BOB airspace between the Indian subcontinent and the Andaman Islands (**Figure 12** and **Figure 13**), the Indian subcontinent and the Arabian Sea;

c) medium priority: airspace between Indonesia and Australia (between Java and West Australia); and

d) lower priority: Coral Sea between Papua New Guinea and Australia.

Europe – Asia/Pacific Trans-Regional Issues

6.19 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.

6.20 There was 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.

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

6.22 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

6.23 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 of America. 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 30 NM separation standards based on RNP 4, DARP, UPR were applied.

6.24 The Oakland Oceanic FIR and South Pacific utilised technologies consistent with ASBU 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.

6.25 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

6.26 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 50/50 NM. In addition, FLAS is also used in Arabian Sea Airspace and applied to low density traffic against the higher density Middle East (MTF AR-5) routes. Owing to the improved utilisation of CPDLC, FLAS is currently being used only on the following five ATS routes in Mumbai FIR: P751, G450 (non-CPDLC equipped aircraft), P570, N563 and M300.

6.27 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 50 NM 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.

6.28 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.

ADS-B Collaboration

6.29 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.

6.30 In May 2015, the ANSPs of India and Myanmar had 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 ATS routes over the BOB similar to that accomplished over the SCS. India had also completed an agreement for implementation of SB ADS-B Data Services for the oceanic regions of Indian FIRs.

6.31 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. SB ADS-B was also being considered to fill any remaining gaps. When completed, these ATS routes within the SCS should have complete surveillance coverage.

Impact of Major Regional and Global Events

6.32 The unavailability of Russian Federation airspace to the vast of airlines in recent period induced a significant impact to the choice of ATS routes to conduct efficient air transport between Europe and APAC Regions. Such airspace closure activity has also worsened the inter-regional traffic demand through the already limited and geopolitically sensitive Middle East Corridor.

6.33 Russian invasion of Ukraine on 24 February 2022 led to the restriction of air traffic in Ukrainian and Russian airspaces due to the military activity and war-related sanctions. Airspace closures have forced airlines to take detours and seek alternative routes. All these causes considerable increasing of flight time on routes connecting Europe and Asia, North America and Asia and North America and Middle East. In turns, longer travel times lead to the increasing of aircraft fuel burn, which causes higher airlines operating costs and carbon emissions.

6.34 The Russia-Ukraine conflict has challenged commercial aviation in yet another way. The closure of the airspace over Russia causes a lengthening of intercontinental routes to Asia for European airlines. Similarly, transatlantic routes to and from North America have been significantly hindered by the closure of Russian airspace. The most heavily impacted markets are Europe-Asia and Asia-North America. This includes flights between the United States of America and Northeast Asia, and between Northern Europe and most of Asia.

PERFORMANCE IMPROVEMENT PLAN

The Asia/Pacific Seamless ANS Plan, Version 3.0 (November 2019), specified performance objectives to be implemented in three phases of *Preferred Aerodrome/Airspace and Route Specifications* (PARS) and *Preferred ANS Service Levels* (PASL). This version of the Plan, is structured under the following phases:

- Phase II – expected implementation by 07 November 2019;
- Phase III - expected implementation by 03 November 2022;
- Phase IV – expected implementation by 27 November 2025; and
- Phase V – expected implementation by 23 November 2028.

Note 1: Phase I – elements (expected implementation by November 2015) that had not been completed by November 2019 were moved to Phase II.

Note 2: Phases II and III are retained in this version of the plan due to the delayed availability of the implementation reporting mechanism following the 2019 update, and taking into consideration the impact of the COVID-19 pandemic.

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 2015.

PARS Phase II (expected implementation by 07 November 2019)

Aerodrome Operations

7.1 All high-density international aerodromes[2] 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, including a detailed assessment of passenger, airport gate, apron, taxiway and runway capacity.

[2] High-density international aerodromes referenced in these performance objectives are:

- aerodromes having 100,000 scheduled movements per annum or more; or
- aerodromes where strategic slot allocation is implemented; or
- aerodromes designated by the relevant authority as requiring or potentially requiring ATFM implementation.

7.2 Where practicable, all high-density 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 high-density international aerodromes should operate an A-CDM system for ACIS integrated with the ATM network function consistent with **ACDM-B0/1** to **B0/2** (Priority 1).

Terminal Operations (Category T airspace)

7.4 Where practicable, all 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 instrument runways serving aeroplanes should have the following approach procedures-consistent with **APTA-B0/1** (Priority 1) and **APTA-B0/3**:

a) SBAS/GBAS CAT1 precision approaches; or ILS CAT1 approaches (with APV approach as a backup); or

b) Approaches with Vertical Guidance (APV); RNP APPCH with LNAV-VNAV or LPV Minima; or

c) if an APV is not practical, straight-in RNP APCH with Lateral Navigation (LNAV) or SBAS based LPV Minima.

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 Helicopter PinS Operations consistent with **APTA-B0/6** where there is an operational benefit (Priority 2).

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** to **B0/4**, 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, B0/2, B0/3** and **B0/6**.

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: 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 **APTA-B0/1 to B0/8**, and **APTA-B1/1 to B1/5**:

- Category R airspace – **RNP 4**, **RNP 10** (RNAV 10); 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.

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 guidance provided by the UAS Advisory Group of the Remotely Piloted Aircraft Systems (RPAS) Panel, as a minimum.

PARS Phase III (expected implementation by 03 November 2022)

Aerodrome Operations

7.18 All high-density international aerodromes should operate an A-CDM system integrated with the ATM network, consistent with **ACDM-B0/1** and **B0/2**.

Terminal Area Operations

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

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** to **B1/4**.

En-Route Operations

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** and **B0/2, COMS-B1/1** to **B1/3**, **APTA-B0/1** to **B0/8**, and **APTA-B1/1** to **B1/5**:

- Category R airspace – **RNP 2** (or **RNP 4**); and
- Category S airspace –**RNAV 2** or **RNP 2**.

PARS Phase IV (expected implementation by 27 November 2025)

Terminal Operations

7.22 Where there is an operational benefit Terminal Areas serving all high-density 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** to **B1/3**.

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 Terminal Areas serving high-density international aerodromes should implement Advanced CDO and CCO operations consistent with **APTA-B1/4** to **B1/5**.

7.24 Where there is an operational benefit, Terminal Areas serving all high-density international aerodromes should implement point merge operations consistent with **RSEQ-B0/3**.

PARS Phase V (expected implementation by 23 November 2028)

<u>Aerodrome Operations</u>

7.25 All high-density international aerodromes should establish Airport Operations Centres (AOPCs) consistent with **ACDM-B2/2**.

7.26 Where there is an operational requirement and benefit, all high-density international aerodromes should implement performance-based aerodrome operating minima consistent with **APTA-B2/4**.

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)

<u>ATS Communications</u>

7.27 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.

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

7.29 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 Pan Regional (NAT and APAC) Interface Control Document for ATS Interfacility Data Communications (PAN AIDC ICD)].

ATS Surveillance

7.30 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 high-density international aerodromes, consistent with **ASUR-B0/1** and **B0/2**. 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 Global Operational Data-link Document (ICAO Doc 10037).

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.

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

7.32 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** and **B0/2, FRTO-B0/1** to **B0/4** and **FRTO-B1/1** to **B1/7**.

7.33 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.

Note 1: 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.

7.34 ATS surveillance systems should enable basic conflict detection and conformance monitoring STCA, MTCD, APW, APM and MSAW consistent with **FRTO-B0/4** and **SNET-B0/1** to **B0/4** (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.

7.35 All high-density international aerodromes where ATFM facilities are required should be served by AMAN/DMAN facilities consistent with **RSEQ-B0/1** and **B0/2** (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.

7.36 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.

7.37 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; the performance of the ATS surveillance system, including data-sharing or overlapping coverage at TOC points;

c) and 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, 5 NM (en-route) or 3 NM (terminal) surveillance-based separations should be authorised within ATC sectors. At the TOC points in such environments, 5-10 NM should be authorised with auto hand-off and surveillance data-sharing or overlapping coverage at the TOC point, and 5-20 NM 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).

7.38 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 conflictions occur within 50 NM of the FIR boundary; and
- ATS surveillance coverage does not overlap the FIRs concerned, or ATS surveillance data is not exchanged between the ATC units concerned.

7.39 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** to **B0/4** (Priority 1).

7.40 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 C**.*

7.41 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** to **B0/5** (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.

7.42 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

7.43 ATM systems should be supported by digitally-based AIM systems consistent with **DAIM-B1/1** to **B1/6,** 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 Regional Plan for Collaborative AIM.

7.44 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** to **B0/4**, 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).

7.45 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** and **B1/2**, and in accordance with the *Asia/Pacific SAR Plan*.

ANSP Human and Simulator Performance

7.46 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 "positive safety 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

7.47 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.

7.48 All States with organisations that conduct space object launch or 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:

- three days for the defined launch window; and
- 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, space object launch and 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 space object launch and re-entry activity is available on the ICAO Asia/Pacific eDocuments webpage.

PASL Phase III (expected implementation by 03 November 2022)

Aerodrome Operations

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

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

7.51 All ATC units providing services to high-density international (ICAO aerodrome reference codes[3] 3 and 4) aerodromes having complex layouts should implement A-SMGCS incorporating 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** to **5**.

Note 1: 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.

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

Terminal Operations

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

En-Route Operations

7.54 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** to **B1/7**.

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

7.55 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** to **B1/10** supporting the integration of time-based management within a flow centric approach, consistent with **TBO-B0/1** and **TBO-B1/1**.

7.56 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, B0/2, B0/4, B0/5** and **B0/6**, including ACARS, ATN/OSI, VDL Mode 2 Basic, SATCOM Class C Data, and HFDL; and

b) **COMI-B1/1** to **B1/4**, 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** and **B0/2**, including CPDLC (FANS 1/A & ATN B1) for domestic and procedural airspace and ADS-C (FANS 1/A) for procedural airspace; and

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[3] Annex 14 *Aerodromes* Volume I *Aerodrome Design and Operations* Section 1.6

d) **COMS-B1/1** to **B1/3**, 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).

7.57 ACCs operating within <u>Category R</u> 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.

<u>Air Navigation Services</u>

7.58 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.

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

PASL Phase IV (expected implementation by 27 November 2025)

<u>Aerodrome Operations</u>

7.60 Where there is an operational benefit, remotely operated Aerodrome Air Traffic Services should be implemented, consistent with **DATS B1/1**.

<u>Air Navigation Services</u>

7.61 Capability for providing aeronautical meteorological observations in support of automated decision processes or aids and performance-based requirements, involving meteorological information, meteorological information translation, ATM impact conversion and ATM decision support should be enabled, consistent with **AMET-B1/1**.

<u>Information Exchange</u>

7.62 States should establish SWIM services consistent with **SWIM-B2/1** and **B2/2**, implementing the following as a minimum:

a) Information Service Provision (**SWIM-B2/1**); and

b) Information Service Consumption (**SWIM-B2/2**).

PASL Phase V (expected implementation by 23 November 2028)

<u>Air Traffic Management</u>

7.63 All ATC units providing services to high-density international aerodromes should operate enhanced surface guidance for pilots and vehicle drivers, comprehensive situational awareness and conflict alerting service for runway operations consistent with **SURF-B2/1** to **B2/3.**

7.64 All aerodromes where ATFM facilities are required, should be served by an integrated system of arrival and departure management sequences into a single runway or dependent runways consistent with **RSEQ-B2/1**.

7.65 ACCs and terminal airspaces should enable Dynamic Airspace Configurations for different traffic flow or complex situations, Enhanced Conflict Detection Tools and Conformance Monitoring consistent with **FRTO-B2/1** and **B2/2**, and **NOPS-B2/2**.

7.66 ACCs should enable, where practicable, large-scale cross-border Free Route Airspace in coordination with adjacent FIRs, and enhanced conflict resolution tools consistent with **FRTO-B2/3** and **B2/4**.

7.67 ACCs should enable, where practicable, ATFM for cross-border Free Route Airspace in coordination with adjacent FIRs, and enhanced conflict resolution tools consistent with **NOPS-B2/6** and **FRTO-B2/3** and **B2/4**.

7.68 All ACCs operating within FIRs where demand may exceed capacity should operate systems that enable, where applicable, collaborative network operations planning, further integration of airport operations and NOPS planning, multi ATFM slot swapping and airspace user priorities consistent with **NOPS-B2/1-5** supporting the integration of time-based management within a flow centric approach, consistent with **TBO-B0/1** and **TBO-B1/1**.

Air Navigation Services

7.69 Capability for providing integrated aeronautical meteorological observations, forecast and, warning information, climatological and historical products in support of automated decision processes and the design and planning of infrastructure, flight routes and airspace management should be enabled, consistent with **AMET-B2/1** to **B2/3**.

7.70 Integrated meteorological information service in the SWIM environment in support of enhanced operational ground and air decision-making processes, particularly in the planning phase and near-term should be implemented consistent with **AMET-B2/4**.

ATS Communications

7.71 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-B2/1** to **B2/3**, including Air/Ground ATN/IPS and AeroMACS and Links for non-safety communication; and

b) **COMS-B2/1** to **B2/3**, including PBCS approved CPDLC, ADS-C and SATVOICE for domestic and procedural airspace.

Information Exchange

7.72 States should establish FF-ICE (Flight and Flow Information for Collaborative Environment) consistent with **FICE-B2/2** and **B2/4,** SWIM services consistent with **SWIM-B2/3**, Aeronautical Information dissemination consistent with **DAIM-B2/1** and Meteorological information service consistent with **AMET-B2/4**, implementing the following as a minimum;

a) Filing Service (**FICE-B2/2**);

b) Flight Data Request Service (**FICE-B2/4**);

c) SWIM Registry (**SWIM-B2/3**);

d) Dissemination of Aeronautical Information in a SWIM Environment (**DAIM-B2/1**); and

e) Meteorological Information Service in SWIM (**AMET-B2/4**).

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 was reinforced at APANPIRG/23 in 2012. 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 and Block 1 implementations and global interoperability:

a) Space-Based ATS Surveillance – the AN-Conf/12 endorsed Recommendation 1/9 regarding SB ADS-B systems being included in the GANP. With the availability of SB ADS-B several APAC States have commenced studies with a view to its implementation to support improved separation, particularly in oceanic (Category R) airspace. Subject to the development by ICAO of standards and procedures for the application of this technology for ATC separation and the necessary supporting communications systems, regional policy and planning development should examine opportunities and develop policies to take advantage of this technology;

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.

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, IV and V, being effective 07 November 2019, 03 November 2022, 27 November 2025 and 23 November 2028 respectively. Phase I elements that had not been completed as of 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 Tool supports the implementation of the global and regional items by monitoring progress of States and Administrations.

9.8 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.

9.9 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.

9.10 The ICAO Asia and Pacific Regional Office assists, where necessary, the implementation of Seamless ANS within its accredited States. In addition, the Asia and Pacific Regional Office coordinates with adjacent ICAO regional offices on an ad hoc basis or at relevant trans-regional meetings.

Appendix A: Beijing and Delhi Declarations

Beijing Declaration

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 harmonisation in the Region, including a focus on:

a) Transitioning from Aeronautical Information Service (AIS) to Aeronautical Information Management (AIM) System;

b) Performance Based Navigation (PBN) implementation;

c) Common ground/ground telecommunication infrastructure to support Air Navigation Services (ANS) applications;

d) An enhanced level of civil/military cooperation;

e) Enhanced surveillance capability including Automatic Dependent Surveillance-Broadcast (ADS-B) technology;

f) Air Traffic Flow Management/Collaborative Decision Making (CDM) implementation for high density airports; and

g) Air navigation in national planning frameworks such as National Development Plans (NDPs) supported by National Air Navigation Plans.

2.2 Promote sharing of best practices in the provision of ANS including Aeronautical Search and Rescue (SAR), Meteorological Services for International Air Navigation (MET) and Air Traffic Flow Management (ATFM) through regional cooperation and enhanced coordination.

Delhi Declaration

4.0 Air Navigation Services

4.1 Commit to resources in modernization and innovation in Air Navigation Services, in tandem with developments in the airport and airline capacity, to support recovery and meet future demand for air travel and new entrants.

4.2 Commit to implement the ICAO Standards and Procedures for Air Navigation Services (PANS), and the Asia/Pacific Seamless ANS Plan (including prioritized GANP elements) and its subsidiary plans to enhance ANS capacity and harmonization in the Asia and Pacific Region focusing on as a matter of priority:

a) Phase I, II and III of the Asia/Pacific Regional Aeronautical Information Management (AIM);

b) Improved Airspace Safety and Capacity through the implementation of more efficient Air Traffic Control (ATC) separation minima;

c) Performance Based Navigation (PBN) implementation in accordance with ICAO Assembly Resolution A37-11 on Global PBN Goals;

d) Common Ground/Ground Telecommunication Infrastructure to support ANS applications;

e) Expediting the implementation of ICAO provisions related to System Wide Information Management (SWIM);

f) *Enhanced civil/military cooperation;*

g) *Enhanced Surveillance capability for improved Safety and Efficiency;*

h) *Air Traffic Flow Management (ATFM) and Airport Collaborative Decision Making (A-CDM) implementation;*

i) *Air Traffic Management (ATM) contingency planning, in coordination with neighbouring States/Administrations;*

j) *Air navigation in national planning frameworks such as National Development Plans (NDPs) supported by National Air Navigation Plans (NANP); and*

k) *Enhancement of safety risk assessment capability.*

4.3 Share best practices, resources and capability in the provision of ANS, including Aeronautical Search and Rescue (SAR), Meteorological Services for International Air Navigation (MET) and Air Traffic Flow Management (ATFM) through regional cooperation and enhanced coordination.

4.4 Work collaboratively through ICAO and Regional collaborative platforms towards Seamless ANS, including Flight and Flow Information for a Collaborative Environment (FF-ICE) and Trajectory-Based Operations (TBO) to support future traffic growth and sustainability.

Appendix B: 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 C: 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 C1** 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 C1: 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 *Manual on Collaborative Air Traffic Flow Management* (ICAO Doc 9971) contained guidelines for ATC sector capacity assessment. **Table C2** provides simplified ATC sector calculation guidance from ICAO 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 C2: Simplified ATC Sector Capacity Table (no complexity/automation allowance)

4 Australia, Japan, New Zealand, Singapore, Thailand and the United States of America 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 150 NM x 100 NM): 7 aircraft (extrapolated √6.66 x airspace volume = 2.58 x 7 = **18**).

Thailand

11 Suvarnabhumi aerodrome capacity expectations:

- single runway: **34** (VMC/IMC).

United States of America

12 **Table C3** 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 C3: Capacity at Selected United States of America Aerodromes

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 C4** 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**
ICAO Doc 9971 Simplified Table Comparison						15	18	18

Table C4: 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 D: List of References

Global and Regional Framework

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 Regional Air Traffic Flow Management Concept of Operations
Asia/Pacific Regional Performance-Based Navigation Implementation Plan (V4.0)
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*
Doc 10037 *Global Operational Data Link (GOLD) Manual*
Doc 10088 *Manual on Civil-Military Cooperation in Air Traffic Management*
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 Construction of Visual and Instrument 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

Aerodromes to be listed in Asia Pacific Air Navigation Plan [Updated on 25 June 2024]

S. No. in ICAO APAC Database	S. No	Sub-region	State / Admin	ICAO Code	Name of City	Name of Aerodrome	Type	APAC ANP
1	1	SA	Afghanistan	OAHR	Herat	Herat Intl	UNK	0
4	2	SA	Afghanistan	OAMS	Mazar-e-Sharif	Mazar-e-Sharif	UNK	0
46	3	NA	China	ZBOW	Baotou		UNK	0
47	4	NA	China	ZGBH	Beihai		UNK	0
49	5	NA	China	ZBAD	Beijing	Daxing	UNK	0
50	6	NA	China	ZYCC	Changchun	Longjia	UNK	0
52	7	NA	China	ZSCG	Changzhou	Benniu	UNK	0
53	**8**	**NA**	**China**	**ZUTF**	**Chengdu**	**Tianfu**	**UNK**	**0**
57	9	NA	China	ZLDH	Dunhuang	**Mogao**	UNK	0
58	10	NA	China	ZHES	Enshi	Xujiaping	UNK	0
60	11	NA	China	ZSGZ	Ganzhou	Huangjin	UNK	0
64	12	NA	China	ZUGY	Guiyang	Longdongbao	UNK	0
65	13	NA	China	ZBLA	Hulunbeier	Hailar	UNK	0
66	14	NA	China	ZJHK	Haikou	Meilan	UNK	0
71	15	NA	China	ZWTN	Hotan **HETIAN**	**Kungang**	UNK	0
72	16	NA	China	ZSSH	Huai'an	Lianshui	UNK	0
73	17	NA	China	RCYU	Hualien	Hualien	UNK	0
74	18	NA	China	ZSTX	Huangshan	Tunxi	UNK	0
75	19	NA	China	ZYJM	Jiamusi	**Jiamusi**	UNK	0
76	20	NA	China	ZGOW	Jieyang	Chaoshan	UNK	0
81	21	NA	China	ZULS	Lhasa	Gonggar	UNK	0
82	22	NA	China	ZSLG	Lianyungang	Baitabu **Huaguosha**	UNK	0
83	23	NA	China	ZPLJ	Lijiang	Sanyi	UNK	0
84	24	NA	China	ZSLY	Linyi	Shubuling **Qiyang**	UNK	0
85	25	NA	China	ZHLY	Luoyang	Beijiao	UNK	0
86	26	NA	China	ZPMS	Dehong	Mangshi	UNK	0
87	27	NA	China	ZBMZ	Manzhouli	Xijiao	UNK	0
88	28	NA	China	ZYMD	Mudanjiang	Hailang	UNK	0
89	29	NA	China	ZSCN	Nanchang	Changbei	UNK	0
92	30	NA	China	ZSNT	Nantong	Xingdong	UNK	0
93	31	NA	China	ZSNB	Ningbo	Lishe	UNK	0
94	32	NA	China	ZBDS	Ordos	Ejin Horo	UNK	0
96	**33**	**NA**	**China**	**ZJQH**	**QIONGHA**	**Boao**	**UNK**	**0**

S. No. in ICAO APAC Database	S. No	Sub-region	State / Admin	ICAO Code	Name of City	Name of Aerodrome	Type	APAC ANP
97	34	NA	China	ZYQQ	Qiqihar	Sanjiazi	UNK	0
98	35	NA	China	ZSQZ	Quanzhou	Jinjiang	UNK	0
104	36	NA	China	ZBSJ	Shijiazhuang	Zhengding	UNK	0
107	37	NA	China	RCMQ	Taichung	Cingcyuangang	UNK	0
108	38	NA	China	RCNN	Tainan	Tainan	UNK	0
112	39	NA	China	ZSWH	Weihai	Dashuipo	UNK	0
113	40	NA	China	ZSWZ	Wenzhou	Longwan	UNK	0
115	41	NA	China	ZSWX	Wuxi	Shuofang	UNK	0
116	42	NA	China	ZSWY	Wuyishan		UNK	0
120	43	NA	China	ZLXN	Xining	Caojiabao	UNK	0
121	44	NA	China	ZPJH	Xishuangbanna	Gasa	UNK	0
122	45	NA	China	ZSXZ	Xuzhou	Guanyin	UNK	0
123	46	NA	China	ZSYN	Yancheng	Nanyang	UNK	0
124	47	NA	China	ZYYJ	Yanji	Chaoyangchuan	UNK	0
125	48	NA	China	ZSYT	Yantai	Penglai	UNK	0
126	49	NA	China	ZSYA	Yangzhou	Taizhou	UNK	0
127	50	NA	China	ZHYC	Yichang	Sanxia	UNK	0
128	51	NA	China	ZLIC	Yinchuan	Hedong	UNK	0
129	52	NA	China	ZSYW	Yiwu	**Yiwu**	UNK	0
130	53	NA	China	ZGZJ	Zhanjiang		UNK	0
131	54	NA	China	ZGDY	Zhangjiajie	Hehua	UNK	0
132	55	NA	China	ZHCC	Zhengzhou	Xinzheng	UNK	0
133	56	NA	China	ZSZS	Zhoushan	Putuoshan	UNK	0
134	57	NA	China	ZUZY	Zunyi	Xinzhou	UNK	0
147	58	SA	India	VEBS	Bhubaneswar	**Biju Patnaik Airport**	UNK	0
149	59	SA	India	VICG	Chandigarh		UNK	0
154	60	SA	India	VOGO	Goa		UNK	0
155	**61**	**SA**	**India**	**VEGK**	**GORAKHPUR**		**UNK**	**0**
157	**62**	**SA**	**India**	**VIDX**	**HINDAN**		**UNK**	**0**
159	**63**	**SA**	**India**	**VOHY**	**HYDERABAD**	**Hyderabad International Airport**	**UNK**	**0**
161	**64**	**SA**	**India**	**VIJO**	**JODHPUR**		**UNK**	**0**
162	**65**	**SA**	**India**	**VEIM**		**Imphal Airport**	**UNK**	**0**

S. No. in ICAO APAC Database	S. No	Sub-region	State / Admin	ICAO Code	Name of City	Name of Aerodrome	Type	APAC ANP
163	**66**	**SA**	**India**	**VOKN**		**Kannur International Airport**	**UNK**	**0**
167	**67**	**SA**	**India**	**VOGA**		**Manohar International Airport, MOPA, GOA**	**UNK**	**0**
172	68	SA	India	VOPB	Port Blair		UNK	0
173	69	SA	India	VAPO	Pune		UNK	0
174	**70**	**SA**	**India**	**VAHS**		**Rajkot International Airport**	**UNK**	**0**
175	71	SA	India	VISR	Srinagar		UNK	0
177	**72**	**SA**	**India**	**VOTP**		**Tirupati Airport**	**UNK**	**0**
180	**73**	**SA**	**India**	**VOVZ**	**VISAKHAPATAN**		**UNK**	**0**
222	74	NA	Japan	RJAH	Hyakuri		UNK	0
227	75	NA	Japan	RJNK	Komatsu		UNK	0
244	76	NA	Japan	RJOS	Tokushima		UNK	0
248	77	NA	Japan	RJOH	Yonago	Miho	UNK	0
285	78	PAC	Micronesia	PTSA	Kosrae I.	Kosrae	UNK	0
286	79	NA	Mongolia	ZMCD	Dornod	Choibalsan	UNK	0
306	80	PAC	N. Mariana Is.	PGWT	Tinian I.	West Tinian Tinian Intl	UNK	0
341	81	PAC	Solomon Islands	AGGM	Munda		UNK	0
345	82	SA	Sri Lanka	VCCJ	Jaffna		UNK	0
363	83	PAC	Vanuatu	NVVW	Tanna	Tanna	**UNK**	0
365	84	SEA	Viet Nam	VVDL	Da Lat	Lien Khuong	**UNK**	**0**

Notes:

1) **Australia:** Need to finalize the Table AOP II -1, APAC ANP V-II.

2) **US**

(1) Tinian I./West Tinian [PGWT] for N. Mariana Is. should be added in Table AOP I – 1 of APAC ANP V - I and Table AOP II – 1 of APAC ANP V - II.

(2) JOHNSTON ATOLL/Johnston I (PJON) should be withdrawn from Table AOP I – 1 of APAC ANP V - I and Table AOP II – 1 of APAC ANP V - II as it had been permanently closed.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

REGIONAL GUIDANCE FOR THE DESIGN AND OPERATION OF ALTIPORTS

[DRAFT]

First Edition, ../../ 2024

This Guidance Material was developed by AP-ADO/TF and approved by the AOP/SG/.. Meeting and published by ICAO Asia and Pacific Office, Bangkok

RECORD OF AMENDMENTS

AMENDMENTS			
No.	Date Applicable	Date Entered	Entered by:

AMENDMENTS			
No.	Date Applicable	Date Entered	Entered by:

Table of Contents

CHAPTER 1. GENERAL

1.1 Introduction

1.1.1 This regional guidance material provides general guidance on altiport's site selection, physical characteristics, obstacle limitation surfaces and visual aids that should be provided at altiports, as well as certain facilities and technical services normally provided at conventional land aerodromes.

1.1.2 Stolport Manual (Doc 9150) defines an ALTIPORT as "a small airport in a mountainous area with a steep gradient runway, used for landing up the slope and for take-off down the slope, thereby making use of only one approach/departure area." (FOREWORD, para 4 refers)

1.1.3 Most of the Annex-14 Volume - I and Stolport specifications may not be applicable to altiports which are constructed in mountainous regions, though some of the STOL aeroplanes in use today are designed to operate from altiports.

1.1.4 As no standards and recommended practices (SARPs) for altiports exist in any of the ICAO documents, this guidance material covers all the aircraft operating aspects of altiports except non-visual navigation aids. The airport terminal building and ground side operations are not addressed in this document.

1.1.5 Since altiports are generally operated under visual meteorological conditions (VMC), the provisions described below are limited to this type of operation [6]:

a) An altiport has at least:

- a steeply sloped runway extended at the top by a low-sloped segment itself associated with a substantially horizontal platform comprising the waiting and parking areas; and/or
- a unique approach and take-off path, which itself is supported by the lower end of the runway strip.

b) The lower part of the steep slope of the runway can be usefully extended by a segment of less steep slope[1] allowing the pilot:

- to make contact more comfortable on landing;
- to have a better view of the end of the runway during the take-off roll prior to take-off;
- <u>to limit the length of the runway necessary for a maneuvering during the accelerating-stop in case of one engine failure while an aeroplane is in take-off run</u> [2].

c) The design of an altiport is based on the idea that, since take-off is downhill and landing is uphill, the steep segment of the runway is used as an additional factor of acceleration on take-off and deceleration on landing to reduce the length required for both, and thus allow an aerodrome to be located at the site to be served. This principal characteristic of altiport runways **<u>is not without posing important problems</u>** for the operation of

[1] *nevertheless, higher than the maximum permissible slope for the runways of conventional aerodromes.*
[2] *minimum requirement for multi-engine aeroplanes carrying more than ten passengers or having a maximum take-off mass of 5,700 kg or less.*

aeroplanes, the use of which are used in the domain of non-conventional flight.

d) The average longitudinal slopes that can be found on altiports are outside the correction ranges covered by the flight manual charts and would require large extrapolations, leading to **aeroplanes intended for use on altiports being subject to additional certification**.

e) However, for altiports intended to receive only light aeroplanes, a simplified method for determining their runway lengths will be used, as described in Attachment A, Section 1.

f) It should be noted that the classical definitions of take-off and landing on conventional runways do not apply to altiports, for which the passages at 35 ft for take-off and 50 ft for landing have no meaning, and that the length to be given to the runway only refers to the take-off speed at which the aircraft leaves the ground after having initiated its take-off roll as well as, possibly, to the accelerated-stop distance of the most critical aeroplane.

Notes: -

1) *At altiport an engine failure is not considered during take-off and climb out until reaching safety altitude of 400 ft above ground level (altiport elevation). Likewise, during approach an engine failure is not considered beyond missed approach point. (Refer to "Supplement No. 178R2 of LET410 UVP-E20, Page, 3, 6 & 8 of 18" [14])*

2) *If an engine fails after the decision speed is reached, the aeroplane will have sufficient speed and power available to complete the take-off safely in the remaining take-off distance available. However, because of the high speed, there would be difficulty in stopping the aeroplane in the remaining accelerate-stop distance available [2.3 of Section 2, Attachment A of Annex 14, Volume I].*

1.2 Altiport design aeroplanes

1.2.1 For the purposes of this guidance material, the altiport design aeroplane is assumed to be an aeroplane with short take-off landing (STOL) performances that has a reference field length of **800 m or less**. In size, the altiport design aeroplane is assumed to have a wingspan of **15 m up to but not including 24 m** and an outer main gear wheel span (OMGWS) of **4.5 m up to but not including 6 m**. In terms of maximum take-off mass, the altiport design aeroplane is assumed to have a maximum take-off mass of **5,700 kg or less**.

Note:-

STOL operations of Dornier 228 are limited for maximum take-off mass of 5,700Kg (Supplement No 1131, Dornier 228). However, such information is not available in Supplement No. 178R2 of L410 UVP-E20.

1.2.2 List of aeroplanes with STOL performance currently being operated at altiports in Indonesia and Nepal are provided in **Appendix 1**.

1.3 Definitions

Refer to *Annex 14 Aerodromes, Volume I Aerodrome Design and Operations* for definitions of terms used for land aerodromes.

When the following terms are used in this manual they have the following meanings:

Altiport. ~~A small airport~~ An aerodrome in a mountainous/hilly terrain with a short runway and a steep ~~gradient runway~~ longitudinal slope, used for landing up the slope and for take-off down the slope, thereby making use of only one approach/departure ~~area~~ path in most of the cases and where operations are possible only by aeroplanes with STOL performance capabilities.

Stolport. An airport whose physical characteristics, visual and non-visual aids and total infrastructure are created to support safe and effective public air transport in and out of densely populated urban areas as well as to and from rural areas with difficult terrain.

1.4 Applicability

1.4.1 This guidance material is meant for the use of altiport planners and the appropriate airport authorities in examining the feasibility of altiport operations at existing aerodromes or other sites and in the planning, design and approval of altiports. Interpretation of the material requires the exercise of discretion and the making of decisions, particularly by the airport authorities.

1.5 Site Selection

1.5.1 Before a commitment of resources is made to establish an altiport in a mountainous area, there should be recognized social, environmental, economic, and operational advantages over existing transportation systems. These advantages hinge on the potential of greatly reducing trip time by providing service from urban areas to remote mountainous areas.

1.5.2 An altiport with a short runway requires a protection of less airspace compared to that needed for conventional airport due to the possibility of providing steep obstacle limitation surfaces allowing a greater flexibility in locating the altiport site.

1.5.3 Once an altiport site is provisionally selected, planning authorities will have to consider the details of construction and application of altiport specifications. This consideration might include a series of demonstration flights. The flights would serve several purposes. The community would be reassured about the safety and compatibility of altiport operations; the effects of air turbulence caused by hills could be tested; and route structures and air traffic service (ATS) separation standards could be established.

1.5.4 At the same time, the site would be examined with respect to the provision/or availability of ground transportation up to the nearest possible location from the feasible altiport site, without which some advantage is lost. Another important consideration governing site selection is the nature and composition of the soil and subsoil upon which prepared surfaces will be supported and, in particular, the adequacy of drainage to prevent the erosion of surfaces. Detailed guidance on airport site evaluation and selection is given in the *Airport Planning Manual (Doc 9184), Part 1 – Master Planning*.

1.5.5 Lastly, having established an altiport location, planners will turn to the design using the descriptions provided in this manual to define the physical characteristics, obstacle limitation surfaces and visual aids. This guidance is contained in the following chapters.

CHAPTER 2. ALTIPORT DATA

2.1 General

2.1.1 *Annex 14, Volume I, Chapter 2* sets forth details of aerodrome data to be determined about aerodromes and reported to the appropriate aeronautical information services (AIS). Where applicable, these requirements should be met by an altiport.

2.1.2 Where the use of an altiport is restricted to a particular aeroplane type, the appropriate aeronautical information service should be informed.

2.1.3 Altiport data should be reported as prescribed in *Annex 15* and *PANS-AIM (Doc 10066)*.

CHAPTER 3. PHYSICAL CHARACTERISTICS

3.1 General

3.1.1 The planning of an altiport comprises the development of suitable physical characteristics to provide the necessary operating elements for services by the altiport design aeroplanes. In addition, capacity or the forecast rate of utilization should be considered by the planner. The maximum rate of use is dependent on such factors as demand, weather and air traffic control capabilities as much as on altiport features. Although the characteristics described in this chapter are meant only to provide safe and effective field lengths and clearances, it is likely, in light of such external factors, that an altiport whose physical characteristics conform to this chapter could handle any forecast frequency of service.

3.2 Runways

3.2.1 Orientation of runway

3.2.1.1 This guidance material is developed for design and operations of altiport to be used only in visual meteorological conditions and intended for use by day only.

3.2.1.2 It is anticipated that the configuration for the most altiports would be a single runway in which operations are restricted to landing uphill and taking off downhill and an associated parking area (Figure 3-1).

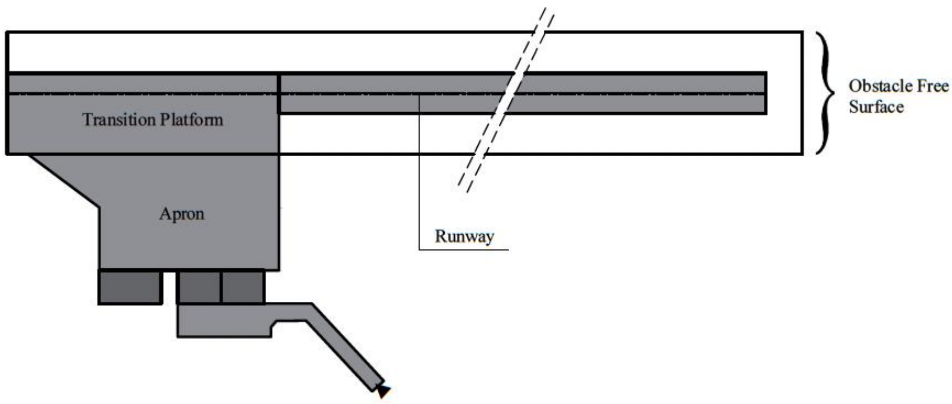


Figure 3 – 1: Schematic diagram of an altiport with paved runway

3.2.1.3 An altiport sites may lessen the opportunity for an ideal runway orientation in the direction of the prevailing wind due to topography of the site. Nevertheless, altiport design should aim for maximum usability factor and the orientation of the runway should take into account of crosswind limitation of the altiport design aeroplane. Guidance on factors to be taken into account in the study of wind distribution is given in *Annex 14, Volume I, Attachment A, Section 1*.

3.2.1.4 The decision on runway orientation should also take into account areas over which traffic will operate on approach, missed approach and departure so that obstructions in these areas or other factors will not unduly restrict operations.

3.2.2 Runway length

3.2.2.1 The length of an altiport runway should be determined using take-off and landing performance charts obtained from the aeroplane flight manual of the altiport design aeroplane and considered together with the following factors:

a) whether the approaches are open or restricted;

b) longitudinal slope of the proposed runway;

c) elevation of the site;

d) temperature and humidity of the site; and

e) nature of the runway surface.

3.2.2.2 When the appropriate aeroplane flight manual is not available the length of an altiport runway may be determined as described in **Section 1 of Attachment A**.

3.2.3 Clearways

3.2.3.1 Where a clearway is provided, an actual runway length less than that suggested by 3.2.2.1 may be considered satisfactory. In such a case any combination of runway, and clearway should meet the take-off and landing requirements of the altiport design aeroplane, taking into consideration the same factors as in 3.2.2.1. The guidance on the use of clearways given in *Annex 14, Volume I, Attachment A, Section 2,* is applicable to altiports.

3.2.4 Runway width

3.2.4.1 Detailed guidance for determination of runway width for altiport is provided in **Section 2 of Attachment A**.

3.2.4.2 For paved runways, the absolute minimum width of **18 m** is recommended for use in visual meteorological conditions and intended for use by day only.

3.2.4.3 For unpaved runways, the minimum width of the runway should be at least the width of the graded portion of the runway strip or **60 m**.

3.2.4.4 The site selection and orientation of a runway in the mountains is generally quite constrained, so particular attention must be paid to crosswinds in determining the width of the runway beyond the minimums thus recommended above.

3.2.5 Slopes on runways

Longitudinal slopes of the runway

3.2.5.1 The slope computed by dividing the difference between the maximum and minimum elevation along the runway centre line by the runway length should not exceed **10 per cent**.

3.2.5.2 Along no portion of a runway should the longitudinal slope exceed **15 per cent**.

3.2.5.3 The longitudinal slope of the upper segment of the runway (at least 1/6 of the length of the runway) should not exceed **3 per cent**.

3.2.5.4 The longitudinal slope of the lower segment of the runway (at least 1/3 of the length of the runway) should not exceed **3 per cent**.

Note:-

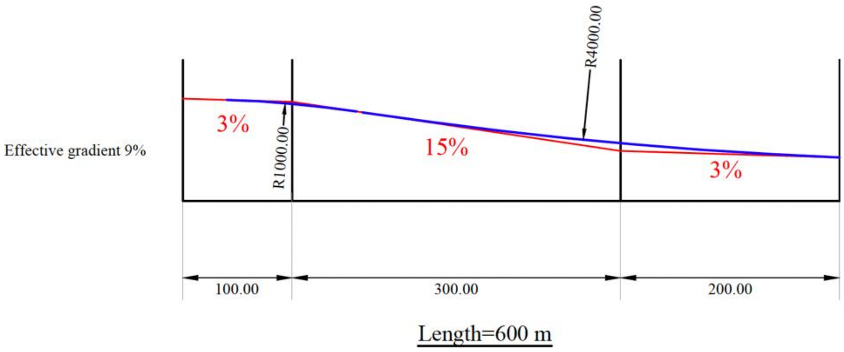
If landing is to be conducted downhill the slope (opposite direction compared to normal landings at altiports) due to excess tail wind and a favorable less steep slope of the runway, the length of the upper segment *of the runway should not be less than one-fourth of the length of the runway.*

Longitudinal slope changes

3.2.5.5 In longitudinal profile, the transition from:

a) the upper segment of the runway to the segment with the steep slope should be accomplished by a curved surface with a rate of change not exceeding 3.4 per cent per 30 m (minimum radius of curvature of 1,000 m); and

b) one slope to another slope at any segment of the steep sloped runway and between last segment of the steep sloped runway and lower segment of the runway should be accomplished by a curved surface with a rate of change not exceeding 0.85 per cent per 30 m (minimum radius of curvature of 4,000 m).



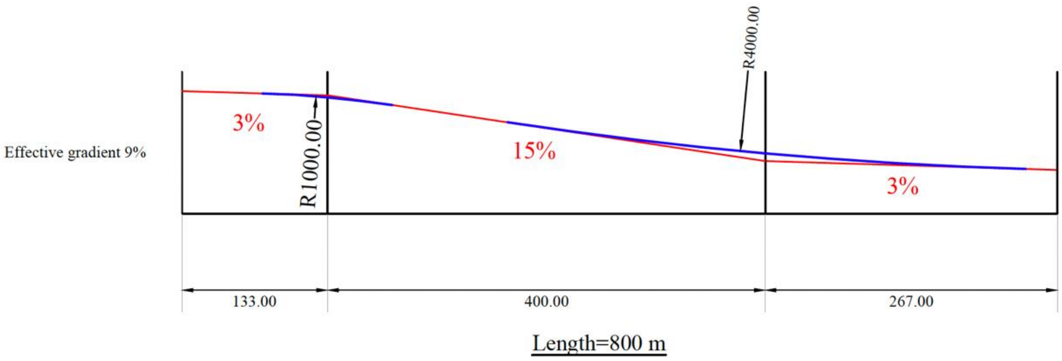


Figure 3 – 2: Schematic longitudinal profile of runway

Distance between slope changes

3.2.5.6 Undulations or appreciable changes in slopes located close together along a runway with steep slope should be avoided. The distance between the points of intersection of two successive curves should not be less than:

a) the sum of the absolute numerical values of the corresponding slope changes multiplied by minimum radius of curvature of 3,000 m; or

b) 45 m;

whichever is greater.

3.2.5.7 Guidance on implementing this specification is given in *Annex 14, Volume I, Attachment A, Section 4.*

Transverse slopes of runway

3.2.5.8 To promote the most rapid drainage of water, the runway surface should either be cambered or sloped from high to low in the direction of the wind most frequently associated with rain. A transverse slope should not exceed **2 per cent** for paved and **2.5 per cent** for unpaved runways. For a cambered surface the slope on each side of the centre line should be symmetrical.

3.2.5.9 The transverse slope should be substantially the same throughout the length of the runway except at the intersection with a taxiway where an even transition should be provided taking account of the need for adequate drainage.

3.2.5.10 Guidance on transverse slopes is given in the *Aerodrome Design Manual (Doc 9157), Part 3*.

3.2.6 Strength of runways

3.2.6.1 A runway should have a bearing strength capable of supporting continual traffic of the altiport design aeroplane along the length of the declared take-off run or the declared landing distance, and throughout its full width.

3.2.6.2 A normal landing may impose little or no impact load on the landing surface. However, the load factors arising from an emergency, or a badly controlled landing should be considered.

3.2.7 Surface of runways

3.2.7.1 The surface of an altiport runway should be constructed without irregularities that would affect aeroplane performance during take-off or landing. Surface unevenness that would cause vibration or other control difficulties of an aeroplane should be avoided. Guidance on runway surfaces is given in the *Aerodrome Design Manual (9157), Part 3.*

3.2.7.2 Special attention must be paid to the construction of the upper layers, which is difficult due to the existence of a fairly steep slope. The possibility of more rapid erosion due to this slope should also be considered.

3.2.7.3 The texture of the surface of an altiport runway requires special attention in view of the short-field landing requirements. A rough texture surface that is conducive to braking should be used. Where aquaplaning from poor drainage is anticipated to be prevalent, considerations should be given to grooving the runway surface. A grooved surface has been shown to be effective in providing braking action on wet runways. Guidance on methods used to measure surface texture is given in the *Airport Services Manual (9137), Part 2*, while guidance on grooving runways is contained in the *Aerodrome Design Manual (9157), Part 3*.

3.3 Runway strips

3.3.1 General

3.3.1.1 The runway should be included in a runway strip. The purpose of a runway strip is to provide for the following operational considerations:

a) a graded area for aeroplanes accidentally running off the runway;

b) a cleared area for aeroplanes drifting from the runway after take-off;

c) a cleared area for aeroplanes carrying out a missed approach;

d) an area for the installation of essential visual aids; and

e) an area for drainage and run-off from the runway.

3.3.2 Runway strip width and length

3.3.2.1 A runway strip is an area free of any obstacle containing at least the runway including its upper segment and the lower segment.

3.3.2.2 To allow the best use of the whole length of the runway, it is recommended to extend the strip beyond the upper end of the paved runway by **a length at least equal to half of the maximum wingspan** of the critical altiport design aeroplane.

3.3.2.3 In the case of a paved runway only, the strip shall extend **30 m** beyond the lower end of the runway.

3.3.2.4 An altiport runway strip width of at least **30 m** on either side of the runway centre line is adequate for day-time operations in visual meteorological conditions.

3.3.3 Graded areas

3.3.3.1 To provide for a) in 3.3.1.1, the portion of a runway strip outside the runway and within a distance of **30 m** from the centre line of the strip should be graded. The surface of that portion of the runway strip that abuts the runway edge should be flushed with the surface of the paved runway.

3.3.3.2 To protect a landing aeroplane from the danger of an exposed edge, the runway strip should be prepared against blast erosion to at least **30 m** before the start of a runway.

3.3.3.3 Where deemed necessary for proper drainage, an open-air storm water conveyance may be allowed after the graded portion of a runway strip and would be placed as far as practicable from the runway.

3.3.4 Longitudinal and transverse slopes of runway strips

3.3.4.1 The longitudinal slope of the lateral parts of the strip should preferably be identical to that of the runway.

3.3.4.2 When carried out, snow and ice removal must be done on the width of the paved runway. A 0.50 m difference in level at the edge of the runway followed by a 15% upward slope to the lateral limit of the strip may be allowed on both sides [6].

3.3.4.3 When the runway **-** whether paved or unpaved **-** is only groomed, the grooming must be carried out over a minimum width of 30 m, beyond which an upward slope, at a maximum of 15 %, will be extended up to the lateral limit of the strip [6].

3.3.4.4 The transverse slopes on runway strips should conform to those specified in *Annex 14, Volume I*, for a strip associated with a runway with code number 1.

3.3.5 Objects on runway strips

3.3.5.1 For safety considerations, no object, unless essential as an aid to air navigation, should be installed on a runway strip. Air navigation equipment that must be located on a runway strip should be marked, be of minimum mass and height, and frangibly designed so as to constitute the minimum hazard to aircraft. Frangibility requirements are set out in *Annex 14, Volume I, Chapters 3, 5 and 9.*

Note.— Guidance on design for frangibility is contained in the Aerodrome Design Manual (Doc 9157), Part 6.

3.4 Taxiways

3.4.1 General

3.4.1.1 As mentioned in 3.2.1.2, the likely configuration of an altiport is a single runway served by taxiway (s) (if provided) or upper transitional platform to link the apron (See Figure 3 - 3 and Figure 3 – 4).

3.4.1.2 A taxiway should be designed so that when the cockpit of the design aeroplane is over the taxiway centre line markings, the clearance distance between the outer main wheel of the aeroplane and the edge of the taxiway should not be less than **2.25 m**.

3.4.1.3 When designing taxiways at an altiport, the specifications should conform to the Standards and Recommended Practices described in Annex 14, Volume I, Chapter 3. Guidance on design of taxiways is given in the *Aerodrome Design Manual (9157), Part 2*.

Figure 3 - 3: Taxiway linking to apron (Alpe d'Huez Airport, France)

3.5 Aprons

3.5.1 General

3.5.1.1 It will be necessary to provide an apron to permit the loading and unloading of passengers and cargo as well as aircraft servicing without interfering with altiport traffic. The distance from the edge of an apron to the edge of a runway strip should be sufficient for an aeroplane parked on the apron not to penetrate the transitional surface.

3.5.1.2 The upper platform of an altiport consists of:

- the upper part of the runway that can be used for landing or take-off maneuvers;
- a transitionl platform (or holding area as shown in Figure 3-4) where aircraft perform engine tests at the start up point, which can also be used as a turning pad, or a taxiway link (as shown in Figure 3-3); and
- the apron (aircraft parking area).

3.5.1.3 These components can be unpaved or paved.

3.5.1.4 Except on the upper segment-of the runway, which may be sloped up to **3 per cent**, the slope of the upper platform shall not exceed **2 per cent** in any direction. On an aircraft parking stand area, the maximum slope should not exceed **1 per cent**.

3.5.1.5 Where it is practically not possible to locate the apron at the upper platform the apron with taxiway may be located at other appropriate places if the topography and the longitudinal slope of runway permit (as shown in Figure 5-1).

Figure 3 – 4: Transition platform (Courchevel Altiport, France)

3.5.1.6 Side-by-side parking of aeroplanes and helicopters is not recommended. Since helicopters frequently use the altiports[3], it is recommended to reserve a specific parking area for them.

3.5.1.7 The Figures 3 -1 and Figure 3 – 2 show a schematic diagram of an altiport with a paved runway as well as the longitudinal profile of the runway in its simplest configuration.

3.5.2 Size of aprons

3.5.2.1 The necessary altiport capacity to handle planned or predicted altiport traffic will be the main determinant in establishing an apron's size. An apron's size should be sufficient to contain an adequate number of aircraft parking bays or spaces to cater to the altiport's traffic volume at its highest level.

3.5.2.2 As the number of aircraft parking bays or spaces required will depend, in part, on parking bay occupancy or turnaround time, aircraft operators intending to use the altiport should be consulted with respect to scheduling and other matters that affect the time an aeroplane needs to occupy the apron.

3.5.2.3 The size of an apron will also be governed by the size of the altiport design aeroplane and the parking method selected for use on the apron. While nose-in parking uses less space, economy and convenience will probably dictate self-manoeuvring, angled nose-in or angled nose-out parking. Figure 3-3 depicts a typical altiport apron.

[3] *In this case, the helicopters do not use the steep runway but a final approach and take-off area specifically dedicated to them.*

Figure 3 – 5: Example of typical altiport apron (Tenzing Hilary Altiport, Lukla, Nepal)

3.5.3 Strength of aprons

3.5.3.1 An apron should have sufficient bearing strength to support the mass of the altiport design aeroplane, keeping in mind that parts of the apron will be subject to higher stresses owing to slow moving and stationary aeroplanes and other vehicles/equipment.

3.5.4 Slopes of aprons

3.5.4.1. The slopes of an apron should be sufficient to prevent accumulation of water but should not exceed **1 per cent** in any direction.

3.5.4.2. Because of the possibility of spilled fuel and the ensuing fire hazard, an apron should not slope down towards a terminal building.

CHAPTER 4. OBSTACLE LIMITATION SURFACES

4.1 General

4.1.1 Obstacle limitation surfaces are established to define the airspace over and around an altiport that must be kept free of obstacles. The obstacle limitation surface sets out the limits above which objects should not extend.

4.1.2 In the planning and design of an altiport, obstacle limitation surfaces require careful consideration. In fact, the presence of objects located in the vicinity or planned for construction near an otherwise suitable altiport site may be the overriding factor in whether an altiport will be a realistic project. The operation of an altiport may be significantly affected by features beyond the altiport boundary such as buildings, bridges and towers or mountains, hills etc. Objects that penetrate the obstacle limitation surfaces described in this chapter may, therefore, impose take-off mass limitations, cause an increase in weather minima or both. They may also necessitate the displacement of the threshold.

4.1.3 Once a commitment is made to the establishment of an altiport, the sectors of the local airspace covered by the obstacle limitation surfaces should be regarded as integral to the altiport and therefore inviolable. Consequently, enactment of zoning legislation may be needed to preserve unobstructed airspaces for take-off, approach, missed approach and circling procedures. Legislation aside, the altiport authorities should be involved in community consultation and should maintain close liaison with local development planners to ensure that altiport requirements are included in forecasts and well-integrated into plans.

4.1.4 Altiport obstacle limitation surface requirements are normally set on the assumption that take-offs and landings will be made in a single direction. Therefore, the functions of surfaces may be integrated and the requirements of one surface nullified because of the more stringent requirements of another.

4.1.5 The obstacle limitation surfaces to be defined at an altiport will depend on terrain and the type of operation envisaged at the altiport. At the very minimum, for daytime operations in visual meteorological conditions, the surfaces requiring protection are the take-off and approach surfaces and the transitional surface.

4.1.6 Obstacle limitation surfaces (OLS), specified in Annex 14 Volume I for aerodromes reference code 1are not suitable for altiports.

4.1.7 Criteria for evaluating obstacles are contained in the *Procedures for Air Navigation Services - Aircraft Operations PANS OPS (Doc 8168,)* Volume II - Construction of Visual and Instrument Flight Procedures.

4.2 French practices for altiport OLS

4.2.1 The variety of runway configurations that can be encountered means that the obstacle limitation surfaces for an altiport can only be chosen after a study of the approach and departure procedures of the aeroplane.

4.2.2 The description given below of the obstacle limitation surfaces associated with a unique approach and take-off path is therefore only indicative and is only intended to provide guidance for altiport planners.

Approach/take-off surfaces

4.2.3 The characteristics in the shape and size of the obstacle limitation surfaces indicate that there is not any difference between approach/take-off surfaces.

4.2.4 The longitudinal profile of the centreline of the approach/take-off surface as shown in Figure 4 - 1 is generally characterized by:

a) a segment Δ_1 originating at lower side of the strip and having a negative slope at least as steep as that of the centreline of the lower segment of the runway (if slope of centreline of the lower segment of the runway is horizontal or positive then the slope should be equal to the runway strip);

b) a horizontal segment Δ_2; and

c) a segment having positive slope Δ3, the length of which is sufficient for the aircraft on take-off to clear the surrounding obstacles.

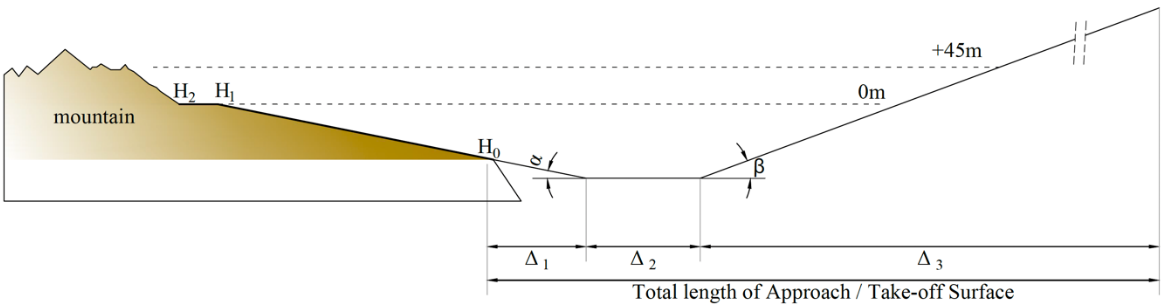


Figure 4 – 1: Longitudinal profile of the approach/take-off surface

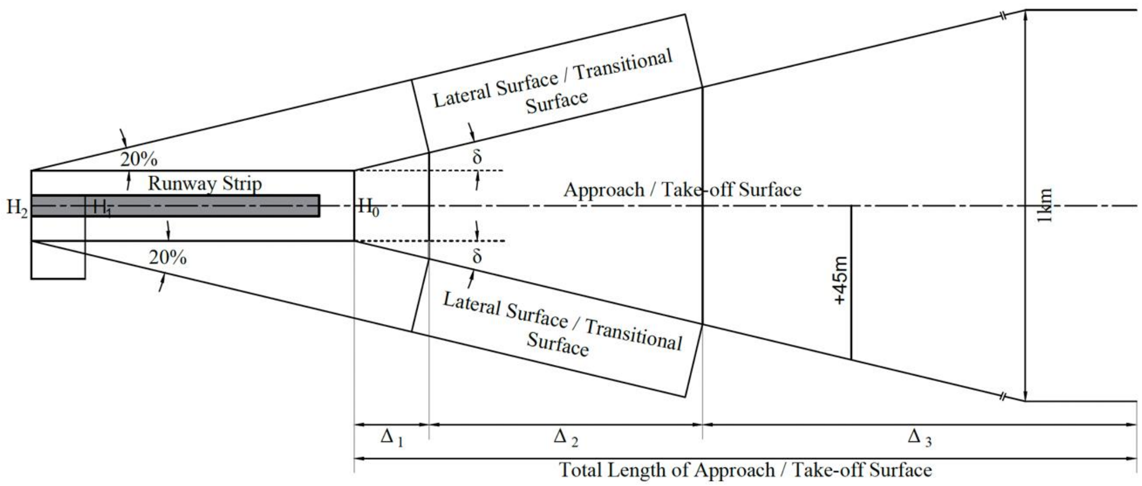


Figure 4 – 2: Plan of altiport approach/take-off surface and lateral/transitional surface

4.2.5 Since the total length of the approach/take-off surface must not be less than **2,000 m**, the values of Δ1, Δ2 and Δ3 will be set on a case-by-case basis according to:

a) the reference code corresponding to the most critical design aeroplane to be served by the altiport to select the slope (β); and

b) the operating constraints specific to the site studied.

<u>Note:</u> *The value of β may be taken 6% or 15:1 as per STOLPORT manual.*

4.2.6 The plan view of Approach and Take-of Surface is shown in Figure 4-2 and is generally characterized by:

a) an inner edge of specified length (equal to width of runway strip), horizontal and perpendicular to the extended centre line of the runway and located at the outer end of the strip;

b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate (with the divergence δ being at least **20 per cent** but never exceeding the value of 30 per cent**)** from the extended centre line of the runway until it reaches **1 km**;

c) an outer edge parallel to the inner edge, and beyond that, the width of the approach and take-off surface remains constant and equal to 1 km;

d) the above surfaces shall be varied when lateral offset, offset or curved approaches are utilized, specifically, two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the lateral offset, offset or curved ground track;

e) the elevation of the inner edge shall be equal to the elevation of the midpoint of the threshold; and

f) the slope(s) of the approach surface shall be measured in the vertical plane containing the centre line of the runway and shall continue containing the centre line of any lateral offset or curved ground track.

Transitional Surfaces (Lateral Surfaces)

4.2.7 The transitional surfaces consist of two surfaces at either side of the runway. The lower and upper limits of these Transitional (Lateral) Surfaces, are:

a) on the lower edge, the limit is defined by the length of the strip along the edge of the strip and from there extending along the bottom of the approach/take-off surface up to the first two segments of longitudinal profile (Δ1 and Δ2 and) defined above; and

b) on the upper edge, the horizontal lines originating from the upper corners of the strip and forming a divergence of **20 per cent (**but never exceeding the value of 30 per cent) with the vertical plane containing the runway centreline.

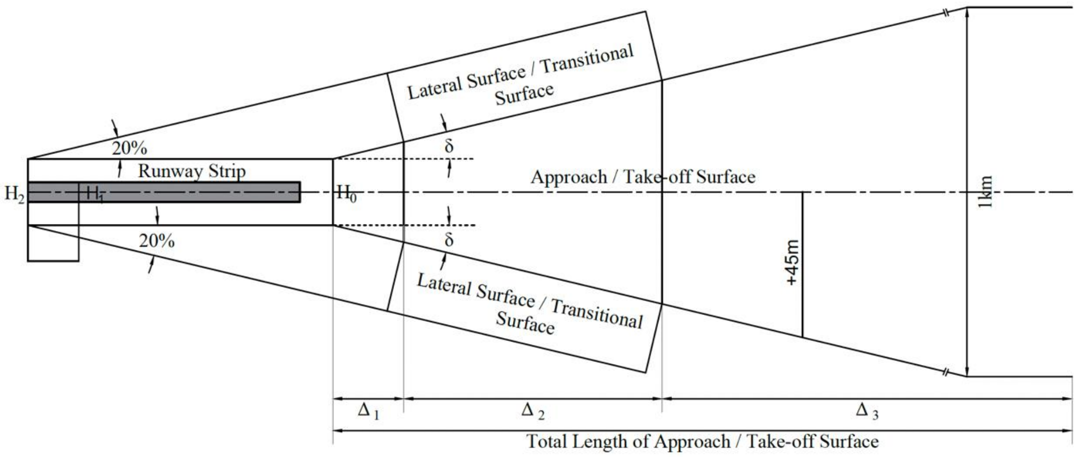


Figure 4 – 3: Plan of altiport approach/take-off surface and lateral/transitional surface

Inner horizontal surface

4.2.8 The selected site must also allow an aeroplane to make a low-level circling over the facilities before landing in order to ensure, if necessary, that the runway is clear on its upper segment.

4.2.9 The conditions of circling will also be the subject of a specific study, the conclusions of which will be associated with the extent of an inner horizontal surface. This surface will be positioned at a minimum height of 45 m, measured from upper platform, this surface will cover an area within a circular sector, centered on the upper platform, with a radius of 2,000 m and with sufficient opening (at least minimum of **65 degrees** towards each side of the runway centreline) to allow circling of a critical aircraft selected for the altiport.

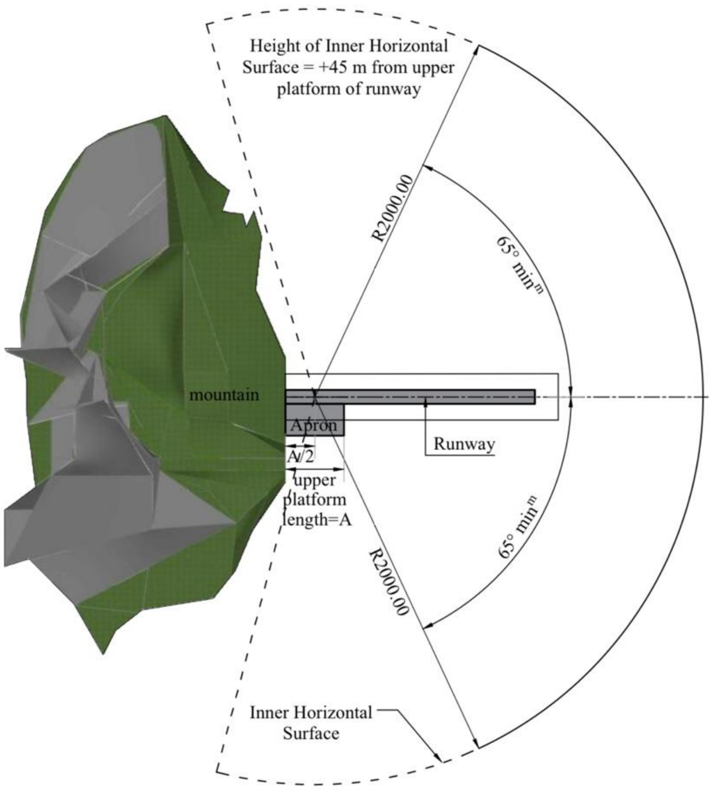


Figure 4 – 4: Inner Horizontal Surface

Missed approach surfaces

4.2.10 It is also recommended to provide a missed approach surfaces to protect the missed approaches.

4.2.11 When the terrain permits this missed approach surfaces can be constructed to be aligned as an extension of the runway (in the case of altiport with mountain pass) as shown in Figure 4-5 below. Its characteristics (width, slope and divergence) of lower edge will match with the take-off climb surface of a runway with normal characteristics (on conventional aerodromes) accommodating the same types of aircraft.

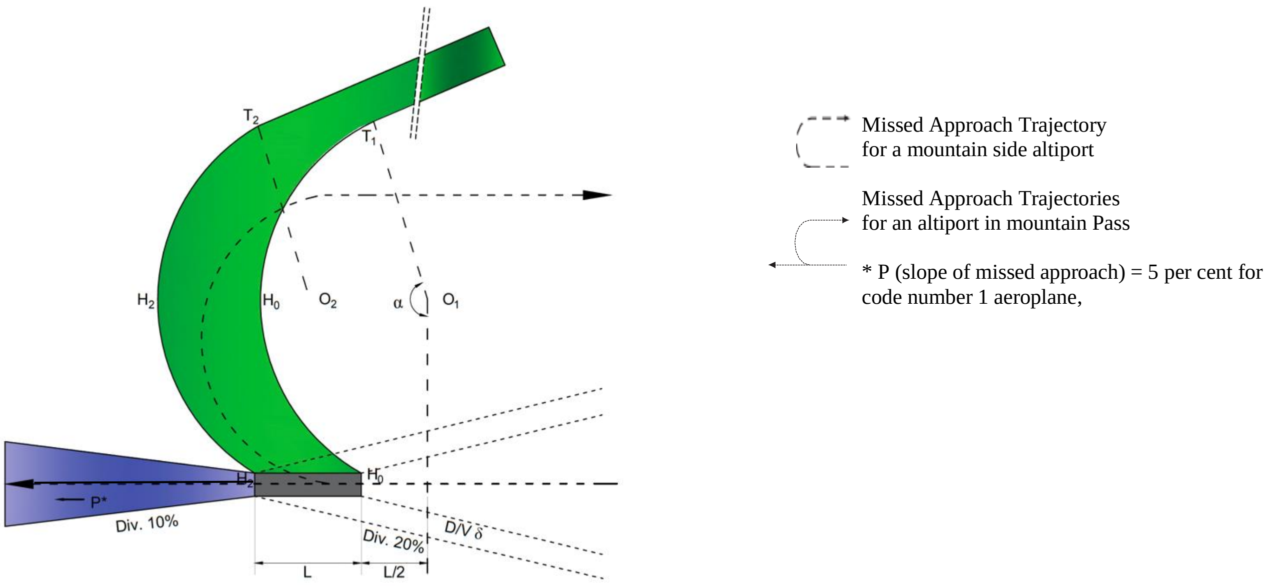


Figure 4 – 5: Missed approach surfaces (Plan)

4.2.12 However, when the terrain does not allow the missed approach to continue along the extension of the runway (e.g. altiports on the side of a mountain), the missed approach can only be carried out laterally (See Figure 4 – 5 with curved missed approach surface and Figure 4 –6).

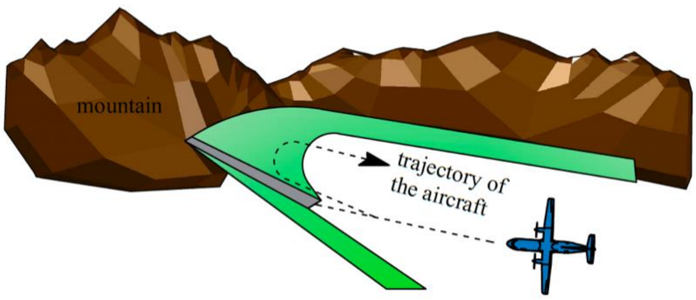


Figure 4 –6: Missed approach surfaces at altiport on a mountain side

4.2.13 The obstacle limitation surfaces protecting the missed approach should be constructed as shown in Figure 4-5, on the side where the missed approach is to be carried out:

a) the horizontal half-plane having elevation H_o as of the lower end of the strip;

b) the defined surface (cylindrical then flat) whose origin will be contained in a plane parallel to the center line of the runway and whose directions will be successively:

i. two horizontal arcs of a circle with elevations Ho and H2 (the latter being that of the upper side of the runway strip), each having a radius of at least 600 m, tangent to the plane containing centreline of the runway and the arc length of sectors (of circles) will be equal to the minimum angle (α) of the turn (depending on the terrain) to be carried out by the aircraft; and

ii. the horizontal tangents at the end of each of these two arcs (as shown in Figure 4 – 5 **as T1 and T2**).

4.2.14 The circular arc at elevation Ho should be centered at the extended runway centre line at a distance equal to one-half of the length of its main segment with a steep slope, from its lower end.

4.2.15 The arc at elevation H_2 shall be centred at the midpoint of the runway centre line.

4.2.16 As far as possible, this lateral missed approach surface should complement the missed approach surface along the extended centerline of the runway as shown in Figure 4-7, when the latter can be provided.

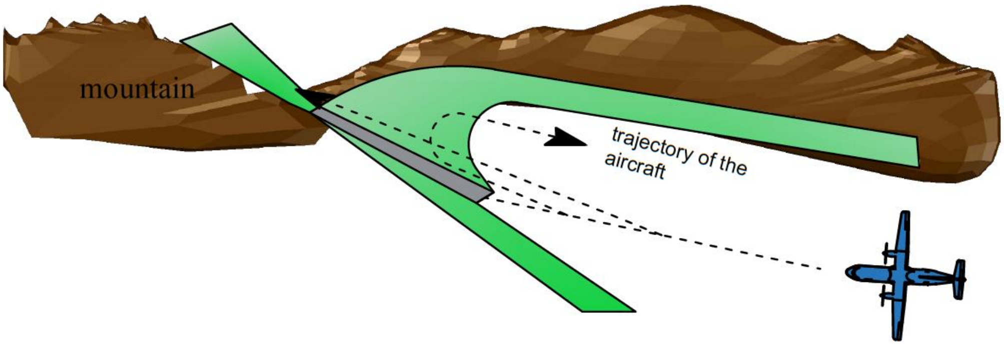


Figure 4 – 7: Missed approach surfaces at altiports in mountain pass or on dome shaped landforms

CHAPTER 5.   VISUAL AIDS FOR NAVIGATION

5.1   General

5.1.1 In general, the specifications of Annex 14 Volume I for indicator and signalling devices, markings, lights, signs and markers are applicable for altiports.

5.1.2 Centre line marking is optional for unpaved runways; however, it may be necessary, at least on the upper part of the runway, to compensate for the lack of visibility caused to the pilot by the change of slope at the beginning of the rolling phase before take-off.

5.1.3 When an altiport is kept in operation without being cleared of snow, the edges of its runway will be marked with red flags spaced **25 m** apart.

5.1.4 Since an altiport can be subject to rapid variations in wind direction and intensity, it is necessary to have a windsock near the holding area for aeroplane taking off, and another at the runway threshold for aeroplane landing, since the conditions at these two points can be very different.

5.1.5 The visual aids provided at an altiport must serve to provide the pilot with the elements of guidance required to execute safe operations at the altiport.

5.2   Markings

5.2.1 The markings described in this chapter are suitable for altiport operations in visual meteorological conditions. Markings should be conspicuous and provide the maximum possible contrast under various conditions.

5.2.2 Runway markings should be white; taxiway and aircraft stand markings should be yellow and of a consistency that will reduce the risk of uneven braking.

5.3   Runway markings

5.3.1   Runway designation marking

5.3.1.1 A runway designation marking should be provided at the thresholds of a paved and unpaved runway as practicable. It should consist of a two-digit number that is the whole number nearest the one tenth of the magnetic azimuth of the centre line of the runway measured clockwise from magnetic north when viewed from the direction of approach. However, where an altiport is located in an area of compass unreliability a runway designation marking should display true azimuth rather than magnetic azimuth. Runway designation marking shall be in accordance with Annex 14, Volume I, Chapter 5, 5.2.2 as applicable.

5.3.2   Threshold marking

5.3.2.1 A runway threshold should be marked on paved runway with a series of white stripes **15 m** long, **1.8 m** wide, spaced 1.8 m apart located at the runway end.

5.3.2.2 A runway threshold marking should consist of a pattern of longitudinal stripes of uniform dimensions disposed symmetrically about the centre line of a runway. The number of stripes should be **4** for the runway width 18 m.

5.3.2.3 Where the threshold of an altiport runway is a displaced threshold, the beginning of the altiport runway should be indicated by a transverse stripe at least **1.8 m** wide. The portion of the runway before the displaced threshold should be marked with arrows and all other markings should be obliterated.

5.3.2.4 The arrows leading to a displaced threshold should be spaced at intervals of **30 m** with the point of the arrow immediately preceding the displaced threshold at **30 m** from the transverse stripe.

5.3.2.5 Guidance on the form and dimensions of the arrows are set out in Figure 5-4 A and B of *Annex 14, Volume I.*

5.3.3 Aiming point marking

5.3.3.1 An aiming point marking for paved runway should be provided at **150 m** from the threshold.

5.3.3.2 An aiming point marking should consist of two conspicuous stripes. The length of the stripe should be **30 – 45 m** and width of the stripe should be **4 m** and the lateral spacing between their inner sides should be 6 m.

5.3.4 Runway centre line marking

5.3.4.1 The runway centre line marking for paved runway should be in accordance with Annex 14, Volume I, Chapter 5, 5.2.2 as applicable.

5.3.5 Runway side stripe marking

5.3.5.1 A runway side stripe marking on paved runway should be provided between the thresholds of a paved runway where there is a lack of contrast between the runway edges and the shoulders or the surrounding terrain. A runway side stripe marking should consist of two stripes, one placed along each edge of the runway with the outer edge of each stripe approximately on the edge of the runway. A runway side stripe should have an overall width of at least **0.45 m**.

5.4 Taxiway marking

5.4.1 The taxiway edge and/or centerline markings should be provided in an altiport. The taxiway markings specified in Annex 14, Volume I, Chapter 5, are considered suitable for altiports.

5.4.2 At an intersection of a taxiway with a runway where the taxiway serves as an exit from the runway, the taxiway centre line marking should be curved into the runway centre line marking. The taxiway centre line marking should consist of a continuous yellow line **15 cm** wide parallel to and **1.8 m** from the runway centre line marking for **30 m** curving at a specified radius to join the taxiway centre line as shown in *Figures 5-6 of Annex 14, Volume I*. The turning radii of the taxiway centerline marking at the intersection of runway and taxiway should be **30 m** at **90 degree** exits.

Figure 5 – 1: Runway marking at Phaplu Airport, Nepal

5.5 Wind direction indicator

5.5.1 Since an altiport can be subject to rapid variations in wind direction and intensity, it is necessary to have a windsock near the holding area for aircraft taking off, and another at the runway threshold for aircraft landing, since the conditions at these two points can be very different. The specifications for wind direction indicators in *Annex 14, Volume I, Chapter 5*, are considered suitable for altiports.

5.6 Signs

5.6.1 General

5.6.1.1 Signs may be provided at an altiport to give information or instructions. The guidance on the sizes of signs, their inscriptions, methods of illumination, location, abbreviations commonly used and frangibility of signs given in the *Aerodrome Design Manual (Doc 9157), Part 6*, is applicable to signs at altiports.

5.6.1.2 A sign should be located as near to the edge of the pavement as possible. Signs should be lightweight and frangibly designed and mounted sufficiently low to preserve clearance with any overhanging part of the critical aeroplane.

5.6.1.3 Only mandatory signs on a movement area should use the colour red for background. A sign should be legible from the cockpit of an aeroplane at the farthest point of viewing.

5.6.2 Mandatory instruction signs

5.6.2.1 When provided, mandatory instruction signs should comprise runway holding position signs and NO ENTRY signs. A NO ENTRY sign should be located at the beginning of an area to which entry is prohibited.

5.6.2.2 Wherever possible, runway holding position signs and NO ENTRY signs should be located on each side of a taxiway facing the direction of approach to the runway or prohibited area. Where for some reason only one sign is utilized, it should be located any side (left or right) wherever feasible.

5.6.2.3 A mandatory instruction sign should consist of a white inscription on a red background.

5.6.2.4 Where applicable, the mandatory instruction sign inscriptions set forth in *Annex 14, Volume I,* *Chapter 5, 5.4.2*should be used.

5.6.3 Information signs

5.6.3.1 Given the compressed area and simplicity of a typical altiport, little use of information signs is foreseen. Where required, an information sign should convey information such as a specific location or destination on a movement area. Whenever possible an information sign on a taxiway should be located any side of the taxiway (left or right) wherever feasible.

5.6.3.2 An information sign should consist of either black inscriptions on a yellow background or yellow inscriptions on a black background.

5.6.3.3 Where applicable, the information sign inscriptions set forth in *Annex 14, Volume I, Chapter 5, 5.4.3* should be used.

5.7 Markers

5.7.5 General

5.7.5.1 Markers should be lightweight and frangibly mounted. Those located near a runway or taxiway should be sufficiently low to preserve clearance with any overhanging part of the critical aeroplane. Guidance on the frangibility of markers is given in the *Aerodrome Design Manual (Doc 9157), Part 6.*

5.7.6 Unpaved runway edge and runway strip markers

5.7.6.1 On unpaved runways, where the runway strip is not maintained to normal grading standards, the runway must be marked using edge markers, except that runway edge markers may be omitted if the full width of the runway strip is maintained suitable for aeroplane operations and the runway strip is marked using strip markers. Where the runway is not provided with edge markers, the threshold locations need to be marked appropriately in the shape of a └─ ─┘ as shown in Figure 5-2 and Figure 5-3.

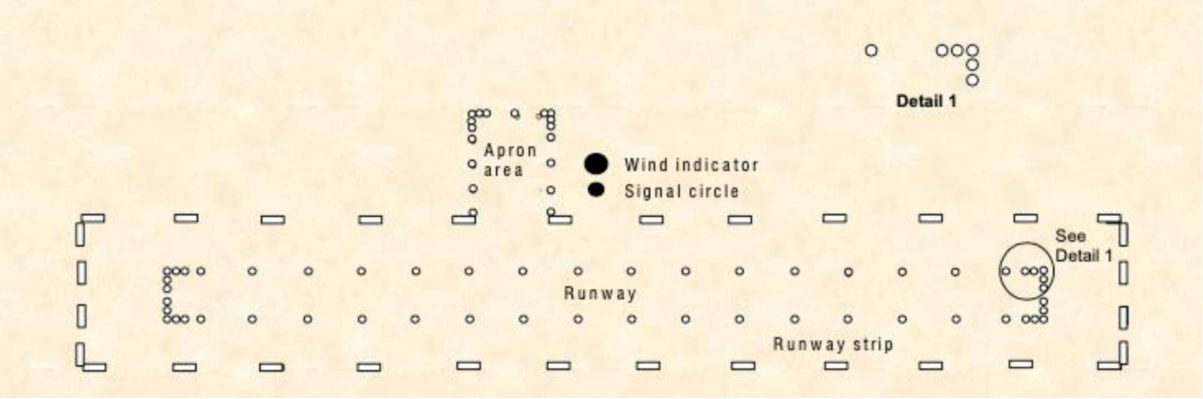


Figure 5 – 2: Runway and runway strip markers

5.7.6.2 Markers of conical shape for runway and markers of flat rectangular shape for runway strip should be used to clearly delineate the runway and runway strips limits on unpaved runways.

5.7.6.3 If flat rectangular markers are used to delineate the limit of the runway strip, they should measure at least **1 m** wide by **3 m** long and be placed with the longer dimension parallel to the runway centre line. If conical markers are used to delineate the runway limit, they should not be more than **30 cm** high and **0.4 m** base diameter.

5.7.6.4 The runway strip should be marked by using cones, gable markers or tires. Runway strip cone markers should have a **0.75 m** base diameter and be **0.5 m** in height. Gable markers should be **3 m** in length.

5.7.6.5 Cone or similar size markers need to be spaced not more than **90 m** apart. Gable or similar size markers need to be spaced not more than **180 m** apart.

5.7.7 Edge markers for snow covered runways

5.7.7.1 When the limits of a snow-covered runway are not otherwise indicated, it is recommended that edge markers should be provided. Edge markers for snow covered runways should be placed along the edges at intervals of not more than **90 m** and far enough from the centre line to not interfere with aeroplane on the runway. The threshold and end of the runway should be marked.

5.7.7.2 Evergreen trees **1.2 m to 1.5 m** high or other conspicuous, lightweight markers are appropriate to be used as edge markers for snow covered runways.

5.7.8 Unpaved taxiway edge markers

5.7.8.1 Taxiway edge markers should be provided where the limits of an unpaved taxiway are not obvious, and taxiway centre line markers are not provided.

5.7.8.2 A taxiway edge marker should be retroreflective blue. The marked surface as viewed by the pilot should be rectangle and should have a minimum viewing are of **150 cm^2**.

5.7.8.3 Taxiway edge markers should be frangible. Their height should be sufficiently low to preserve clearance for propellers.

Figure 5 – 3: Example of Runway and Threshold markers

CHAPTER 6. VISUAL AIDS FOR DENOTING OBSTACLES

6.1 Objects to be marked and lighted

6.1.1 The marking and/or lighting of obstacles is intended to reduce hazards to aircraft by indicating the presence of obstacles. It does not necessarily reduce operating limitations which may be imposed by an obstacle.

6.1.2 A fixed obstacle that extends above an approach, or take-off climb surface within **2,000 m** of the inner edge should be marked and lighted except that:

a) such marking and lighting may be omitted when the obstacle is shielded by another fixed obstacle; and

b) the marking may be omitted when the obstacle is lit by day by high intensity obstacle lights.

6.1.3 A fixed obstacle above an inner horizontal surface should be marked and lighted except that:

a) such marking and lighting may be omitted when:

1) the obstacle is shielded by another fixed obstacle;

2) For an inner horizontal surface extensively obstructed by immovable objects or terrain, circling procedures have been established to ensure safe vertical clearance below the circling flight paths; or

3) the appropriate authority determines that the obstacle has no operational significance through an aeronautical study; and

b) the marking may be omitted when the obstacle is lit by day by high intensity obstacle lights.

6.1.4 Mobile equipment and vehicles, other than aircraft, on the movement area of an altiport are obstacles and should be marked and lighted except that equipment and vehicles used only on aprons may be exempt.

6.2 Marking and lighting of objects

6.2.1 Objects should be marked and lighted in accordance with *Annex 14, Volume 1, Chapter 6, 6.2*.

CHAPTER 7. VISUAL AIDS FOR DENOTING RESTRICTED USE AREAS

7.1 Closed runway and taxiway marking

7.1.1 Markings denoting a closed runway should be placed at each end of the runway and along the runway at intervals of not more than **300 m**.

7.1.2 Markings denoting a closed taxiway should be placed at each end of the taxiway or part of the taxiway that is closed,

7.1.3 Closed runway and taxiway markings should be painted on the surface if permanent but may be made of other materials if the closing is temporary. The marking should be in the form of an **"X"**, each arm of which should be at least **6 m** long and **0.9 m** wide as shown in Figure 7-1 of *STOLPORT Manual (Doc 9150)*.

7.2 Unserviceable-area marking

7.2.1 Unserviceable portions of a maneuvering area should be conspicuously marked with devices like cones, flags or marker boards placed at intervals that clearly mark the unserviceable area. Characteristics of unserviceable area marking devices are:

a) a cone should be at least **0.5 m** high;

b) a flag should be at least **0.5 m** square;

c) a marker board should be at least **0.5 m** high and **0.9 m** long; and

d) the foregoing devices should be red, orange or yellow or one of these colors in combination with white.

7.3 Pre-threshold area

7.3.1 Where the surface leading to the runway threshold is paved but is not suitable for normal use by aircraft and exceeds **60 m** in length, the entire pre-threshold should be marked with yellow chevron markings.

7.3.2 The chevrons should be formed of yellow stripes **0.9 m** wide and should be set at an angle of **45 degrees** to the extended runway centre line as shown in Figure 7.2 of *Annex 14, Volume I*.

7.4 Non-Loadbearing Surface Marking

7.4.1 Shoulders for taxiways, runway turn pads, aprons and other non-loading bearing surfaces which cannot readily be distinguished from load-bearing surfaces and which, if used by aeroplane, might result in damage to the aeroplane should have the boundary between such areas and the load-bearing surface marked by a taxi side stripe marking.

7.4.2 A taxi side stripe marking should consist of a pair of solid lines, each **15 cm** wide and spaced **15 cm** apart and the same colour as the taxiway centre line marking should be placed along the edge of the load-bearing pavement, with the outer edge of the marking approximately on the edge of the load-bearing pavement.

CHAPTER 8. EQUIPMENT AND INSTALLATIONS

8.1 Electrical power supply systems for air navigation facilities

8.1.1 Adequate power supply should be available at altiport for the safe functioning of air navigation facilities.

8.1.2 Where provided, the following aerodrome facilities should be provided with a power supply:

a) the signalling lamp and the minimum lighting necessary to enable air traffic services personnel to carry out their duties;

Note.— The requirement for minimum lighting may be met by other than electrical means.

b) all obstacle lights which, in the opinion of the appropriate authority, are essential to ensure the safe operation of aircraft;

c) meteorological equipment;

d) essential security lighting,

e) essential equipment and facilities for the aerodrome responding emergency agencies;

8.1.3 Requirements for a power supply should be met by either of the following:

— the public power, which is a source of power supplying the aerodrome service from a substation through a transmission line; or

— standby power unit(s), which are engine generators, solar-wind power, UPS batteries, etc., from which electric power can be obtained.

CHAPTER 9. ALTIPORT OPERATIONAL SERVICES, EQUIPMENT AND INSTALLATIONS

9.1 Altiport emergency planning

9.1.1 To prepare an altiport to cope with an emergency, altiport planners should use the specifications in *Annex 14, Volume I, Chapter 9*, and the emergency planning guidance contained in the *Airport Services Manual (Doc 9137), Part 7*, to develop an altiport emergency plan commensurate with aircraft operations and other activities.

9.1.2 When established, an altiport emergency plan should provide for the actions to be taken in an emergency occurring at the altiport or in its vicinity. The plan should co-ordinate the response or participation of all agencies that could assist in responding to an emergency. The outline of aerodrome emergency plan is given in *Appendix 2 of Airport Service Manual (Doc 9137), Part 7*.

9.1.3 There should be a procedure established for testing an altiport emergency plan with a view to improvement.

9.1.4 If the formal altiport emergency plan cannot be established, the altiport operator should establish an emergency management procedure in accordance with State regulations, which should include the followings:

(a) the positions of those who constitute the membership of the altiport emergency committee (if established);

(b) the description of the role of each emergency service organisation involved in the emergency response arrangements, as applicable;

(c) the procedures for liaison with the authorised person responsible for local emergency planning arrangements;

(d) the procedures for notification and initiation of an emergency response;

(e) the procedures for activation, control and coordination of altiport-based emergency responders (if any) during the initial stages of an emergency;

(f) the procedures for use of the altiport's emergency facilities (if any);

(g) the procedures for facilitating altiport access and the management of assembly areas (if any);

(h) the procedures for an altiport to respond to a "local stand-by" event, if applicable;

(i) the procedures for initial response to a "full emergency" event on, or in the immediate vicinity of, the altiport;

(j) the arrangements for keeping altiport emergency facilities, access points and assembly areas (if any) in a state of readiness;

(k) arrangements to ensure emergency preparedness by both on and off-altiport responders; and

(l) the arrangements to return the altiport to operational status after an emergency.

9.2 Rescue and firefighting

9.2.1 An altiport should be provided with appropriate rescue and firefighting equipment and services, the primary objective of which is to save lives in the event of an aircraft accident or fire at the altiport. This objective would be met by making a fire-free escape route for the evacuation or rescue of passengers and crew. A secondary objective is to protect property by containing or extinguishing fire resulting from an aircraft accident.

9.2.2 Rescue and firefighting services should also have a standby function, coming to a high state of readiness when an in-flight emergency is declared. Altiport operators should be guided on rescue and firefighting equipment and services by the specifications in *Annex 14, Volume I, Chapter 9,* and the material in *Annex 14, Volume I, Attachment A, Section 17,* and *the Airport Services Manual (Doc 9137), Part 1*.

9.2.3 When it is not feasible to provide the rescue and firefighting services at an altiport, the altiport operator should establish the following:

a) Installation of fire hydrants and firefighting facilities in appropriate places at an altiport;

b) Ensure the mechanism to deal with rescue operation in normal and difficult terrain during any aircraft incident or accident at or in the vicinity of an altiport;

c) Provision of basic firefighting training to operate the fire hydrants and installed firefighting equipment to the security staff or other available staff at an altiport in an event of fire incident; and

d) MOU with the local security and medical authorities from the vicinity of an altiport for necessary assistance in an event of aircraft incident and accident and structural fire.

9.3 Disabled aircraft removal

9.3.1 An altiport emergency plan should include a plan for removing a disabled aircraft that is on or adjacent to the movement area. Guidance on removal of a disabled aircraft is given in the *Airport Services Manual (Doc 9137), Part 5*.

9.3.2 If an altiport does not have a plan for removal of disabled aircraft, the altiport should have the procedures for removing an aircraft that is disabled on or near the movement area. The procedures may include the following:

a) identifying the roles of the altiport operator and the holder of the aircraft's certificate of registration;

b) notifying the holder of the certificate of registration;

c) obtaining appropriate equipment and persons to remove the aircraft;

d) identifying:

  1) the names and roles of the persons responsible for arranging the removal of an aircraft; and

  2) the telephone numbers for contacting the relevant individuals during and after normal working hours.

9.3.3 The procedures described in 9.3.2 should be in line with national regulations or local government regulations.

Note:- Light aircrafts can also be removed manually without necessitating any specialized equipment.

9.4 Wildlife strike hazard reduction

9.4.1 An altiport operator should institute a method of controlling wildlife (birds and animals) that constitute a hazard to aircraft operations. Guidance on wildlife hazard management is given in the *PANS-Aerodromes (Doc 9981), Part II, Chapter 6* and *Airport Services Manual (Doc 9137), Part 3*.

9.4.2 An altiport operator should institute a method of controlling wildlife hazard for the safe operation of an aircraft.

9.4.3 An altiport should have wildlife hazard management procedures to deal with the hazards to aircraft operations caused by the presence of wildlife on or in the vicinity of the altiport, including details of the arrangements for the following:

a) monitoring wildlife activities at the aerodrome;

b) assessing any wildlife hazard;

c) mitigating any wildlife hazard;

d) reporting wildlife hazards to aircraft through one or more of the following as applicable: the AIP, NOTAM, air traffic control;

e) identifying proposed or actual sources of wildlife attraction outside the altiport boundary; and

f) liaising with the relevant planning authorities or proponents to facilitate wildlife hazard mitigation.

9.5 Apron Safety

9.5.1 Procedures on apron safety are specified in the *PANS-Aerodromes (Doc 9981), Part II, Chapter 7*.

9.6 Altiport vehicle operation

9.6.1 *Annex 14, Volume 1, Attachment A, Section 18* and *PANS-Aerodromes (Doc 9981), Part II, Chapter 9 may be used for altiport vehicle operation.*

9.7 Siting of equipment and installations on operational areas

9.7.1 Unless its function requires it to be there for air navigation or for aircraft safety purposes, no equipment or installation should be:

a) on a runway strip, a taxiway strip if it would endanger an aircraft; or

b) on a clearway if it would endanger an aircraft in the air.

9.7.2 Any equipment or installation required for air navigation or for aircraft safety purposes which must be located on a runway strip and which:

a) penetrates the lateral (transitional) surface should be of minimum mass and height, frangibly designed and sited to reduce hazards to a minimum. Guidance on the frangibility requirements of navigation aids is contained in the *Aerodrome Design Manual (Doc 9157), Part 6.*

9.8 Fencing

9.8.1 A fence or other suitable barrier should be provided on an altiport:

a) to prevent the entrance to the movement area of animals large enough to be a hazard to aircraft; and

b) to deter the inadvertent or premeditated access of an unauthorized person onto a non-public area of the altiport.

9.8.2 Suitable means of protection should be provided to deter the inadvertent or premeditated access of unauthorized persons into ground installations and facilities essential for the safety of civil aviation located off the altiport.

9.8.3 A fence or other means should separate the movement area and other facilities or zones on the altiport essential to safe operations from areas open to the public.

9.8.4 Wherever fencing is not feasible to be provided some kind of mechanism should be employed to protect the movement area for the safety of aircraft operations.

CHAPTER 10. ALTIPORT MAINTENANCE

10.1 General

10.1.1 A maintenance programme, including preventive maintenance, should be established at an altiport to maintain facilities in a condition that does not impair safety, regularity or efficiency of air navigation.

10.1.2 A maintenance programme developed in accordance with *Annex 14, Volume I, Chapter 10*, and using the following guidance would be suitable for an altiport.

a) Guidance on the maintenance of runway shoulders is contained in *Annex 14, Volume I, Attachment A, Section8.1*, and in the *Aerodrome Design Manual (Doc 9157), Part 2.*

b) Guidance on maintenance of a runway surface to preclude harmful irregularities is given in *Annex 14, Volume I, Attachment A, Section 5*.

c) Guidance on runway condition report for reporting runway surface condition is given in *Annex 14, Volume I, Attachment A, Section 6, PANS-Aerodromes (Doc 9981), Part II, Chapter 2 and Circular 355*.

d) Guidance on improving braking action and on the clearing of runways is given in the *Airport Services Manual (Doc 9137), Part 2*.

e) Guidance on suitable chemicals for removing or preventing frost or ice on pavements is given in the *Airport Services Manual (Doc 9137), Part 2*.

10.1.3 A system of preventive maintenance of visual aids should be employed to ensure marking system reliability. Guidance on preventive maintenance of visual aids is given in the *Airport Services Manual (Doc 9137), Part 9*.

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APPENDIX 1 - ALTIPORT DESIGN AEROPLANES

Notes:- Table 1 contains a list of aeroplanes in operations at altiports in Indonesia and Nepal. It should be noted that operations by these aeroplanes require special authorization by the manufacturers for Maximum Performance STOL Operations and approved by the local regulatory authority.

Table 1

S. No	Aeroplanes	Remarks
A)	**Indonesia**	
1	Cessna - 206	
2	Cessna - 208	
3	PC-6	
4	DHC - 4 Carribou	
5	DHC - 6	
B)	**Nepal**	
	DHC 6 - 300	
	DHC 6 - 400 (Viking)	
	DO 228 - 212	
	L 410 UVP – E20	

ATTACHMENT A

GUIDANCE MATERIAL SUPPLEMENTARY TO ASIA PACIFIC GUIDANCE ON DESIGN AND OPERATIONS OF ALTIPORTS

1. Runway length

1.1 As for conventional aerodromes, the determination of the length[4] of an altiport runway requires the involvement of an expert service or organization. The simplified method, which is described below, is nevertheless a fairly good approximation for light aeroplanes.

1.2 For the longitudinal profile slopes adopted at altiports, the acceleration of an aeroplane at take-off is only significantly affected, in its rolling phase, compared to what it would be on a substantially horizontal runway, by the effect of the orthogonal projection of the aeroplane's weight on the runway's axis.

1.3 Therefore, if aH denotes the acceleration of the aircraft traveling at speed V on a horizontal runway Figure A1 - 1, the acceleration aα of the same aircraft traveling at the same speed on a slope of an angle α to the horizontal as shown in the Figure A1 - 2 has the value:

$$\mathbf{a}_\alpha = \mathbf{a}_H + g.\ sin\ \alpha \text{ ------}\mathbf{A}$$

Figure A1-1

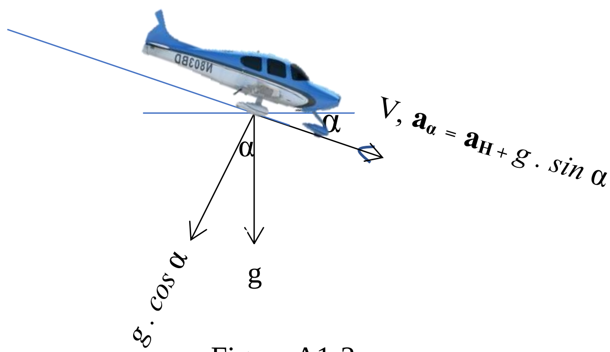

Figure A1-2

1.4 In the case of the deceleration corresponding to an acceleration-stop procedure the force due to gravity would be in opposite direction with respect to deceleration hence the equation-A may be rewrite as:

$$\mathbf{a}_\alpha = \mathbf{a}_H - g\ .\ sin\ \alpha\ . \text{ --------- }\mathbf{B}$$

1.5 The assumption is made below that an acceleration aH is invariant of the aeroplane type which makes this method as the approximation method.

1.6 Let us take the scenario with the multiple slopes of the runway, where the aeroplane movement uniformly accelerated (respectively decelerated) on each segment of runway i of constant slope αi and applying the newton's law of motion elimination of the time variable between

[4] *In view of the significant slopes, it is specified that the length referred to here is that measured on the ground.*

expressions the distance traveled on the axis and the speed leads to the relation:

$2ad = v_f^2 - v_i^2;$

where,

'a' is an acceleration, 'd' is distance travelled and v_f^2 is the final velocity and v_i^2 is the initial velocity of any object/aeroplane.

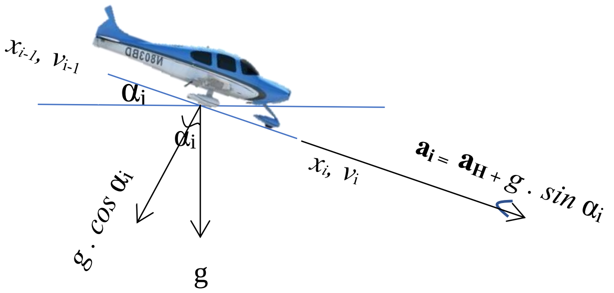

Figure A1-3

$2\, \mathbf{a}_i \cdot (x_i - x_{i-1}) = v_i^2 - v_{i-1}^2$ ---------**C**

in which:

- ✓ $\mathbf{a}_i = \mathbf{a}_H + g. \sin \alpha_i$
- ✓ $(x_i - x_{i-1})$ is the length of the section**,**
- ✓ v_{i-1} is the speed at the origin of said section,
- ✓ v_i is the speed at its end.

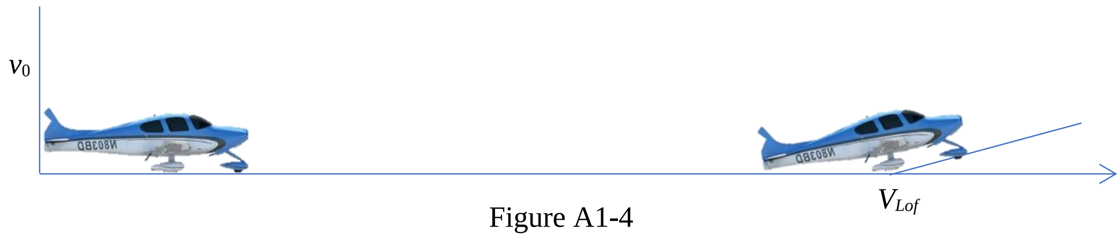

Figure A1-4

1.7 By successively writing this relation for each section of constant slope since the release brake ($v_0 = 0$) until the speed reaches the flight speed $V_{Lof,}$ we obtain a series of equalities, which, by addition, results in the formula giving the length of runway preceding the point where the reference aeroplane leaves the ground after having initiated it's pitch up Figure A1-4.

$2\, \Sigma\, \mathbf{a}_i \cdot (x_i - x_{i-1}) = V_{Lof}^2$---------**D**

1.8 Note that by making $\alpha = 0$, in the equation-**D** allows to substitute for the parameter $\mathbf{a}_i$ by value $\mathbf{a}_H$, whose value is not published with respect to the speed V_{Lof} and the distance at the end of at which this speed is reached on a horizontal runway.

1.9 For altiports intended to accommodate exclusively only light aeroplane, to which the method above is intended, the length to be given to the runway is taken equal to the product by **1.25** of the distance thus calculated from the equation-**D**.

1.10 The length of the runway determined under 1.9 should be increased at the rate of 7 per cent per

300 m elevation.

1.11 The length of runway determined under 1.10 should be further increased at the rate of 1 per cent for every 1°C by which the aerodrome reference temperature exceeds the temperature in the standard atmosphere for the aerodrome elevation (see *Table 3-1 of Aerodrome Design Manual (Doc 9157), Part 1 Runways*). If, however, the total correction for elevation and temperature exceeds 35 per cent, the required corrections should be obtained by means of a specific study. The operational characteristics of certain altiport design aeroplanes may indicate that these correction constants for elevation and temperature are not appropriate, and that they may need to be modified by results of aeronautical study based upon conditions existing at the particular site and the operating requirements of such aeroplanes.

1.12 Although current regulations do not require accelerate-stop for light aeroplanes, there is no reason why the possibility of a rejected take-off should not be considered in determining the runway length. Since the above reason applies to the deceleration introduced by the initiation of an accelerate-stop procedure, the decision speed, as may be, as it has been developed, can be determined within its possible range.

1.13 The length of an altiport runway does not necessarily have to provide for operations by the design aeroplane at its maximum mass. Rather, the aeroplane mass selected should be the mass required to carry out its allocated task and different take-off and landing masses may be determined for each site served by the design aeroplane.

2. Runway width

2.1 The width of an altiport runway may be determined by reference to the minimum values previously provided[5] for conventional aerodromes, according to the reference code of the most critical altiport design aeroplane to be accommodated.

2.2 On the basis of this information, if the code letter of an aeroplane does not seem to specify it differently for an altiport than for conventional aerodromes, the fact that the reference field length of the same aeroplane is not in itself significant for an altiport, should not, considering the correlation that exists between this distance and the one necessary for this aeroplane to reach its speed of rotation, be considered as removing all validity to the use of the code number[5] that is associated with it.

2.3 The minimum widths previously provided for conventional aerodromes will therefore be applicable without correction to altiports.

2.4 Thus, the minimum width of the runway will be **60 m** in unpaved configuration.

2.5 For paved runways, the absolute minimum width is **18 m**.

2.6 The site selection and orientation of a runway in the mountains is generally quite constrained, so particular attention must be paid to crosswinds in determining the width of the runway beyond the minimums thus defined.

[5] *although this situation cannot be established as a rule, it should be noted that, as they use a short take-off and landing runway, the aircraft used at the altiport generally use the code number 1*

ATTACHMENT B

CAA NEPAL PRACTICES FOR SHORT TAKE-OFF AND LANDING (STOL) OPERATIONS

(Refer to Chapter – 14, Part I - Flight Crew and Part II - STOL Fields Clearance Requirements)

URL:

https://caanepal.gov.np/storage/app/media/file%20upload/fora-6th-edition-consolidated-1-026262626.pdf

ATTACHMENT C
OBSTACLES LIMITATION SURFACES

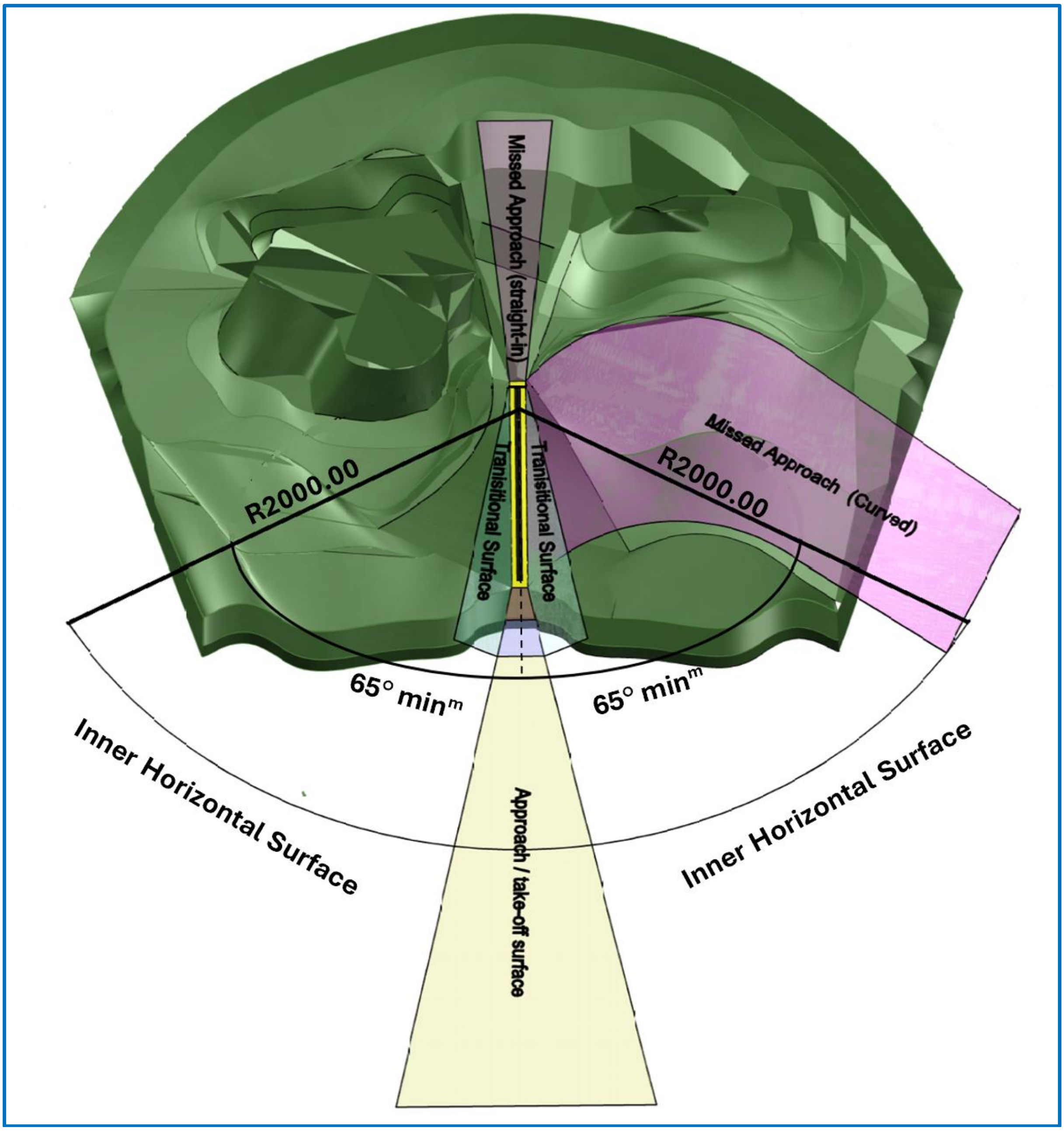

Figure ATT C-1: Missed approach surfaces at altiports in mountain pass or on dome shaped landforms

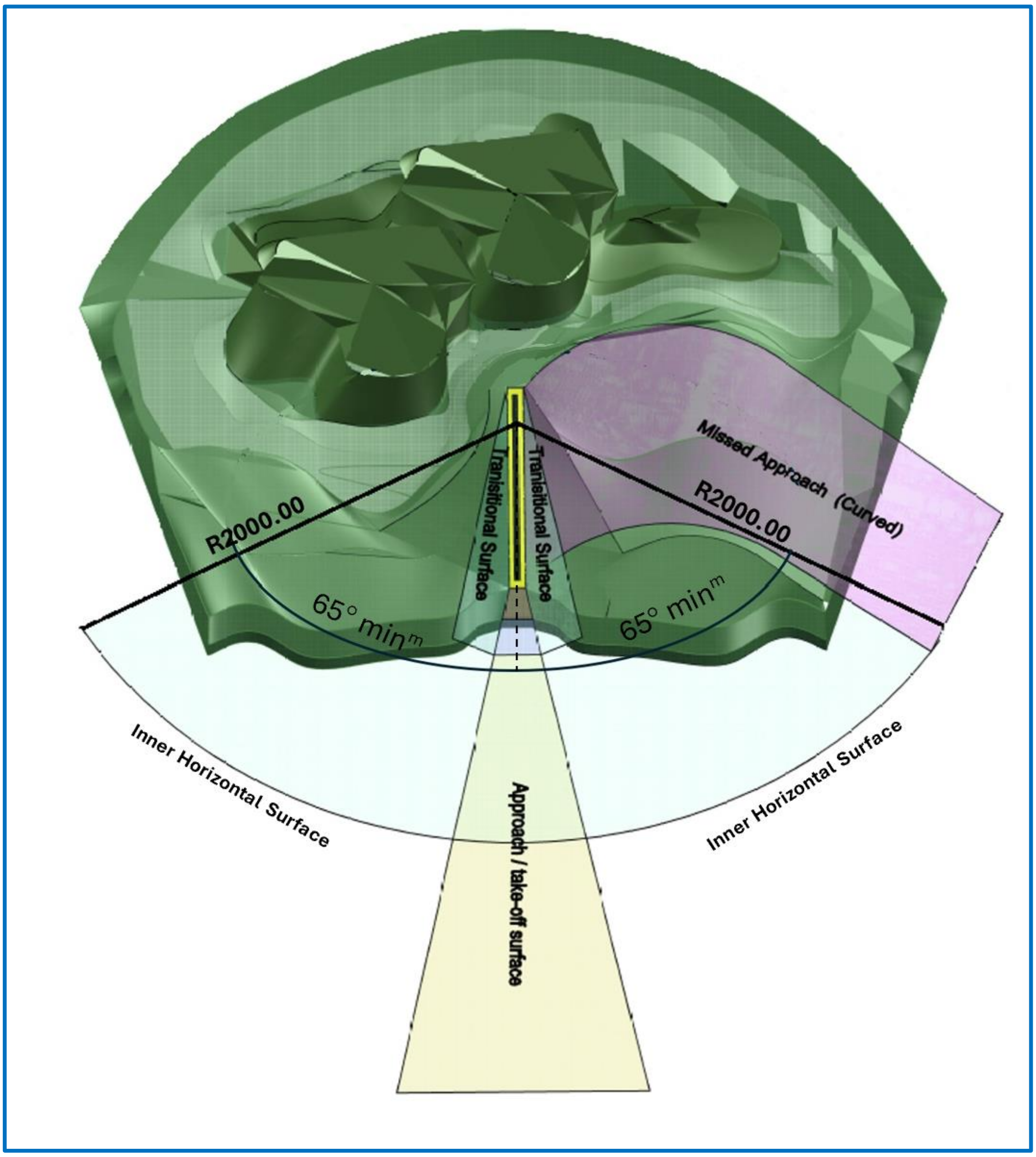

Figure ATT C-2: Missed approach surfaces at altiport on a mountain side

ATTACHMENT D

REFERENCES

1) ICAO Annex 14 Aerodromes, Volume I Aerodrome Design and Operations

2) Aerodrome Design Manual (Doc 9157, Part 1 to 6

3) Airport Planning Manual (Doc 9184), Part 1 – 3

4) Airport Services Manual (Doc 9137), part 1 - 8

5) Stolport Manual (Doc 9150);

6) Instruction Technique sur les Aérodromes Civils (ITAC), DGAC France

7) UNDP/ICAO Project, NEP/82/009, High –altitude STOL Performance Criteria Study, DHC 6 – 300 Series Twin Otter Aircraft, Nepal, February 1988

8) CAAN Flight Operations Requirements Aeroplane, Appendix 9 - STOL Field Clearance Requirements

9) Minimum Safety Requirements for Temporary / Unlicensed Aerodromes, DGCA India;

10) CASA CAAP 92A-1(0): Guidelines on Aerodromes intended for Small Aeroplanes conducting RPT Operations;

11) FAA AC 150/5325-4B: Runway Length Requirements for Airport Design, Chapter 2 Runway Length for Small Airplanes;

12) FAA AC 150/5220-22B: Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns;

13) AC139-6 Aerodrome design, Aeroplanes at or Below 5700 kg MCTOW (2015)

14) Supplement No. 178R2 of LET410 UVP-E20

15) Supplement No 1131, Dornier 228

16) PSM1 – 64 – POH, DHC – 6 – Twin Otter – Pilot Operating Handbook, Section 10.10.1 - Maximum Performance STOL Operations into Section 10 of PSM1-64-POH, after Temporary Revision 23.

ICAO APAC WHM Go Team Assistance Mission Programme Document

1. Purpose

This document offers a structured program for a five-day mission of an ICAO Wildlife Hazard Management (WHM) Go Team. The program content may be customised to align with the specific needs and environment of the Host State.

2. Preparations Before the Mission

The leader of the Go Team mission should send an ICAO APAC questionnaire on WHM to the Host State at least 6 weeks before the mission. The Host State is expected to complete the questionnaire at least two weeks before the mission, enabling a better understanding of their WHM requirements and challenges. The Host State is also expected to identify and invite well in advance relevant stakeholders in their State to participate in the Go Team activities.

Members of the Go Team mission should send necessary documents to the Host State for security clearance and preparation of airside permits. The onus of obtaining the necessary permits and clearances for airside access shall be the sole responsibility of the State in coordination with the airport well in advance taking into consideration the duration of the Go Team program, as the State specific security regulations may vary and the application process take time.

3. Mission Program

The Go Team may follow or adapt the mission program detailed below to suit the needs of the Host State. The program should be communicated at least two weeks in advance to the Host State for effective coordination and planning with relevant stakeholders.

Day	Activities	Action By or Participants
Day 1	Initial meeting and introductions	Host State and Go team
	Explain mission by Go Team, including objective of mission, ICAO requirements and guidance on WHM e.g. Annex 14, doc 9137 Part 3, and industry guidance (WBA, ACI guidance)	Go Team
	Explain the framework of State Safety Programme (SSP) to establish a national plan and procedures related to wildlife hazard management, not only at the aerodrome but also in its vicinity.	Host State
	Present an overview of WHM in State, including regulations, SSP, national plan, procedures, established committees, and wildlife strikes data.	Host State
	Identify and review key WHM concerns and adjust mission program as needed based on the questionnaire completed by Host State before the mission and the discussions in the morning of Day 1.	Host State and Go Team

Day	Activities	Action By or Participants
Day 2	Morning session - discussion on key concerns and actions taken so far. Considering location, resourcing, and any environmental factors, discuss potential practical mitigation options available. Afternoon session - Fieldwork to assess current WHM practices such as: • Habitat management; • Risk assessment and mitigation; • Identification of species, wildlife survey and monitoring, and strike data; and • Wildlife hazard control measures.	Host State and Go Team
Day 3	Based on discussions and evidence gathered on previous days and in consultation with the Go Team, Host State to propose an outline action plan and to prepare roadmap to progress and complete action plan. Reference documents for preparation of action plan and roadmap: • State WHM Program and documents, e.g. audit procedure • Airport WHM Plan (agree on an alternative if Airports do not have a WHMP, e.g. any relevant documents available providing essential elements of a WHM Plan) • State regulations and procedures related to WHM	Go Team accompanied by the relevant stakeholders of the Host State

Day 4	In the morning, continuation of discussion on recommendations and action plan.
	
	In the afternoon draft initial report consisting of:
	
	• *Key observations*:
	  ◦ Summary of Key WHM Concerns: Go-Team members should compile a concise summary of the most critical WHM concerns identified during the mission (Day 1-4). These should be the issues that have the highest potential impact on aviation safety.
	
	• *Observations*:
	  ◦ Achievements and opportunities for improvements in the Host State's existing
		Host State and Go Team
		
		Go Team

Day	Activities	Action By or Participants

	WHM program covering aspects such as documentation, training, monitoring, reporting, and coordination.
	• Detailed WHM Findings: Provide details of the WHM situation in the host state based on the mission's observations.
	• Implementation of ICAO SARPs recommended practices of international associations guidance related to WHM. Identify and document any areas where there may be deviations or room for improvement.
	• *Recommendations*:
	  • Mitigation Measures and enhancements to existing practices: Offer specific recommendations for addressing the identified and emerging WHM concerns. These recommendations should be actionable and tailored to the context of the Host State. These may include suggestions to improve existing regulatory framework, protocols, equipment, or training programs.
	  • Discussions of potential improvements in implementation of ICAO SARPs.
	• *Roadmap*
	  • Timelines: Develop a timeline for implementing the recommended actions. Specify short-term and long-term goals, indicating when each action should be completed.
	  • Action Items: List the specific tasks or actions required to achieve each recommendation. These action items should be detailed, outlining the steps needed to carry out the recommendations effectively.	

Day 5	Presentation of initial report with preliminary observations and recommendations, recommended action plan and roadmap to undertake and complete agreed actions. Discussions and comments on initial report	Go Team and Relevant Stakeholders Host State and relevant Stakeholders

4. Follow Up After the Mission

The Go Team should submit a final report on the mission based on the agreed initial report to the Host State with a copy to the Regional Office of ICAO APAC within 6 weeks after the mission.

The Host State should review and provide any comment on the report back to the Go Team via the Regional Office of ICAO APAC within 3 months after receiving the report.

References

- Annex 14 Aerodromes
- Annex 19 Safety Management
- Doc 9981 PANS Aerodrome
- Doc 9137 Part 3 on Wildlife Hazard Management of the Airport Services Manual
- Doc 9332 Manual on the ICAO Bird Strike Information System (IBIS) (new 2024 edition expected)
- WHM Go Team Methodology (Appendix D to WHM-WG/5 Report)
- ACI Wildlife Hazard Management Handbook
- ICAO APAC Regional WHM documents (under the AGA tab)
- Survey Questionnaire - State's problems /issues /deficiencies on Wildlife Hazard Management (Attachment to State Letter T 11/5.9 — AP069/19 (AGA))
- WBA guidance documents

Additional References

- Australian Airport Association (AAA) Airport Practice Note 9 - Wildlife Hazard Management at Airports
- Australian Airport Association (AAA) Airport Practice Note 6 - Managing Bird Strike Risk-Species Information
- Australian Aviation Wildlife Hazard Group (AAWHG) Recommended Practice 1.3 Wildlife Risk Assessment and Analysis

- End -

List of Aerodromes used for International Operations in APAC Region that have to be certified

S. No in APAC Database	Sub-region	State / Admin	ICAO Code	Name of City	Name of Aerodrome
1	SA	Afghanistan	OAHR	Herat	Herat Intl
2	SA	Afghanistan	OAKB	Kabul	Kabul Intl
3	SA	Afghanistan	OAKN	Kandahar	Kandahar Intl
4	SA	Afghanistan	OAMS	Mazar-e-Sharif	Mazar-e-Sharif
42	SEA	Brunei	WBSB	Brunei	Brunei Intl
73	NA	China	RCYU	Hualien	Hualien
107	NA	China	RCMQ	Taichung	Cingcyuangang
108	NA	China	RCNN	Tainan	Tainan
149	SA	India	VICG	Chandigarh	
154	SA	India	VOGO	Goa	
155	**SA**	**India**	**VEGK**	**GORAKHPUR**	
157	**SA**	**India**	**VIDX**	**HINDAN**	
161	**SA**	**India**	**VIJO**	**JODHPUR**	
172	SA	India	VOPB	Port Blair	
173	SA	India	VAPO	Pune	
175	SA	India	VISR	Srinagar	
180	**SA**	**India**	**VOVZ**	**VISAKHAPATAN**	
250	PAC	Kiribati	PLCH	Kiritimati	Christmas I.
251	PAC	Kiribati	NGTA	Tarawa	Bonriki Intl
253	SEA	Lao PDR	VLLB	Luangprabang	Luangprabang Intl
254	SEA	Lao PDR	VLSK	Kaisonphimvihan	Savannakhet Intl
255	SEA	Lao PDR	VLPS	Pakse	Pakse Intl
264	SEA	Malaysia	WMKD	Kuantan	Haji Ahmad Shah
266	SEA	Malaysia	WBKL	Labuan	
282	PAC	Micronesia	PTPN	Pohnpei I.	Pohnpei Intl
283	PAC	Micronesia	PTKK	Weno I.	FM Chuuk Intl
284	PAC	Micronesia	PTYA	Yap I.	Yap Intl
285	PAC	Micronesia	PTSA	Kosrae I.	Kosrae
292	PAC	Nauru	ANYN	Nauru I.	Nauru intl
321	SEA	Philippines	RPVK	Kalibo, Aklan	Kalibo Intl*
325	SEA	Philippines	RPLC	Pampanga	Diosdado Macapagal Intl*
326	SEA	Philippines	RPVP	Puerto Princesa City	Puerto Princesa Intl*
327	SEA	Philippines	RPSP	Panglao	Bohol-Panglao Intl*
350	SEA	Thailand	VTSG	Krabi	
355	SEA	Thailand	VTSB	Surat Thani	

S. No in APAC Database	Sub-region	State / Admin	ICAO Code	Name of City	Name of Aerodrome
357	SEA	Timor Leste	WPDB	Suai	Commander-in-Chief of the FALINTIL – Kay Rala Xanana Gusmão Intl
360	PAC	Tuvalu	NGFU	Funafuti	Funafuti Intl

* Airports granted with temporary aerodrome certificates

INTERNATIONAL CIVIL AVIATION ORGANIZATION

ASIA/PACIFIC REGIONAL GUIDANCE

FOR

SPACE OBJECT LAUNCH AND RE-ENTRY ACTIVITIES COORDINATION

Version 1.0, September 2024

Approved by ATM/SG/12 and published by the
ICAO Asia and Pacific Office, Bangkok

Contents

1: SCOPE OF THE PLAN

This guidance document was created by the Space Vehicle Launch and Re-entry Coordination Small Working Group (SVLRC SWG) formed through a decision of the 10th Meeting of the Air Traffic Management Sub-Group of APANPIRG in October 2022. The document builds upon and replaces the regional guidance provided in the Asia/Pacific Seamless ANS Plan Version 3.0, and in the Asia/Pacific Planning Checklist for Ballistic Launch and Space Re-Entry, approved by the 29th APANPIRG and is in keeping with the provisions of UN Resolution 2222 (XXI) as amended.

Participants of the SWG consisted of representatives from Australia, China, Hong Kong China, India, Japan, New Zealand, Papua New Guinea, Republic of Korea, Singapore, Sri Lanka, Thailand, the United States, Viet Nam, and IATA.

This guidance applies to all forms of space object launch and re-entry activities (hereinafter referred to as activities), and includes commercial, State, ballistic launch, or any other space object activities that can pose a hazard to civil aviation.

The goal of this guidance is to achieve timely and efficient collection, coordination and dissemination of space object launch and re-entry information that will assist with avoiding hazards to civil aircraft and minimize interference with the normal operation of such aircraft.

This guidance should be harmonized with other ICAO regions who are working on similar efforts so that there is consistency across the globe on how space object launch and re-entry activities are coordinated and disseminated.

While space object launch and re-entry activities have existed for decades within the region, not all States and/or stakeholders are equally affected. The collection, coordination and dissemination of space object launch and re-entry activity information mainly include the following stakeholders:

- Launching State
- Launching State Appropriate ATS Authority
- Affected Appropriate ATS Authority
- Launch and Re-entry Operator
- Airspace user

To facilitate timely and orderly information dissemination, all APAC States are encouraged to identify and provide contact information for space object launch and re-entry activity coordination. These will be added to the regional Asia/Pacific Space Object Launch and Re-Entry Points of Contact list, maintained by the ATM/SG Secretariat.

1.1 Launching State Appropriate ATS Authorities should make efforts to collaborate with affected appropriate ATS authorities, operators, and other affected stakeholders to minimise potential impacts to the airspace system.

1.2 Generally, space object launch and re-entry activities take place from pre-defined locations, including States facilities or private spaceports. Launch locations should be positioned with consideration for minimal disruption to the safety and efficiency of airspace system.

The procedures below are intended to improve regional coordination efforts by complementing well-established and proven processes compliant with ICAO Annex 11 (Air Traffic Services), Doc 10088

(Manual on Civil-Military Cooperation in Air Traffic Management), Doc 9554 (Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations), and replacing existing ICAO APAC regional guidance. States conducting space object launch and re-entry activities, or managing airspace affected by said activities are encouraged to create, test, and refine practices and procedures that fit their needs. The *State* is responsible for coordination of activities potentially hazardous to civil aircraft, regardless of whether they're conducted by its space launch agencies, its military, or any other organization.

States defining consistent coordination procedures allows sufficient time for airspace managers to assess the operational impact and airspace users to plan around hazardous activity. States routinely conducting space object launch and re-entry activities and States managing affected airspace, are encouraged to dedicate adequate resources to this planning and coordination effort to assure the continued safe operation of all airspace users.

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2: DEFINITIONS, ABBREVIATIONS AND ACRONYMS

2.1 DEFINITIONS

Affected Appropriate ATS Authority – the relevant authority responsible for providing air traffic services in the airspace affected by space object launch and re-entry activities conducted by the Launching State.

Airspace user – Organisations or individuals operating flights using aircraft and/or vehicles in the airspace.

Air traffic services unit. A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office.

Appropriate ATS authority **–** the relevant authority designated by the State who is responsible for providing air traffic services in the airspace concerned. This is commonly referred to as the Air Navigation Service Provider or Air Traffic Services Provider.

Launch State – a State which launches or procures the launching of a space object or a State from whose territory or facility a space object is launched. This includes any space object launch and re-entry activities.

Launch Window – the span of time during which a launch or re-entry may take place while satisfying the constraints imposed by safety and mission objectives.

NOTAM – A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

Launch and Re-entry Operator – an entity who conducts or will conduct the launch and/or re-entry of a space object and any payload.

Space object **–** includes component parts of a space object as well as its launch vehicle and parts thereof.

NOTE: The definitions listed above are to aid readers in understanding and applying the principles outlined in this document. They may not be universally agreed upon outside of the APANPIRG.

2.2 ACRONYMS AND ABBREVIATIONS

AFTN	Aeronautical Fixed Telecommunication Network
AIS	Aeronautical Information Service
AMHS	ATS Message Handling System
ATC	Air Traffic Control
ATS	Air Traffic Service
ATSU	Air Traffic Service Unit
FIR	Flight Information Region
NOF	International NOTAM Office
POC	Point of Contact

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3: PROCEDURES FOR COORDINATING SPACE OBJECT LAUNCH AND RE-ENTRY ACTIVITIES

3.1 This section provides an overview of the general responsibilities of the Launching State, Launching State Appropriate ATS authority, Affected Appropriate ATS authority, Operator and Airspace User. All entities must coordinate to ensure the safe and efficient integration of activities into airspace systems. It is important to consider the responsibilities of each organization within their States.

3.1.1 Launching State

- Regulates space object launch and re-entry activities.
- Develops and enacts regulations ensuring that the space object launch and re-entry operator and the Launching State appropriate ATS Authority comply with the requirements in ICAO Annexe 11 for the coordination of activities potentially hazardous to civil aircraft.
- Identifies the appropriate ATS authority responsible for coordination of space activities, including identifying the proper entity to initiate NOTAM request for space object launch and re-entry activities within the FIR/s assigned to the launching State in accordance to Annex 15, Section 2.1.
- Validates the launch window and the coordinates of the extent of the airspace affected by the space object launch and re-entry activities.

  Note: There are various responsible authorities within individual Launching States as far as space object coordination activities.

3.1.2 Launching State Appropriate ATS Authority

- Serve as the focal point for collecting, coordinating, and disseminating all available information relevant to space object launch or re-entry activities to affected appropriate ATS authorities and/or other affected stakeholders.
- Identify and assess potential impacts or constraints to airspace where the State is responsible for the provision of air traffic services, to ensure the compliance of the requirements in ICAO Annex 11, Section 2.19.

  Note: This includes the determination for the need to establish any special use airspace (SUA), airspace restrictions or temporary withdrawal of established ATS routes to avoid hazards to civil aircraft and inform affected ATSU accordingly.
- Plot area using validated coordinates and provide a graphical representation of the polygon to affected appropriate ATS authorities for reference.
- Ensure the safe and efficient integration of space object launch and re-entry activities into the airspace system.

3.1.3 Affected Appropriate ATS Authority

- Receive and coordinate information relevant to space object launch or re-entry activities from launching state appropriate ATS authorities with other affected stakeholders.

- Identify and assess potential impacts or constraints to airspace where the State is responsible for the provision of air traffic services, to ensure the compliance of the requirements in ICAO Annex 11, Section 2.19.

  Note: This includes the determination for the need to establish any special use airspace (SUA), airspace restrictions or temporary withdrawal of established ATS routes to avoid hazards to civil aircraft and inform affected ATSU accordingly.

- Plot Hazard/Danger Area

- Ensure the issuance and update of any NOTAM promulgating information on the activity.

- Ensure the safe and efficient integration of space object launch and re-entry activities into the airspace system.

3.1.4 **Operator**

- Provide tentative launch window commencement time and duration (primary and, if any, backup timing and dates), and extent of airspace affected (latitude/longitude coordinates), and any other necessary supporting information to the Launching State Appropriate ATS Authority.

  Note: Once the Launching State approves an operation, the operator works with the Appropriate ATS Authority to determine the necessary steps for coordination of airspace and operations.

3.1.5 **Airspace User**

- Undertake safety risk assessments in accordance with standard operating procedures;

- Comply with promulgated airspace and ATS restrictions.

3.2 **PRE-LAUNCH PLANNING AND COORDINATION**

3.2.1 Operational coordination to the Appropriate ATS Authority of affected airspace should be accomplished using Aeronautical Fixed Telecommunication Network (AFTN) or ATS Message Handling System (AMHS), while supplemental material should be provided via email. Ideally a conference call or some other form of positive coordination should also be accomplished by the Appropriate ATS Authority responsible for the airspace over the State where the activity planning organization is located. States should provide group mailboxes for operational coordination.

Note: This may include a list for advanced planning, including additional POCs for situational awareness, and one for tactical event updates, such as removal once an activity is complete to reopen the airspace. Ideally, each State has a single group email box forwarding information internally to appropriate parties.

3.2.2 The Launching State Appropriate ATS Authority responsible for coordinating space object launch and re-entry activity should begin coordinating with affected appropriate ATS authorities at **least 10 days (ideally 14 days)** prior to the proposed activity. The following information should be included in the coordination:

- Tentative launch window commencement time and duration (primary and, if any, backup timing and dates).

- Activity time of day and extent of airspace affected (latitude/longitude coordinates).

Note: In cases where extent of airspace affected crosses multiple FIRs, individual requests should be developed and sent to each impacted FIR. The appropriate ATS authority developing requests should ensure there are shared points for airspace affected spanning across multiple FIRs to ensure safety.

- Identification of POC in the Affected Appropriate ATS Authority.

- Any other necessary supporting information

3.2.3 The Appropriate ATS authority for affected airspace should ensure planning and notification are in place for all stages of the activity to include any re-entry/debris possibility, and in accordance with ICAO Doc 10066. Publication of the NOTAM for all affected FIRs will be completed at least seven days in advance and include the following items of information:

- Activity window duration

- Activity time of day and extent of proposed danger or restricted area (latitude/longitude coordinates)

Note: For ease of implementation, each danger area should be plotted with the minimum number of coordinates to present a polygon (please refer to PANS AIM for exacts on how the danger area is formulated). Publication of the danger area coordinates is crucial to ensure the safety of air traffic, especially in the event of an emergency. It is therefore vital for ATC and flight crew to have precise awareness of danger areas while managing any inflight contingencies.

- Any other necessary supporting information, such as affected airways, alternate routings, direct routings, etc. (please see attachment A)

3.3 TACTICAL LAUNCH COORDINATION

3.3.1 Launching State Appropriate ATS authority should provide notice of **three days** prior to the requested launch window via AMHS/AFTN to all affected appropriate ATS authorities.

3.3.2 Positive coordination between affected Appropriate ATS authority and Launching State Appropriate ATS authority should be executed to confirm and manage the requested dates of the activity **within three days, but not less than 24 hours**, of the proposed start. The definitive information should be shared externally to ensure maximum efficiency of affected airspace.

3.3.3 After confirming coordination via AMHS/AFTN, the affected Appropriate ATS authority should publish a NOTAM for the **launch "Window" with three days' notice**, **but not less than 24 hours.**

Note: NOTAM are published by the NOF serving the affected FIR in response to the request/direction of the appropriate ATS authority for that FIR.

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4: RE-ESTABLISHING NORMAL AIRSPACE OPERATIONS FOLLOWING THE END OF ACTIVITIES

4.1 When confirmation from the operator of the end of activities potentially hazardous to civil aircraft occurs prior to the end of the coordinated launch window, the Launching State Appropriate ATS Authority should notify affected appropriate ATS authorities to enable timely cessation of mitigations and withdrawal of NOTAMs for all affected FIRs. Otherwise, the NOTAMs will expire as published.

4.2 Cancellations of launch activities at any point of time needs to be disseminated by the Launching State Appropriate ATS Authority as soon as possible to all affected FIRs.

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5: POST-LAUNCH ASSESSMENT

5.1 It is recommended for the Launching State to designate the Appropriate ATS Authority to conduct a post-activity assessment which helps in improving the maturity of launch-related airspace management processes. It is recommended that the affected State and the affected appropriate ATS authority conduct a similar assessment. All stakeholders may provide comments to improve future activities. POCs may exchange suggestions on improving coordination and reducing impacts on civil air traffic flow.

5.2 States should share lessons learned and proposed revisions to this regional guidance with APANPIRG, through its ATM Sub-Group.

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APPENDIX A: Space Object CHECKLIST

- Launch required by:
- Proposed Temporary Danger Area:
- Proposed Launch Window, including backup dates:
- Date: DD/MM/YYYY to DD/MM/YYYY Time: XX:XX to YY:YY UTC
- Proposed Definitive launch window:
- Date: DD/MM/YYYY to DD/MM/YYYY Time: XX:XX to YY:YY UTC
- Expected exact date of launch: DD/MM/YYYY

Affected FIR	*Affected AWYs*	*Affected Flights in requested Time window*	*Option 1: Suggested revised time and date*	*Option 1: Affected flights in revised time and date*	*Option 2: Suggested revised time and date*	*Option 2: Affected flights in revised time and date*

1. With this information, airspace managers and other State authorities are expected to assess the impact of the proposed launch or re-entry details and determine if the activities can be conducted safely. This assessment includes airspace and airways affected as well as expected traffic density during the event. Potential mitigations include rerouting of traffic around the danger area or delay of traffic to avoid the event window.

2. If adequate mitigations are available, the airspace manager, State, or designated competent authority should reply to the requester noting support. However, if adequate mitigations are not available, timely feedback to the requestor clarifying the issue and potential solutions is required. Note space missions require specific timing to meet orbital requirements. Options for modification may be limited. If needed, establishing a planning call to address concerns or clarify mission parameters is highly effective.

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APPENDIX B: LIST OF REFERENCES

- Doc 10088 – Manual on Civil-Military Cooperation in Air Traffic Management
- Doc 9554 – Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations
- Asia/Pacific Seamless ANS Plan V3.0
- Doc 10066 Procedures for Air Navigation Services Aeronautical Information Management (PANS AIM)
- 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
- Annex 11 Air Traffic Services
- Annex 15 Aeronautical Information Services
- Doc 4444 Procedures for Air Navigation Services Air Traffic Management (PANS ATM)
- FAA Joint Order 7400.2P – Procedures for Handling Airspace Matters
- Basics of Space Flight Section III. Space Flight Operations (nasa.gov)

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2023 Asia Pacific
Consolidated Safety Report

RASMAG/29
19 - 22 August 2024

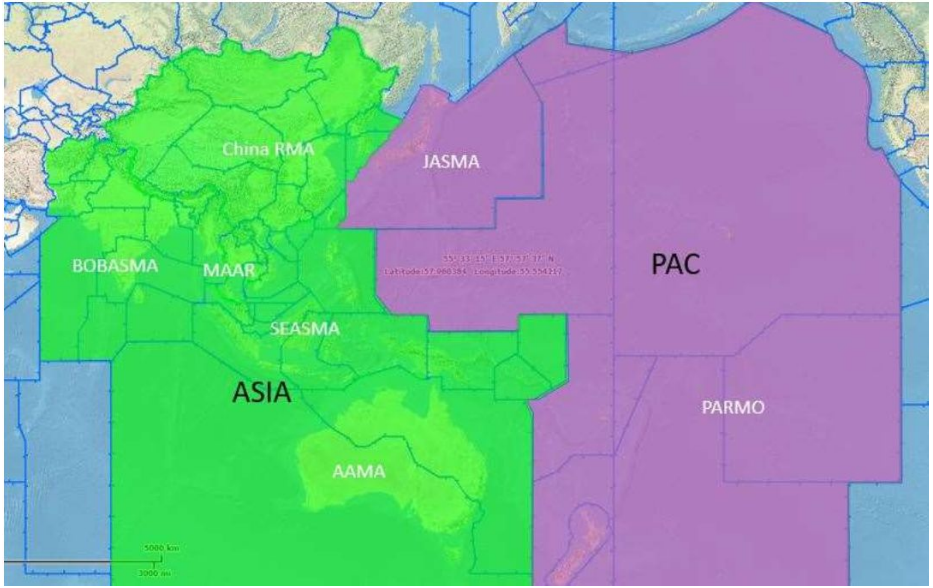
Outline

- Background
- PAC Area
  - Vertical Collision Risk Estimates and Summary of LHDs
  - Horizontal Collision Risk Estimates and Summary of LLDs and LLEs
  - Geolocations of LHDs/LLDs/LLEs
  - Hot Spots
- Asia Area
  - Vertical Collision Risk Estimates and Summary of LHDs
  - Horizontal Collision Risk Estimates and Summary of LLDs and LLEs
  - Geolocations of LHDs/LLDs/LLEs
  - Hot Spots
- Reporting Rate of LHDs/LLDs/LLEs
- Conclusion

Background

Background

In MAWG/5, APAC monitoring agencies agreed to consolidate key elements from their safety risk analysis into one report to give an overall picture of airspace safety risk in Asia Pacific.



The report is divided into:

- **Pacific (PAC) Area**
- **Asia Area**

For each area, there will be a summary of:

- vertical collision risk estimates, LHD summary, and their hot spots (if any);
- horizontal collision risk estimates, LLD & LLE summary, and their hot spots (if any); and
- reporting rates in 3 groups: Category A + B + C (related to the pilot/aircrew), D + E + F (related to ATC), and G + H + I + J + K + L + M (Other).

Pacific Area (PAC)

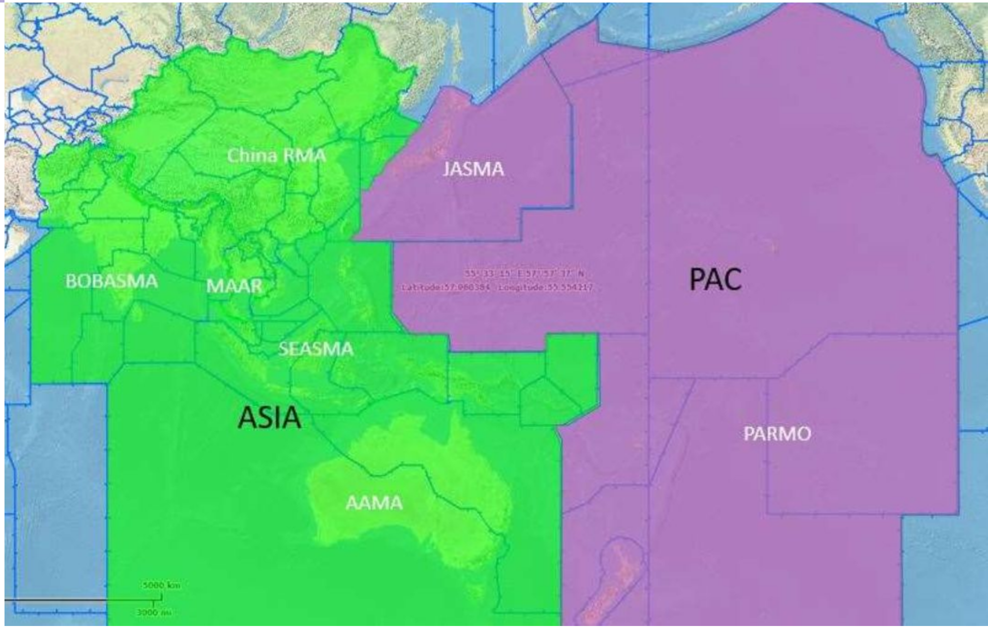
Traffic between North America and Asia, or North America and South Pacific States

FIRs : Anchorage, Auckland, Fukuoka, Nadi, Oakland, and Tahiti

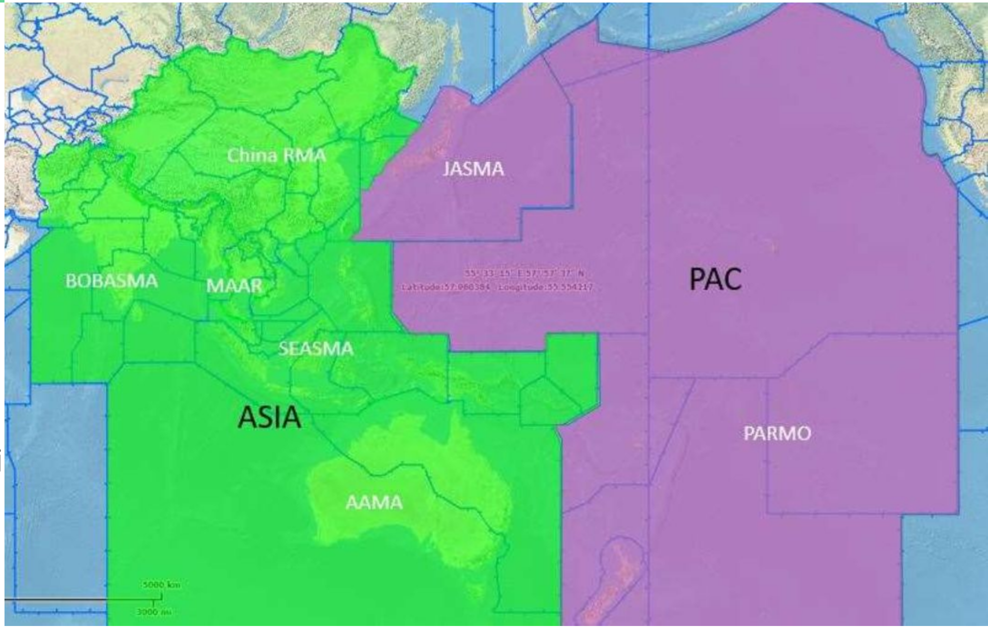
Monitoring Agencies :

RMAs (Verical): JASMA, PARMO

EMAs (Horizontal): JASMA, PARMO



Asia Area (Asia)



Traffic flows between between Asia and Middle East, Europe and South Pacific States.

FIRs : Bangkok, Beijing, Brisbane, Chennai,Colombo, Dhaka, Delhi, Guangzhou, Hanoi, Ho Chi Minh, Hong Kong, Honiara, Incheon, Jakarta, Karachi, Kathmandu, Kolkata, Kota Kinabalu, Kuala Lumpur, Kunming, Lahore, Lanzhou, Male, Manila, Melbourne, Mumbai, Nauru, Phnom Penh, Port Moresby, Pyongyang, Sanya, Shanghai Shenyang, Singapore, Taibei, Ujung Pandang, Ulaanbaatar, Urumqi, Vientiane, Wuhan, and Yangon

Monitoring Agencies :

RMAs (Vertical): AAMA, China RMA, MAAR, PARMO
EMAs (Horizontal): AAMA, BOBASMA, PARMO, SEASMA

PAC Area

PAC : Vertical Collision Risk

PAC : Vertical Collision Risk Estimates

Number of annual flying hours: 3,462,071 hours/year

2023 PAC Area	Vertical Risk Estimate	Remark
Vertical Technical Risk	0.22×10^{-9} FAPFH	Below Technical TLS
Vertical Operational Risk	10.55×10^{-9} FAPFH	
Vertical Overall Risk	10.77×10^{-9} FAPFH	Above TLS

PAC : Vertical Collision Risk Estimates

2016 - 2023

Year	Vertical Overall Risk Estimate	Remark
2023	10.77 x 10^{-9} FAPFH	Above TLS
2022	19.62 x 10^{-9} FAPFH	Above TLS
2021	19.74 x 10^{-9} FAPFH	Above TLS
2020	16.71 x 10^{-9} FAPFH	Above TLS
2019	30.21 x 10^{-9} FAPFH	Above TLS
2018	19.40 x 10^{-9} FAPFH	Above TLS
2017	7.30 x 10^{-9} FAPFH	Above TLS
2016	5.01 x 10^{-9} FAPFH	Above TLS

PAC : Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Levels Crossed
Aircrew/ Pilot	A	Flight crew failing to climb/descend the aircraft as cleared	**16**	**4.98**	**9**
	B	Flight crew climbing/descending without ATC Clearance	**14**	**14.22**	**13**
	C	Incorrect operation or interpretation of airborne equipment	**3**	**2.13**	**2**
ATC	D	ATC system loop error	**6**	**2.50**	**3**
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	**57**	**224.18**	**6**
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	**1**	**7.00**	**0**
Aircraft/ Avionics/ Contingencies	G	Aircraft contingency event leading to sudden inability to maintain assigned flight level	**0**	**0.00**	**0**
	H	Airborne equipment failure leading to unintentional or undetected change of flight level	**0**	**0.00**	**0**

PAC : Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Levels Crossed
Weather/ Turbulence	I	Turbulence or other weather related causes leading to unintentional or undetected change of flight level	20	59.93	1
TCAS	J	TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory	16	21.63	2
	K	TCAS resolution advisory, flight crew incorrectly climb or descend following the resolution advisory	0	0.00	0
Other	L	An aircraft being provided with RVSM separation is not RVSM approved	0	0.00	0
	M	Other	1	25.00	0
		Total	134	361.58	36

PAC : Horizontal Collision Risk

PAC : Horizontal Collision Risk Estimates

Number of annual flying hours: 1,892,881 hours/year

2023 PAC Area	**Horizontal Risk Estimate**	**Airspace**	**Remark**
Total Lateral Risk	0.09×10^{-9} FAPFH	Pacific	Below TLS
Total Longitudinal Risk	0.17×10^{-9} FAPFH	Pacific	Below TLS
2022 PAC Area	**Horizontal Risk Estimate**	**Airspace**	**Remark**
Lateral Risk	2.09×10^{-9} FAPFH	Pacific	Below TLS
50NM Lateral Risk	0.456×10^{-9} FAPFH	Japan	Below TLS
30NM Longitudinal Risk	0.008×10^{-9} FAPFH	Japan	Below TLS
10MIN Longitudinal Risk	1.754×10^{-9} FAPFH	Japan	Below TLS

Notes:

- The 2023 Horizontal collision risk estimates are combined into a single value using a weighted average.

PAC : Summary of LLDs and LLEs

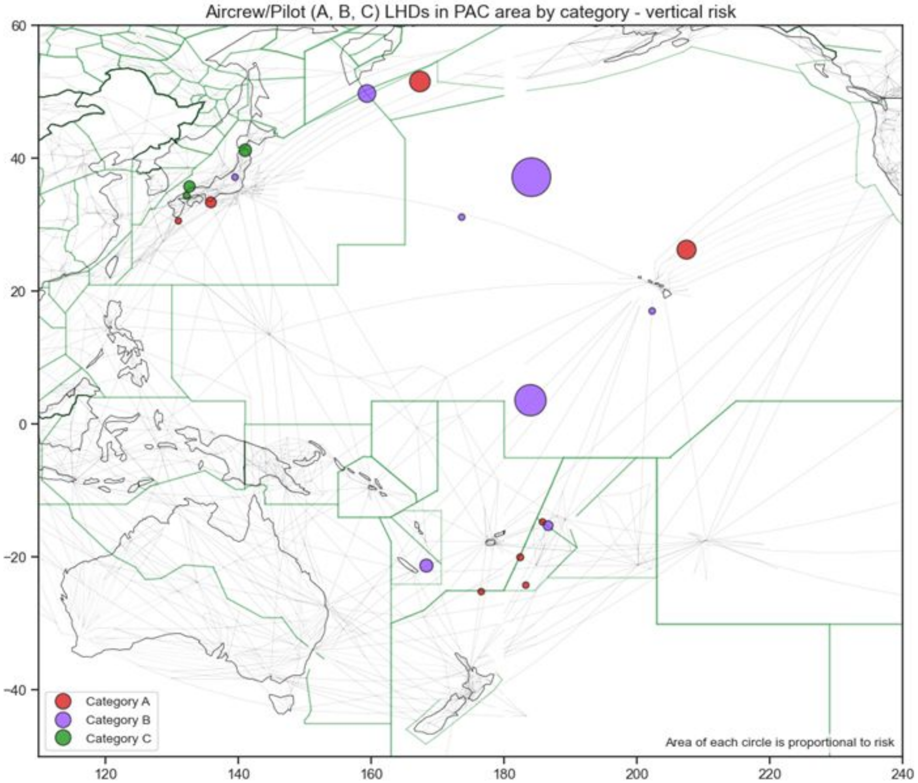
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	10	10.00	3	100
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne equipment	3	1.00	1	15
	C	Flight crew waypoint insertion error, due to correct entry of incorrect position or incorrect entry of correct position	3	15.00	0	75
ATC	D	ATC system loop error	2	5.00	1	61
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	109	1614.00	0	158
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	1	11.00	0	0

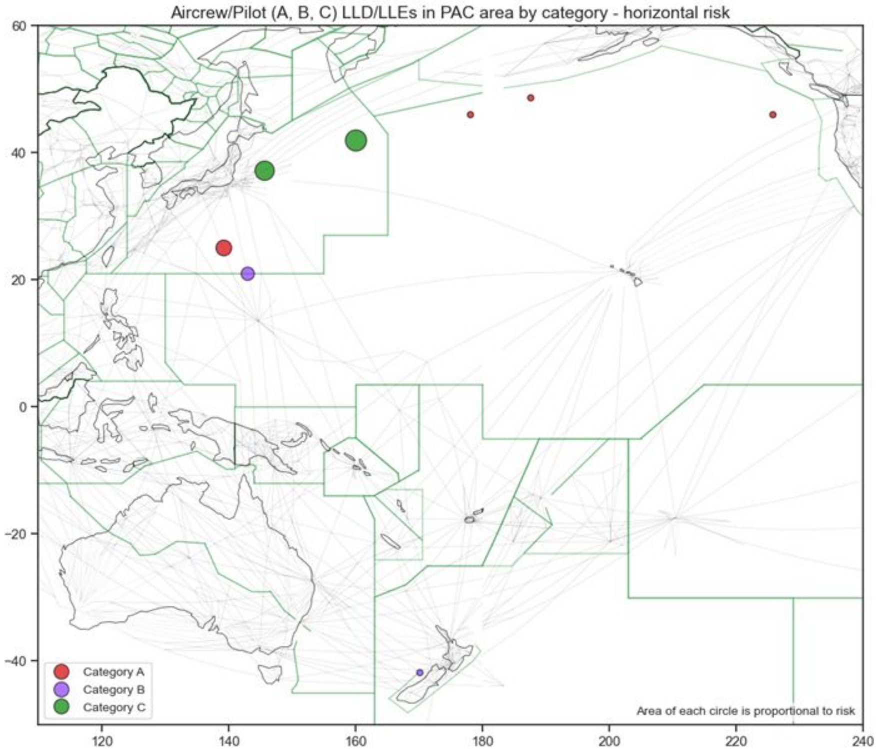
PAC : Summary of LLDs and LLEs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircraft/ Avionics/ Contingencies	G	Navigation errors due to airborne equipment failure	1	20.00	0	128
Weather/ Turbulence	H	Turbulence or other weather related causes leading to a deviation in the horizontal dimension	11	98.00	0	255
Other	I	An aircraft was provided with reduced horizontal separation minima but did not meet the RNP/RSP/RCP specification;	0	0.00	0	0
	J	Other	1	0.00	1	20
		Total	141	1774.00	6	812

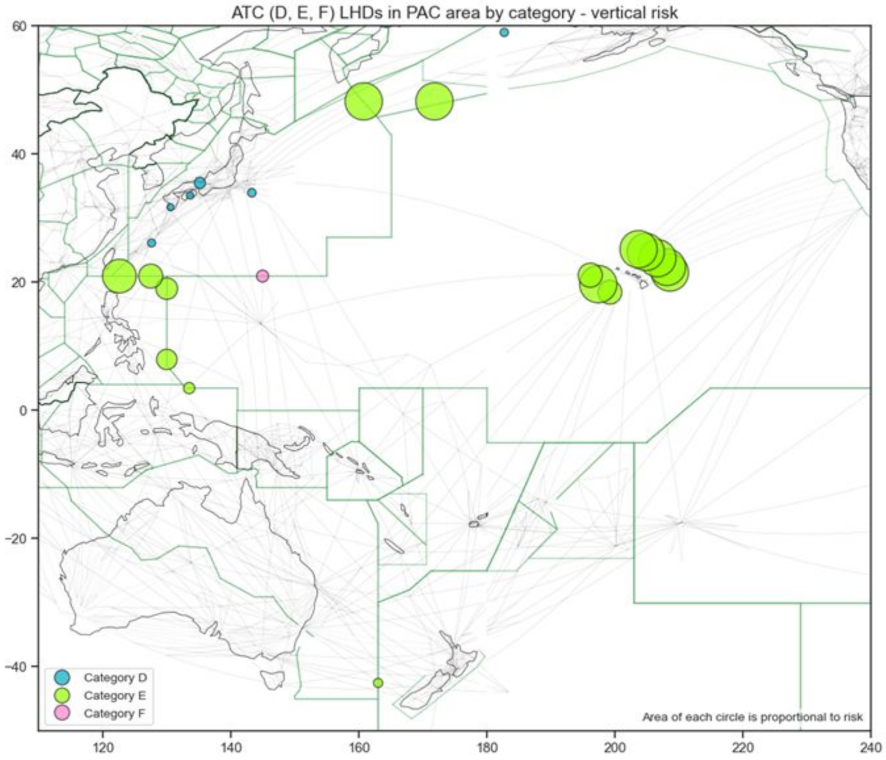
PAC : Geolocation of LHDs/LLDs/LLEs

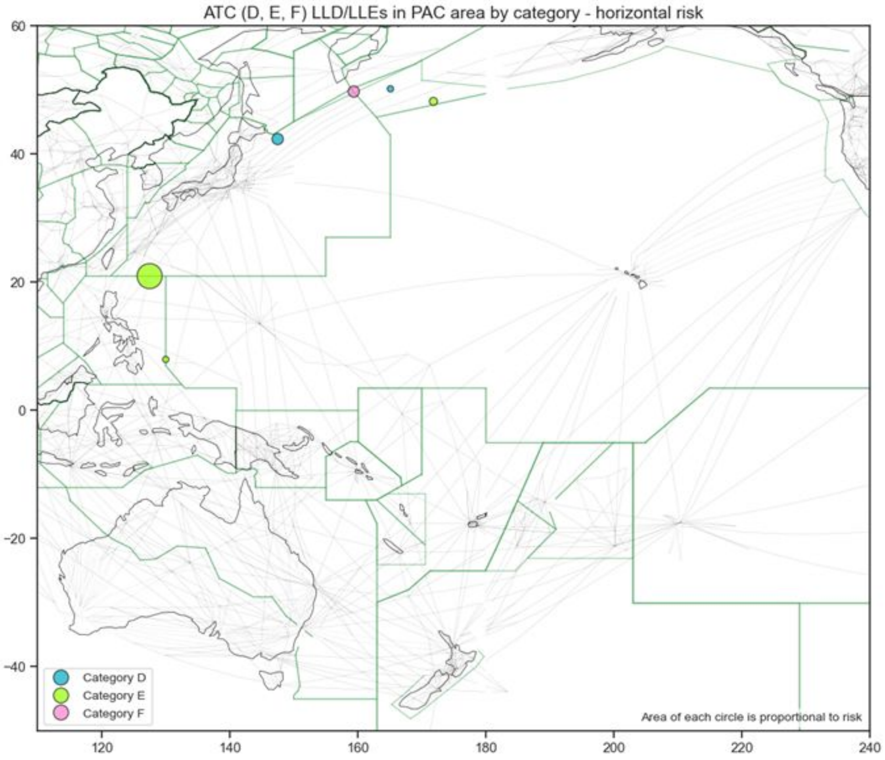
PAC : Aircrew/Pilot (A, B, C)



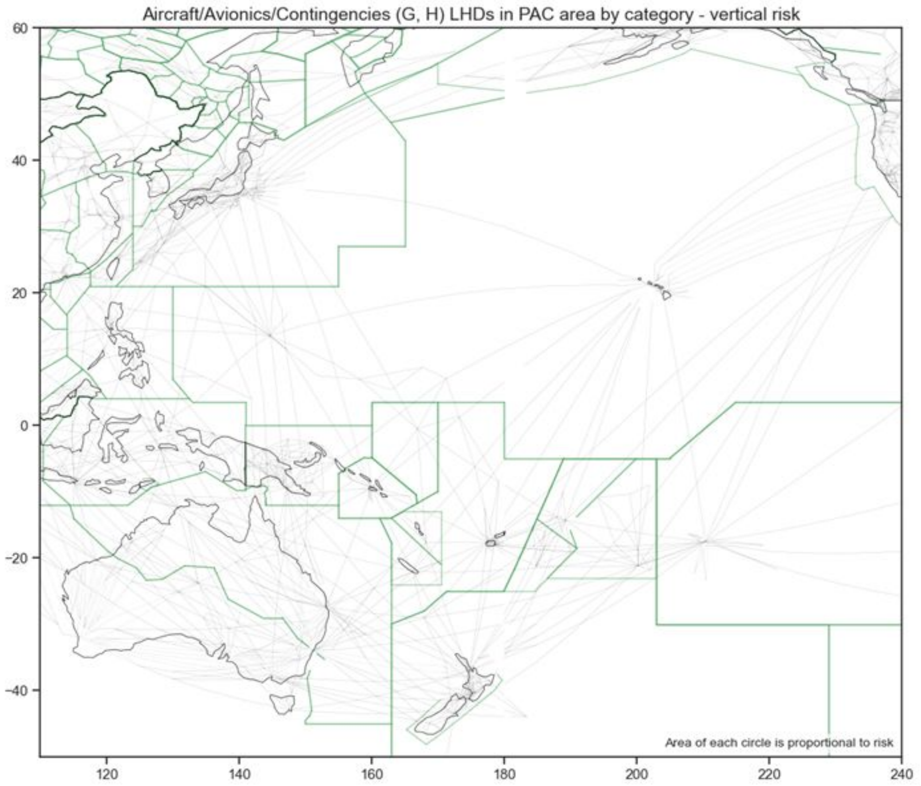


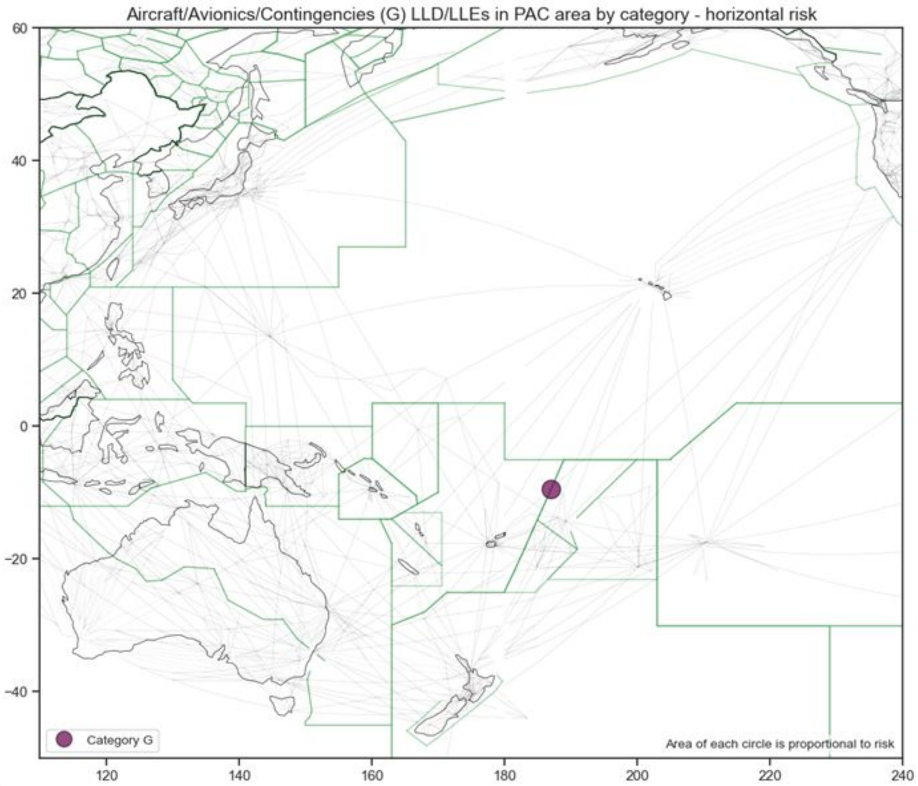
PAC : ATC (D, E, F)


ATC (D, E, F) LHDs in PAC area by category - vertical risk
Category D
Category E
Category F
Area of each circle is proportional to risk
60
40
20
0
-20
-40
120
140
160
180
200
220
240


ATC (D, E, F) LLD/LLEs in PAC area by category - horizontal risk
Category D
Category E
Category F
Area of each circle is proportional to risk
60
40
20
0
-20
-40
120
140
160
180
200
220
240

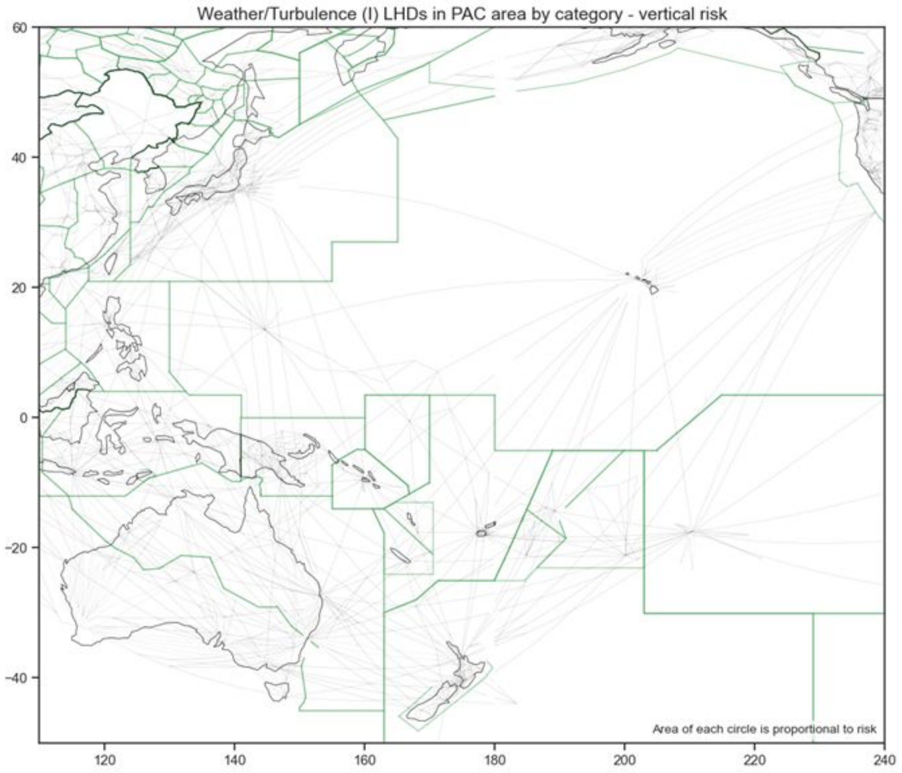
PAC : Aircraft Avionics/Contingencies (LHD:G,H, LLD/LLE:H)

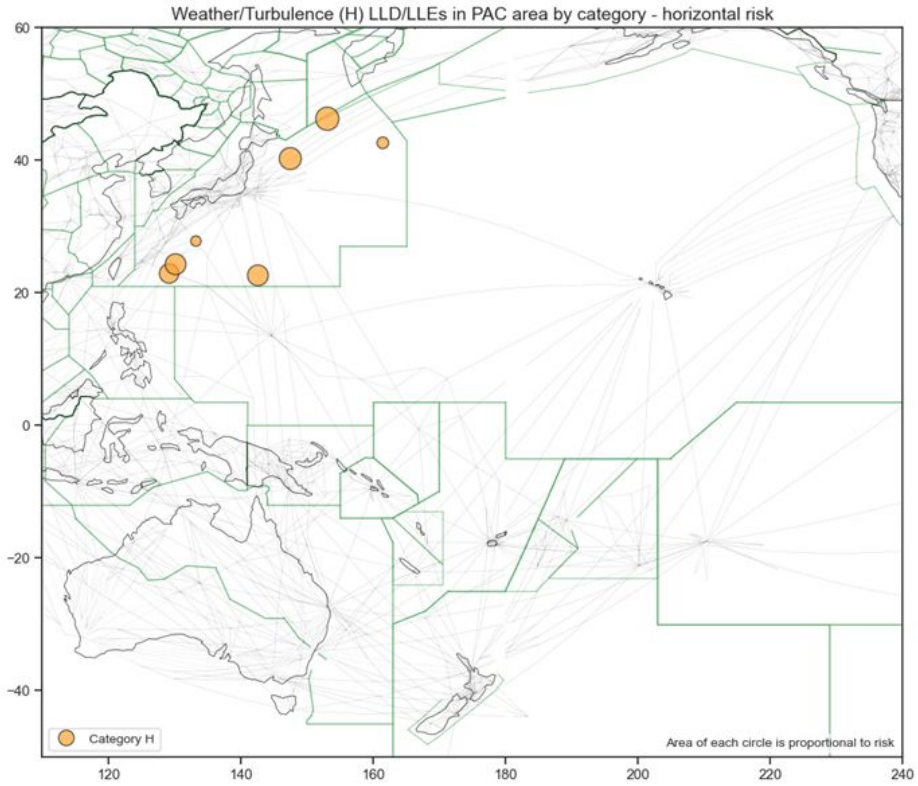




Note: No non-zero Category G and H LHD in 2023

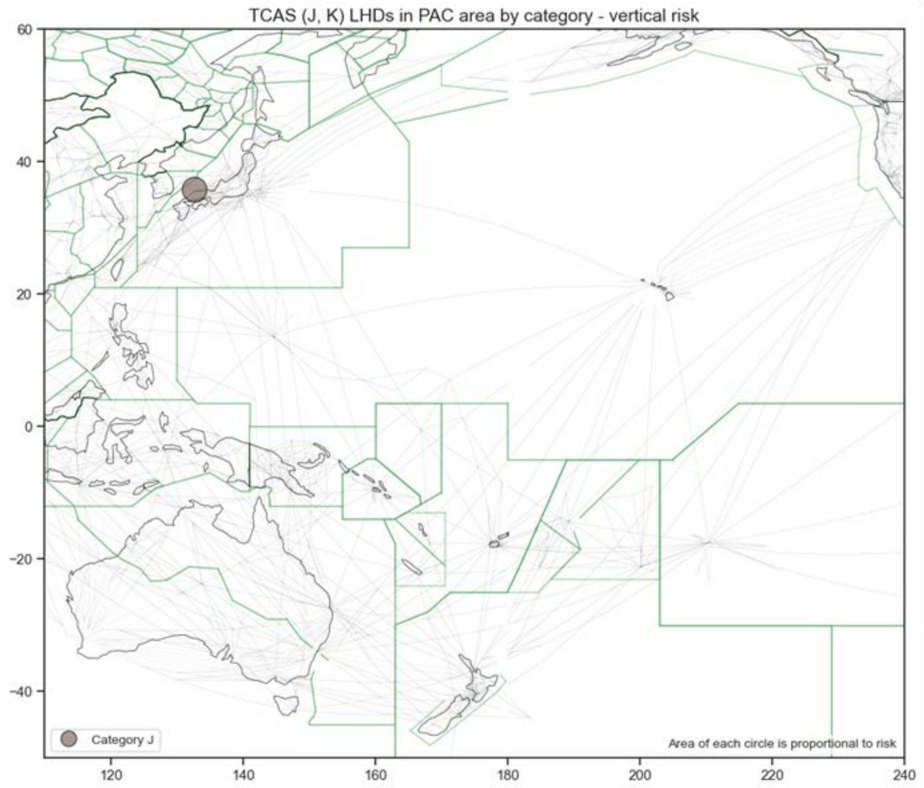
PAC : Weather/Turbulence (LHD:I, LLD/LLE:H)



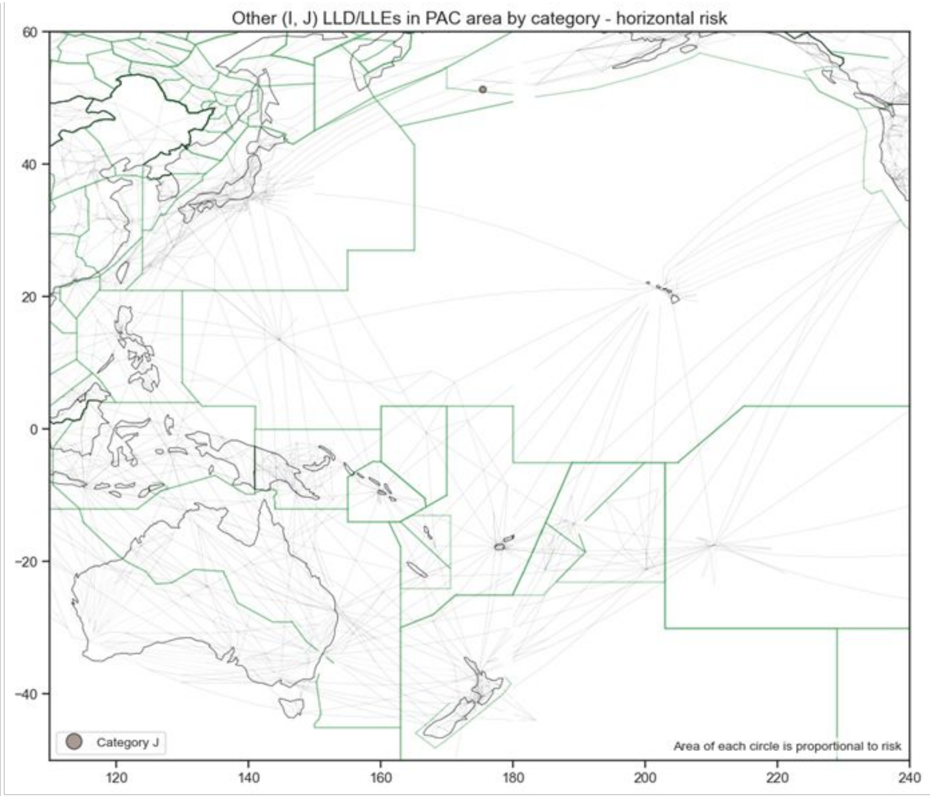


Note: No non-zero Category I LHD in 2023

PAC : TCAS (LHD:J, K)



Note: No non-zero Category K LHD in 2023



Note: No non-zero Category I LLD/LLE in 2023

PAC : Hot Spots

PAC : LHD Hot Spot N (Hawaii CEP/Oakland USA)

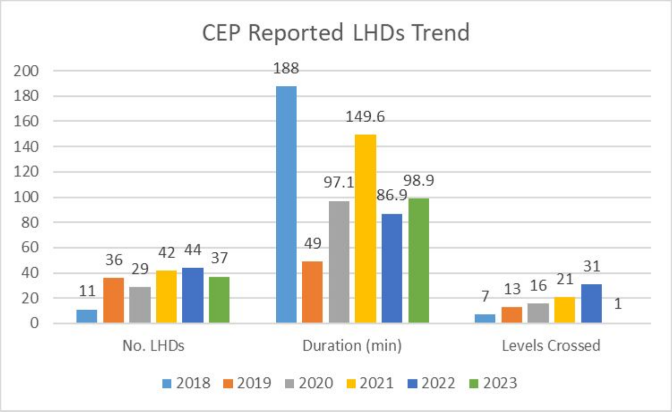
Nature of Occurrences : Coordination errors as a result of human factors issues (Category E)

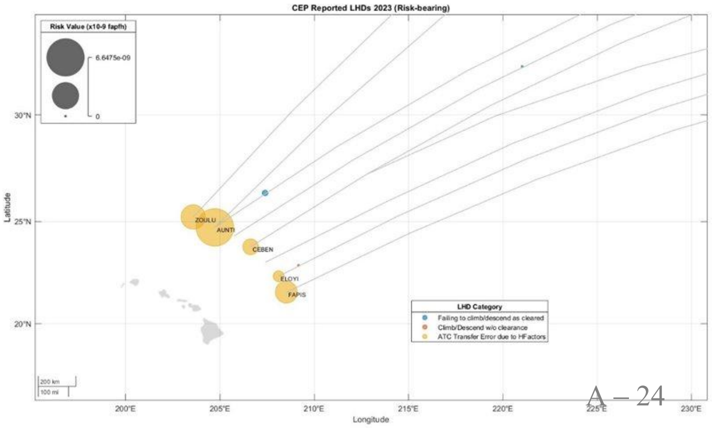
Contributing Factors : The reported LHDs occur within the high traffic volume in the Central East Pacific (CEP). These occurrences affect the CEP traffic and the user-preferred routes that cross the CEP airways.

Trend : Modifications were made to the vertical risk calculations to account for the one-way routes in the traffic flow. These adjustments have resulted in a lower vertical collision risk estimate, but still exceeds the TLS.

Mitigations : North America and Hawaii CEP have developed mitigation procedures. The long term mitigation is a new ATC system scheduled to be implemented at the Honolulu Control Facility in 2025.

Result from the hot spot identification process : This boundary continues to satisfy the hot spot criteria. Therefore, **Hot Spot N remains on the hot spot list**.





Asia Region

Asia : Vertical Collision Risk

ASIA : Vertical Collision Risk Estimates

Number of annual flying hours: 10,153,474 hours/year

2023 ASIA Area	Vertical Risk Estimate	Remark
Vertical Technical Risk	0.56×10^{-9} FAPFH	Below Technical TLS
Vertical Operational Risk	2.84×10^{-9} FAPFH	
Vertical Overall Risk	3.40×10^{-9} FAPFH	Below TLS

ASIA : Vertical Collision Risk Estimates

2016 - 2023

Year	Vertical Overall Risk Estimate	Remark
2023	3.40 $\times 10^{-9}$ FAPFH	Below TLS
2022	1.53 $\times 10^{-9}$ FAPFH	Below TLS
2021	4.03 $\times 10^{-9}$ FAPFH	Below TLS
2020	7.42 $\times 10^{-9}$ FAPFH	Above TLS
2019	12.88 $\times 10^{-9}$ FAPFH	Above TLS
2018	15.50 $\times 10^{-9}$ FAPFH	Above TLS
2017	27.30 $\times 10^{-9}$ FAPFH	Above TLS
2016	12.53 $\times 10^{-9}$ FAPFH	Above TLS

Asia : Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Levels Crossed
Aircrew/ Pilot	A	Flight crew failing to climb/descend the aircraft as cleared	25	15.00	19
	B	Flight crew climbing/descending without ATC Clearance	12	12.75	12
	C	Incorrect operation or interpretation of airborne equipment	19	26.00	1
ATC	D	ATC system loop error	25	26.00	6
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	519	304	106
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	21	21.00	0.00
Aircraft/ Avionics/ Contingencies	G	Aircraft contingency event leading to sudden inability to maintain assigned flight level	1	1.00	1
	H	Airborne equipment failure leading to unintentional or undetected change of flight level	6	0.00	6

Asia : Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Levels Crossed
Weather/ Turbulence	I	Turbulence or other weather related causes leading to unintentional or undetected change of flight level	**82**	**0.20**	**62**
TCAS	J	TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory	**19**	**1.50**	**19**
	K	TCAS resolution advisory, flight crew incorrectly climb or descend following the resolution advisory	**0**	**0.00**	**0**
Other	L	An aircraft being provided with RVSM separation is not RVSM approved	**0**	**0.00**	**0**
	M	Other	**95**	**7.00**	**5**
		Total	**824**	**414.45**	**237**

Asia : Horizontal Collision Risk

Asia : Horizontal Collision Risk Estimates

Number of annual flying hours: 503,528 hours/year

2023 Asia Area	**Horizontal Risk Estimate**	**Airspace**	**Remark**
Total Lateral Risk	1.517 x 10^{-9} FAPFH	ASIA	Below TLS
Total Longitudinal Risk	4.444 x 10^{-9} FAPFH	ASIA	Below TLS
2022 Asia Area	**Horizontal Risk Estimate**	**Airspace**	**Remark**
30NM Lateral Risk	0.068 x 10^{-9} FAPFH	SEA	Below TLS
50NM Lateral Risk	0.096 x 10^{-9} FAPFH	SEA	
30NM Longitudinal Risk	0.786 x 10^{-9} FAPFH	SEA	Below TLS
50NM Longitudinal Risk	0.475 x 10^{-9} FAPFH	SEA and SA/IO	Below TLS

Notes:

- The 2023 Horizontal collision risk estimates are combined into a single value using a weighted average.

Asia : Summary of LLDs and LLEs

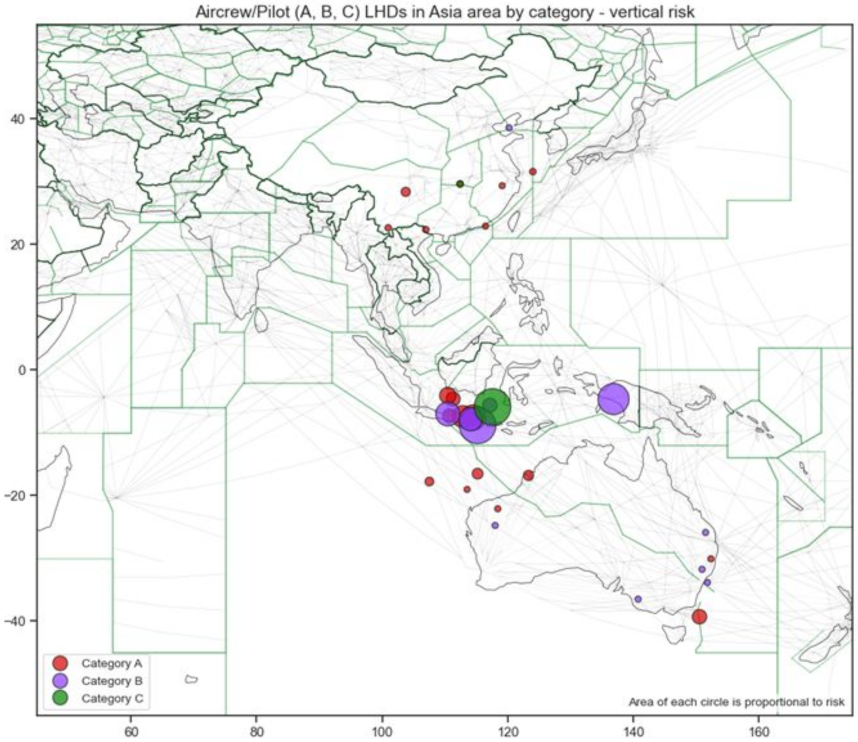
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	5	0.00	0.00	104.00
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne equipment	1	0.00	0.00	32.00
	C	Flight crew waypoint insertion error, due to correct entry of incorrect position or incorrect entry of correct position	0	0.00	0.00	0.00
ATC	D	ATC system loop error	0	0.00	0.00	0.00
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	4	0.00	1.00	0.00
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	0	0.00	0.00	0.00

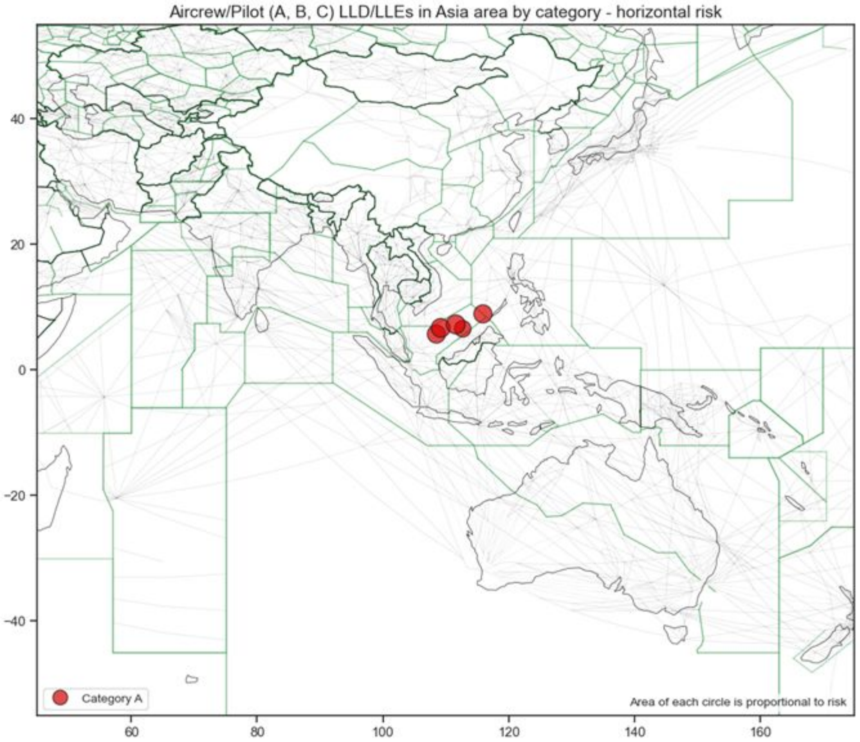
Asia : Summary of LLDs and LLEs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircraft/ Avionics/ Contingencies	G	Navigation errors due to airborne equipment failure	0	0.00	0.00	0.00
Weather/ Turbulence	H	Turbulence or other weather related causes leading to a deviation in the horizontal dimension	0	0.00	0.00	0.00
Other	I	An aircraft was provided with reduced horizontal separation minima but did not meet the RNP/RSP/RCP specification;	0	0.00	0.00	0.00
	J	Other	0	0.00	0.00	0.00
		Total	10	0.00	1.00	136.00

Asia : Geolocation of LHDs/LLDs/LLEs

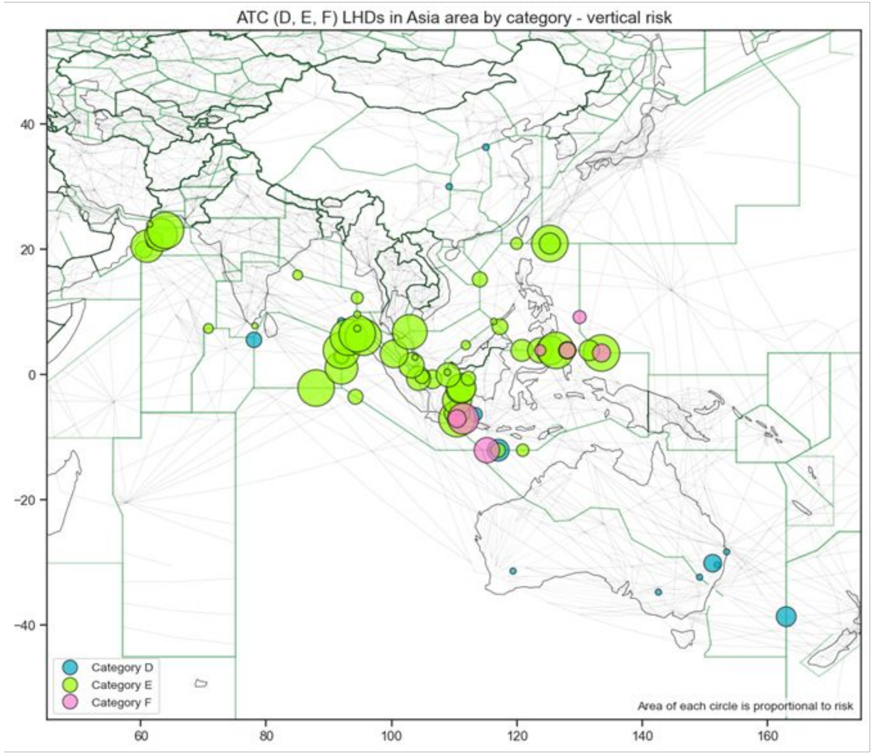
Asia : Aircrew/Pilot (A, B, C)

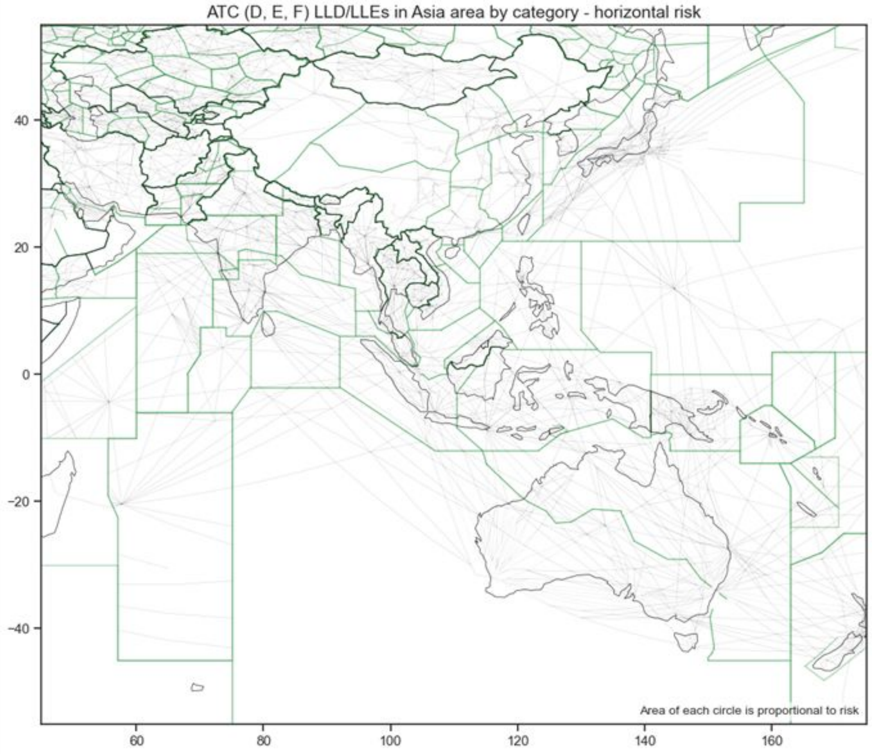




Note: No non-zero Category B and C LLD/LLE in 2023

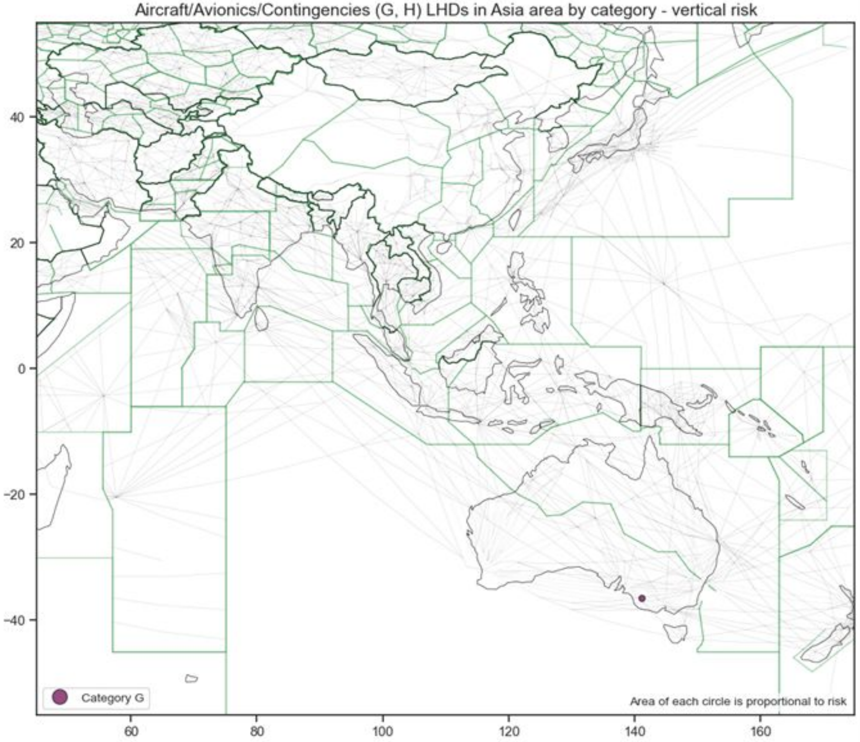
Asia : ATC (D, E, F)



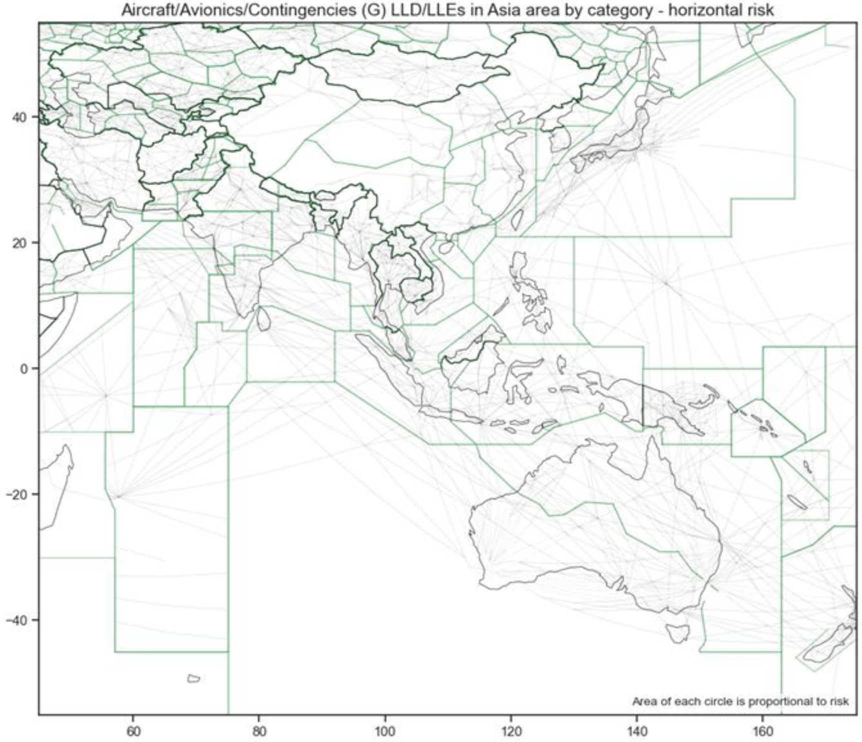


Note: No non-zero Category D, E and F LLD/LLE in 2023

Asia : Aircraft Avionics/Contingencies (LHD:G,H, LLD/LLE:H)

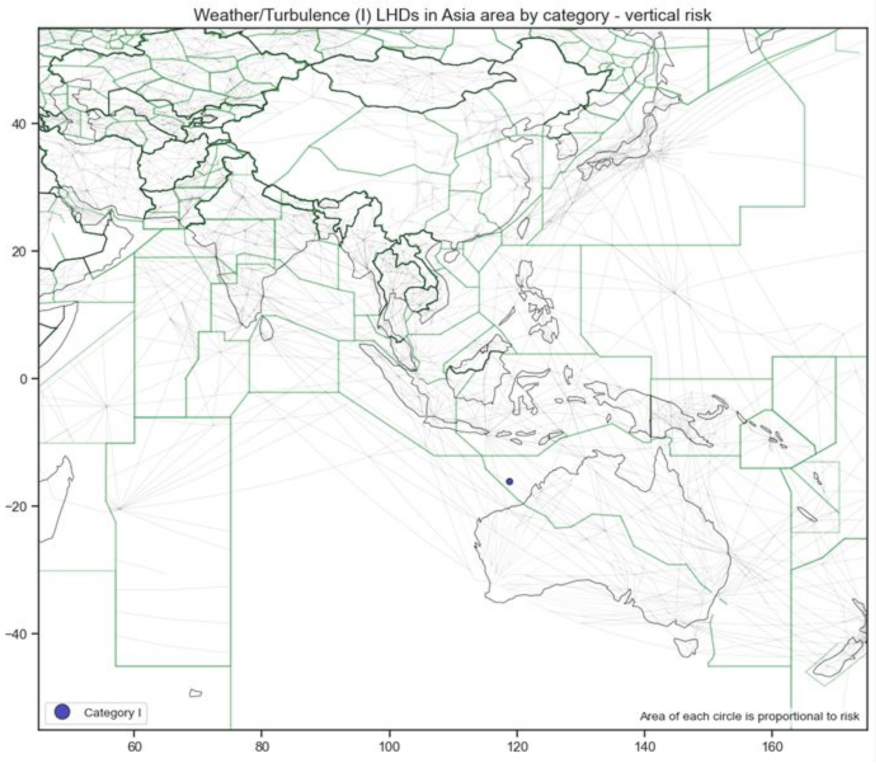


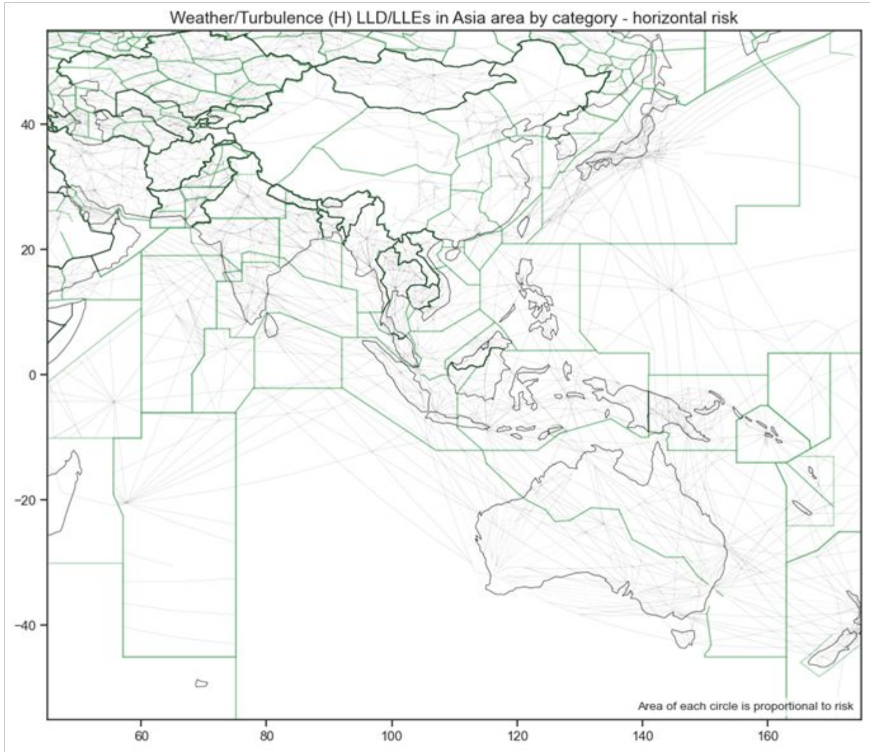
Note: No non-zero Category H LHD in 2023



Note: No non-zero Category G LLD/LLE in 2023

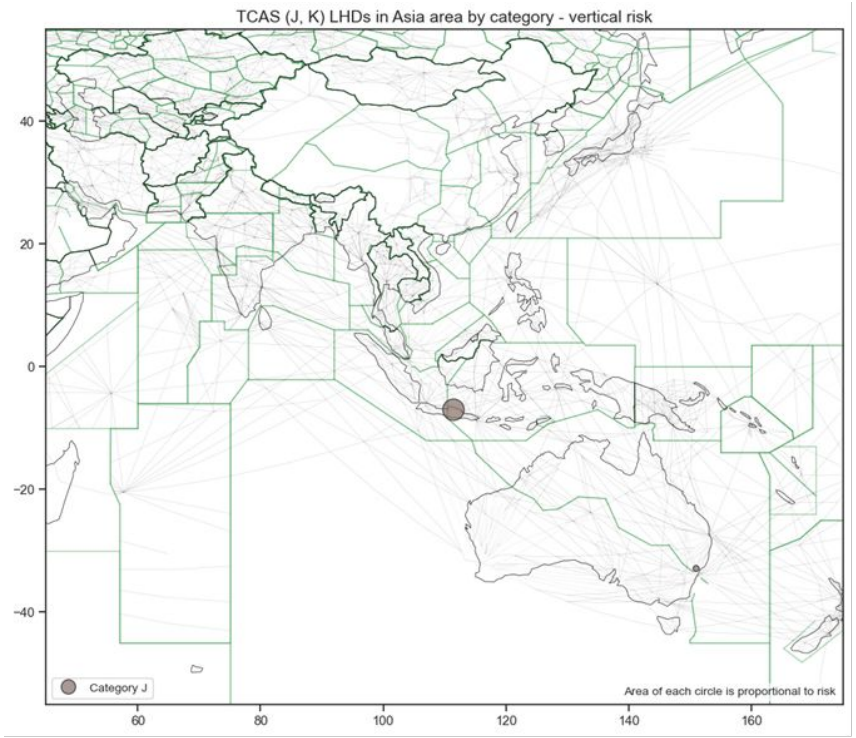
Asia : Weather/Turbulence (LHD:I, LLD/LLE:H)



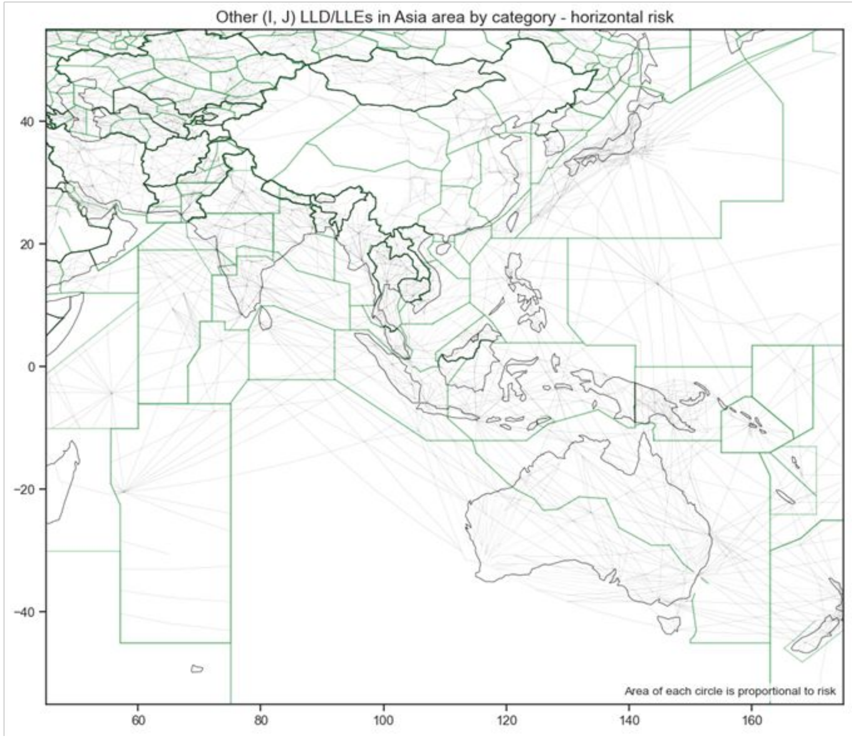


Note: No non-zero Category H LLD/LLE in 2023

Asia : TCAS (LHD:J, K)



Note: No non-zero Category K LHD in 2023



Note: No non-zero Category I and J LLD/LLE in 2023

Asia : Hot Spots

Asia : LHD Hot Spot A1 (Chennai/Dhaka/Kolkata/Yangon)

Nature of Occurrences : Coordination errors as a result of human factors issues (Category E)

Contributing Factors : Some gaps in communication and surveillance coverage.

Trend : The number of LHDs slightly decreased in 2023. There was one non-zero-duration LHD, contributing to the operational risk of 0.06 x 10^{-9} FAPFH.

Mitigations :
- The surveillance was enhanced by Space-Based ADS-B of Indian FIRs and ADS-B data sharing among Kolkata ACC, Chennai ACC and Yangon ACC.
- The AIDC is initiated between Kolkata ACC/Chennai ACC and Yangon ACC, but has not been successfully operated yet.

Result from the hot spot identification process :
- Hot Spot A1 does not meet the hot spot criteria.
- However, **Hot Spot A1 remains on the hot spot list** and should be monitored until further safety improvement initiatives are implemented.

Boundary	The Number of LHDs		
	2021	2022	2023
Kolkata-Yangon	1	17	11
Chennai-Yangon	8	23	15

Boundary	Operational Risk (FAPFH)		
	2021	2022	2023
Kolkata-Yangon	0	0	0.00
Chennai-Yangon	0	0.02×10^{-9}	0.06×10^{-9}

Asia : LHD Hot Spot A2 (Chennai/Kuala Lumpur)

Nature of Occurrences : Coordination errors as a result of human factors issues (Category E)

Contributing Factors : Some gaps in communication and surveillance coverage.

Trend : The number of LHDs decreased in 2023, but the operational risk increased from 0 to 0.23 x 10^{-9} FAPFH.

Mitigations :
- The surveillance was enhanced by Space-Based ADS-B of Indian FIRs.
- The AIDC operation was successfully implemented between Chennai ACC and Kuala Lumpur ACC since January 2021

Result from the identifying hot spots process :
- Hot Spot A2 does not satisfy any hot spot criteria for two consecutive years.
- **Hot Spot A2 is removed from the hot spot list,** because the safety improvement initiatives such as Spaced-Based ADS-B and the AIDC have been successfully operated.

Boundary	The Number of LHDs		
	2021	2022	2023
Chennai-KL	21	22	13
Boundary	**Operational Risk (FAPFH)**		
	2021	**2022**	**2023**
Chennai-KL	0.05 x 10^{-9}	0	0.23 x 10^{-9}

Asia : LHD Hot Spot B (AKARA Airspace)

Nature of Occurrences : Coordination errors as a result of human factors issues (Category E)

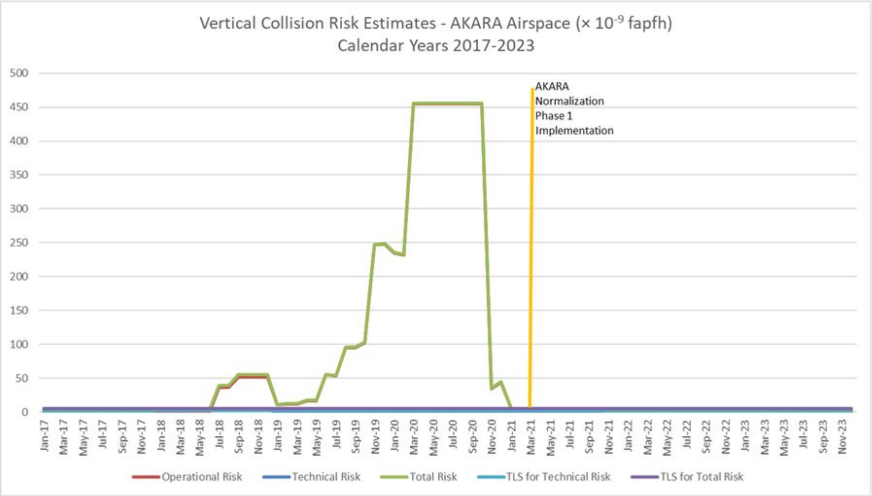
Contributing Factors : The Flight Level Allocation Scheme (FLAS) limits available flight levels due to high traffic volume in the area. Existing LOA for provision of ATS.

Trend :

- Continued trend in the number of LHDs at Incheon-Shanghai TOC point.
- No reported LHD at Fukuoka-Incheon FIR boundary and within the Incheon FIR from 2021 to 2023. As a result, the vertical operational risk estimate was zero.

Mitigations :

- Significant route structure change was implemented in March 2021. The Phase I implementation included a parallel airway (Y590/Y591) to A593.
- Mitigations provided by the available surveillance and direct speech circuit.



Asia : LHD Hot Spot B (AKARA Airspace)

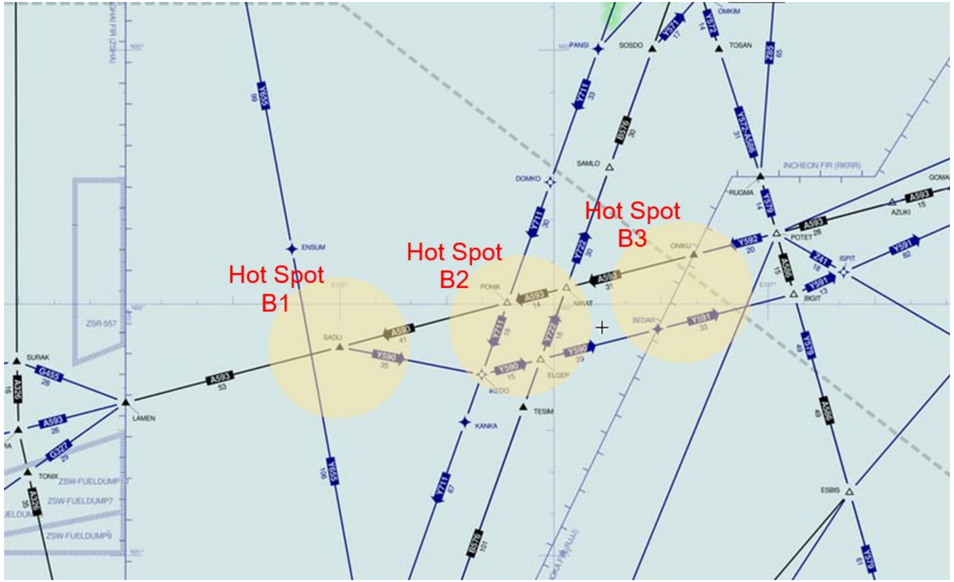
Subdivision of Hot Spot B :
During RASMAG MAWG/11, APAC monitoring agencies agreed to subdivide Hot Spot B into :

- B1 - Incheon (Transfer-of-Control Point between Incheon ACC and Shanghai ACC)
- B2 - Incheon (Intersection points of A593, Y590, Y711, and Y722)
- B3 - Fukuoka/Incheon

Result from the identifying hot spots process :
In 2022 and 2023, only B1 met the criteria in terms of the number of LHDs.

B1 remains on the Hot Spot list, because it still meets the hot spot criteria and should be monitored until further safety improvement initiatives are implemented (such as AIDC and route structure reorganization as suggested by PARMO and ROK).

B2 and B3 are removed from the Hot Spot list, because no LHD has been reported at those areas for more than two years and the reorganization of route structure in Phase I was completed.



Asia : LHD Hot Spot D (Manila and adjacent FIRs)

Nature of Occurrences :
- Coordination errors as a result of human factors issues(Category E)
- Several coordination errors as a result of equipment outage or technical issues (Category F) emerging from AIDC failures.

Contributing Factors :
- Communication and surveillance coverage gaps along the boundaries of Manila FIR
- Verbal exchange of transfer information
- Sectors configuration of Manila ACC
- New ATM system and new infrastructure implementation such as AIDC

Trend : In 2023, the total number of LHDs and the operational risk increased.

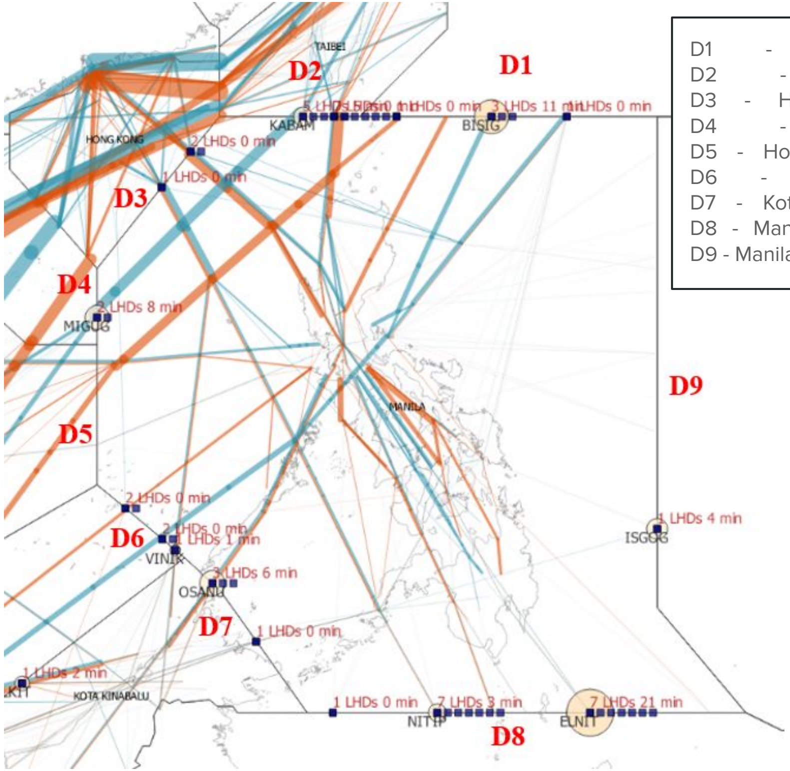
Mitigations :
- Several safety improvement activities such as the new ATM system, ACC sector re-sectorization, enhanced surveillance, and ADS-C/CPDLC have been implemented.

- Manila ACC and Fukuoka ACC have bilateral meetings regularly and agreed to implement a mitigation measure that would contribute to a reduction of transfer error due to human factors.

Boundary	Number of LHDs			Operational Risk (x 10^{-9} FAPFH)		
	2021	2022	2023	2021	2022	2023
Fukuoka/Manila	11	4	4	0.45	0.03	0.19
Ho Chi Minh/Manila	7	3	2	0.77	0.05	0.10
Hong Kong/Manila	2	1	3	0.00	0.00	0.00
Kota Kinabalu/Manila	2	3	5	0.00	0.04	0.13
Manila/Sanya	0	0	0	0.00	0.00	0.00
Manila/Singapore	2	2	4	0.00	0.04	0.00
Manila/Taibei	4	3	12	0.07	0.00	0.06
Manila/Ujung Pandang	7	2	15	0.36	0.11	0.41
Manila/Oakland	2	0	1	0.00	0.00	0.07
Total	**37**	**18**	**46**	**1.65**	**0.27**	**0.96**

Note: The number of LHDs and the operational risk in this table are based solely on the LHDs collected in MAAR's analysis.

Asia : LHD Hot Spot D (Manila and adjacent FIRs)



D1 - Fukuoka/Manila
D2 - Manila/Taibei
D3 - Hong Kong/Manila
D4 - Manila/Sanya
D5 - Ho Chi Minh/Manila
D6 - Manila/Singapore
D7 - Kota Kinabalu/Manila
D8 - Manila/Ujung Pandang
D9 - Manila/Oakland

Subdivision of Hot Spot D :
During RASMAG MAWG/11, APAC monitoring agencies agreed to subdivide Hot Spot D to 9 interfaces (D1 to D9).

Result from the identifying hot spots process :
D1 met the criteria in terms of the operational risk in 2023 (JASMA).
D8 met the criteria in terms of the operational risk in 2023.

The remaining subdivisions did not meet any of the hot spot criteria in the last two years. However, AIDC was successfully implemented at D2, D3, D4, D6, and D9.

Thus, D2, D3, D4, D6, and D9 are removed from the Hot Spot list.

D1, D5, D7, and D8 remain on the Hot Spot list and should be monitored until further safety improvement initiatives such as AIDC are implemented.

Asia : LHD Hot Spot F (Mogadishu/Mumbai)

Nature of Occurrences : Coordination errors as a result of human factors issues (Category E)

Contributing Factors : The Mogadishu-Mumbai FIR boundary (Waypoint: ORLID, Route: G450) is in the oceanic airspace with poor communication and surveillance coverage.

Trend : The number of LHDs slightly increased in 2023. The operational risk conversely decreased to 0 FAPFH.

Mitigations :
- The Space-Based ADS-B enhances surveillance capability of Indian FIRs.
- AIDC implementation between Mumbai and Mogadishu ACC remains in the testing phase.

Boundary	The Number of LHDs		
	2021	2022	2023
Mogadishu-Mumbai	5	9	10
Boundary	**The Operational Risk (FAPFH)**		
	2021	**2022**	**2023**
Mogadishu-Mumbai	0.12×10^{-9}	0.02×10^{-9}	0.00×10^{-9}

Result from the identifying hot spots process :
- Even though this area does not satisfy any hot spot criteria, **Hot Spot F remains on the hot spot list** until further safety improvement initiatives or prevention measures such as AIDC are completed and demonstrate their effectiveness.

Asia : LHD Hot Spot G (Mumbai/Muscat/Sanaa)

Nature of Occurrences : Coordination errors as a result of human factors issues (Category E)

Contributing Factors : Mumbai-Muscat and Mumbai-Sanaa FIR boundaries are oceanic airspace with poor communication and surveillance coverage.

Trend : At Mumbai-Muscat, the number of LHDs and the operational risk significantly increased in 2023. Conversely, at Mumbai-Sanaa, the number of LHDs remained low over the past three years, with the operational risk being zero in both 2022 and 2023.

Mitigations :
- The Space-Based ADS-B enhances surveillance capability of Indian FIRs.
- AIDC implementation between Mumbai ACC and Muscat ACC remains in the testing phase.

Result from the identifying hot spots process :
- Hot Spot G, particularly at Mumbai-Muscat FIR boundary, met the criteria in terms of both the number of LHDs and the operational risk in 2023.
- **Hot Spot G remains on the hot spot list** until further safety improvement initiatives or prevention measures such as AIDC are completed and demonstrate their effectiveness.

Boundary	The Number of LHDs		
	2021	2022	2023
Mumbai-Muscat	44	43	138
Mumbai-Sanaa	4	2	3

Boundary	The Operational Risk (FAPFH)		
	2021	2022	2023
Mumbai-Muscat	1.35×10^{-9}	0.79×10^{-9}	2.79×10^{-9}
Mumbai-Sanaa	0.07×10^{-9}	0.00×10^{-9}	0.00×10^{-9}

Asia : LHD Hot Spot J (Jakarta/Kota Kinabalu/Singapore)

Nature of Occurrences :
Coordination errors as a result of human factors issues (Category E)

Contributing Factors : To be analysed

Trend : The number of LHDs and operational risk significantly increased in 2023. However, the operational risk remained below the TLS.

Mitigations : AAMA is working with SEASMA to share and confirm the information about LHDs on the Jakarta–Singapore FIR boundary. AirNav Indonesia is working towards implementation of AIDC, which could mitigate coordination errors due to human factors issues.

Result from the identifying hot spots process :
This boundary satisfied the hot spot criteria in terms of the number of LHDs from 2021 to 2023. Therefore, **Hot Spot J remains on the hot spot list**.

Boundary	The Number of LHDs		
	2021	2022	2023
Jakarta – Singapore	16	14	27
Boundary	**The Operational Risk (FAPFH)**		
	2021	**2022**	**2023**
Jakarta – Singapore	0.23×10^{-9}	0.18×10^{-9}	0.33×10^{-9}

Asia : LHD Hot Spot M (Colombo/Melbourne)

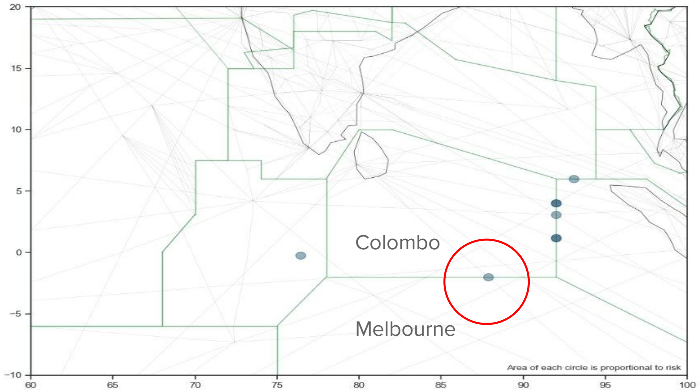
Nature of Occurrences : Category A, B, and E LHDs.

Contributing Factors : A large number were pilot errors involving the Indian Navy.

Trend : Since 2019, the number of LHDs at Hot Spot M has been decreasing, so RASMAG/26 proposed to re-classify as a non-Hot Spot. However, AAMA and MAAR still do not have a suitable contact for the Indian Navy.

Mitigations : In 2020, the re-sectorisation was implemented at Colombo oceanic airspace. The awareness and training on this issue were also provided to ATCOs in both Colombo and Melbourne OCCs.

For this reason, **Hot Spot M is removed from the Hot Spot list.**



Asia : LHD Hot Spot O
(Bangkok/Ho Chi Minh/Kuala Lumpur/Singapore)

Nature of Occurrences : Coordination errors as a result of human factors issues (Category E).

Contributing Factors : The route structure and ATC procedures of handling crossing traffic over this area can be complex due to the different Transfer of Control and Communication Points and the involvement of multiple ATS units.

Trend : The operational risk and the number of LHDs slightly decreased in 2023. However, the proportion of operational risk, at 28%, remains high compared to the total operational risk in SEA airspace.

Result from the identifying hot spots process : This area satisfied the hot spot criteria in terms of the operational risk in 2022 and 2023. Therefore, **Hot Spot O remains on the hot spot list**.

Boundary	The Number of LHDs		
	2021	2022	2023
Hot Spot O	5	7	5
Boundary	The Operational Risk (FAPFH)		
	2021	2022	2023
Hot Spot O	0.14×10^{-9}	0.58×10^{-9}	0.51×10^{-9}

Reporting Rate
of LHDs/LLDs/LLEs

2023 Reporting Rate of LHDs/LLDs/LLEs

Airspace	Flying Hours	Aircrew/Pilot		ATC		Other		Total	
		# Reports	1 Report : Flying Hrs	# Reports	1 Report : Flying Hrs	# Reports	1 Report : Flying Hrs	# Reports	1 Report : Flying Hrs
DPRK	-	0	-	0	-	0	-	0	-
Mongolia	83,708	0	-	0	-	0	-	0	-
SEA	2,969,413	6	1: 494,902	92	1: 32,276	3	1: 98,804	101	1: 29,400
Japan	1,688,572	12	1: 140,714	16	1: 105,536	44	1: 38,377	72	1: 23,452
SW Pacific	1,182,067	33	1: 35,820	28	1: 42,217	4	1: 295,517	65	1: 18,186
China	2,346,976	9	1: 260,775	19	1: 123,525	195	1: 12,036	223	1: 10,525
SA/IO	2,642,401	1	1: 2,642,41	256	1: 10,322	1	1: 2,642,401	258	1: 10,242
Pacific	1,773,499	37	1: 47,932	160	1: 11,084	6	1: 295,583	203	1: 8,736
Indonesia	762,410	13	1: 58,647	111	1: 6,869	1	1: 762,410	125	1: 6,099
ROK and AKARA	166,500	0	-	75	1: 2,220	0	-	75	1: 2,220
Total	13,615,545	111	1: 122,663	757	1: 17,986	254	1: 53,605	1,122	1: 12,135

Notes:

- No aircraft flying in the RVSM airspace of DPRK due to public health crisis in 2023. As a result, there were no flying hours and no reported LHDs, LLDs, or LLEs for DPRK.

Reporting Rate of LHDs/LLDs/LLEs

Airspace	# Reports							1 Report : Flying Hrs						
	2017	2018	2019	2020	2021	2022	2023	2017	2018	2019	2020	2021	2022	2023
DPRK	0	0	0	0	0	0	0	-	-	-	-	-	-	-
Mongolia	4	1	2	0	1	0	0	1: 37,771	1: 158,891	1: 82,138	-	1: 121,621	-	-
SEA	474	205	152	42	70	62	95	1: 6,548	1: 17,757	1: 22,275	1: 25,106	1: 15,456	1:32,620	1:29,400
Japan	71	76	77	66	80	75	67	1: 21,510	1: 20,632	1: 20,762	1: 14,737	1: 13,528	1:18,751	1:23,452
SW Pacific	51	53	101	46	47	81	65	1: 17,572	1: 17,817	1: 9,335	1: 6,954	1: 11,975	1:5,352	1:18,186
China	134	110	79	85	105	72	223	1: 18,248	1: 22,229	1: 31,119	1: 26,867	1: 15,477	1:18,003	1:10,525
SA/IO	935	681	439	152	135	143	254	1: 3,166	1: 3,783	1: 7,955	1: 7,907	1: 11,167	1:21,018	1:10,242
Pacific	42	43	173	134	176	179	193	1: 54,191	1: 45,064	1: 10,139	1: 6,404	1: 6,638	1:8,280	1:8,736
Indonesia	34	23	37	18	41	54	125	1: 10,842	1: 53,603	1: 33,321	1: 17,346	1: 7,402	1:8,060	1:6,099
ROK and AKARA	5	12	34	5	24	108	75	1: 117,090	1: 28,365	1: 18,959	1: 25,965	1: 6,285	1:1,056	1:2,220
Total	**1,750**	**1,204**	**1,094**	**548**	**679**	**774**	**1,122**	**1: 8,180**	**1: 12,332**	**1: 14,330**	**1: 13,202**	**1: 11,200**	**1:13,230**	**1:12,135**

The reporting rate for SEA, China, SA/IO and Indonesia improved in 2023.
The reporting rate for SW Pacific dropped because of the huge increase in the estimated flying hours.

Notes:

- The flying hours for Indonesian airspace in 2021 was calculated based on the 2020 TSD.
- The flying hours for SW Pacific and Indonesian airspace in 2022 were calculated based on the 2021 TSD.

Conclusion

RVSM TLS Compliance - Vertical

- **The 2023 PAC vertical overall risk is 10.77 x 10^{-9} FAPFH, above the TLS,** mostly driven by Hot Spot N (Hawaii CEP/Oakland USA). To address this hot spot, the responsible units have already implemented mitigation procedures while planning for an ATM system upgrade to begin in 2025 to resolve the issue.
- **The 2023 ASIA vertical overall risk is 3.40 x 10^{-9} FAPFH, below the TLS.**

RVSM TLS Compliance - Horizontal

- **All horizontal risk estimates in 2023 are below the TLS.**

RASMAG's Hot Spot List

Hot Spot	Involved FIRs	Identified	Remarks
A1	Chennai/Dhaka/Kolkata/Yangon	2015	Cat. E LHDs and risk reducing.
A2	Chennai/Kuala Lumpur	2015	Cat. E LHDs reducing. Risk slightly increasing. Removed from the Hot Spot list in 2024 (RASMAG/29).
B1	Incheon (Transfer-of-Control Point between Incheon ACC and Shanghai ACC)	2015	Cat. E LHDs and risk reducing.
B2	Incheon (Intersection points of A593, Y590, Y711, and Y722)	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
B3	Fukuoka/Incheon	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
D1	Fukuoka/Manila	2015	Cat. E LHDs reducing. Risk slightly increasing.
D2	Manila/Taibei	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
D3	Hong Kong/Manila	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
D4	Manila/Sanya	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
D5	Ho Chi Minh/Manila	2015	Cat. E LHDs reducing. Risk slightly increasing.
D6	Manila/Singapore	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).

RASMAG's Hot Spot List

Hot Spot	Involved FIRs	Identified	Remarks
D7	Kota Kinabalu/Manila	2015	Cat. E LHDs and risk slightly increasing.
D8	Manila/Ujung Pandang	2015	Cat. E & F LHDs and risk increasing.
D9	Manila/Oakland	2015	Removed from the Hot Spot list in 2024 (RASMAG/29).
F	Mogadishu/Mumbai	2015	Cat. E LHDs slightly increasing. Risk reducing.
G	Mumbai/Muscat/Sanaa	2015	Cat. E LHDs and risk increasing.
J	Jakarta/Kota Kinabalu/Singapore	2018	Cat. E LHDs and risk increasing.
M	Colombo/Melbourne	2019	Removed from the Hot Spot list in 2024 (RASMAG/29).
N	Hawaii CEP/Oakland USA	2019	Cat. E LHDs and Risk reducing.
O	Bangkok/Ho Chi Minh/Kuala Lumpur/ Singapore	2023	Cat. E LHDs and Risk reducing.

Reporting Rate of LHDs/LLDs/LLEs

- The estimated flying hours significantly increased from

  7,604,927 hours in 2021 and
  10,240,138 hours in 2022 to
  13,615,545 hours in 2023.

- The overall reporting rate of LHDs/LLDs/LLEs slightly improved from

  1 report per 13,230 hours in 2022 to
  1 report per 12,135 hours in 2023.

- The reporting rate for SEA, China, SA/IO and Indonesia improved in 2023.
- The reporting rate for SW Pacific dropped because of the huge increase in the estimated flying hours.
- The reporting rate for DPRK could not be calculated because there were no flying hours and no reported LHDs, LLDs, or LLEs due to a public health crisis (no aircraft flying in DPRK's RVSM airspace in 2023.)
- The reporting rate for Mongolia could not be calculated because no LHDs, LLDs, or LLEs were reported. Mongolia submitted NIL reports for all months in 2023.

Thank You

VHF COM Frequency Allotment Plan for APAC Region (March 2024)

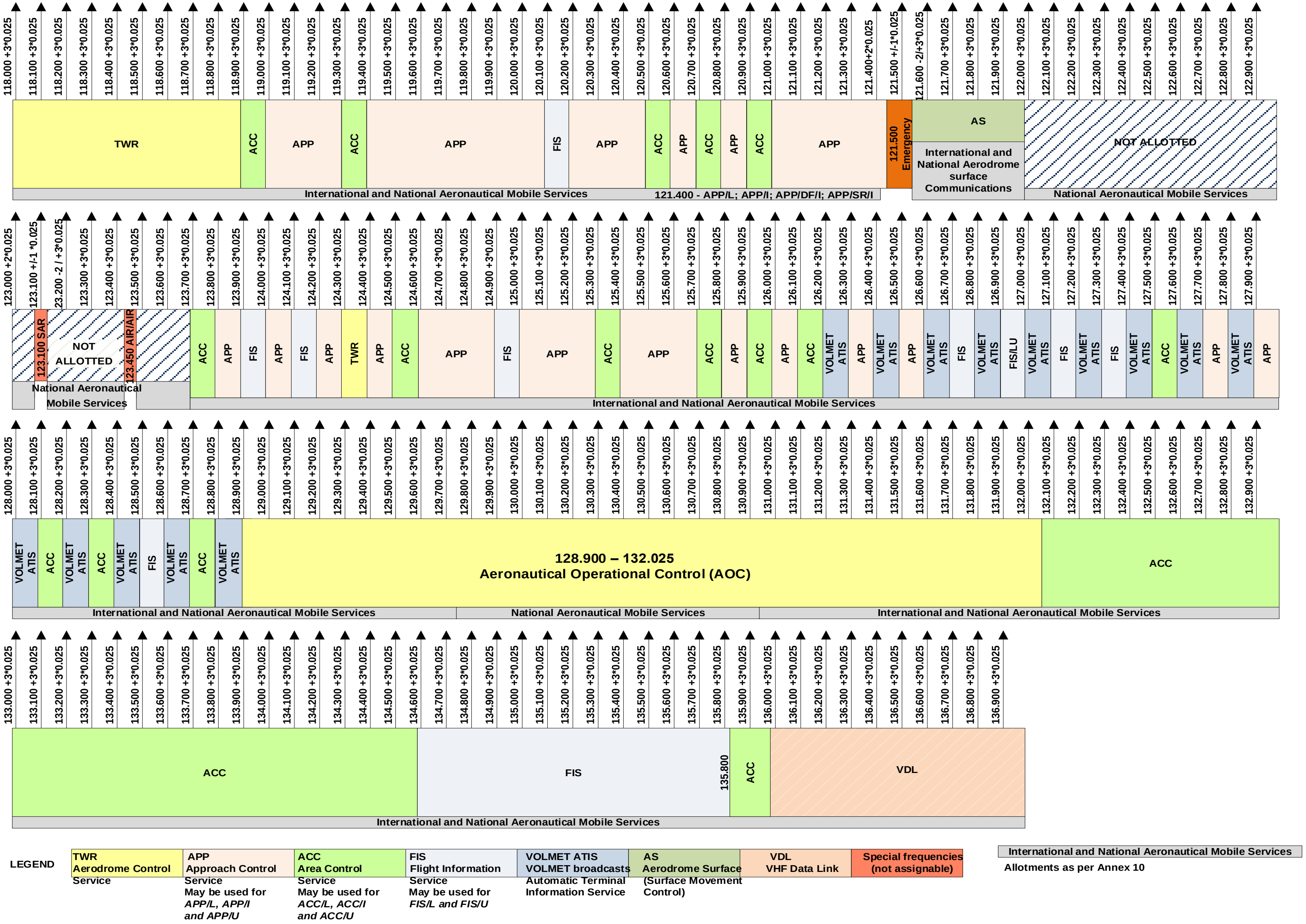
Function (revised)	**Function**	**Frequencies (MHz)**
TWR 118.000-118.875MHz 124.300-124.375MHz	TWR	118.000 118.025 118.050 118.075 118.100 118.125 118.150 118.175 118.200 118.225 118.250 118.275 118.300 118.325 118.350 118.375 118.400 118.425 118.450 118.475 118.500 118.525 118.550 118.575 118.600 118.625 118.650 118.675 118.700 118.725 118.750 118.775 118.800 118.825 118.850 118.875 124.300 124.325 124.350 124.375
AS 121.550-121.975MHz	AS	**121.550 121.575** 121.600 121.625 121.650 121.675 121.700 121.725 121.750 121.775 121.800 121.825 121.850 121.875 121.900 121.925 121.950 121.975
APP 119.000-119.275MHz 119.400-120.075MHz 120.200-120.475MHz 120.600-120.675MHz 120.800-120.875MHz 121.000-121.450MHz 123.800-123.875MHz 124.000-124.075MHz 124.200-124.275MHz 124.400-124.475MHz 124.600-124.875MHz 125.000-125.275MHz 125.400-125.675MHz 125.800-125.875MHz 126.000-126.075MHz 126.300-126.375MHz 126.500-126.575MHz 127.700-127.775MHz 127.900-127.975MHz	APP	119.500 119.525 119.550 119.575 119.600 119.625 119.650 119.675 119.800 119.825 119.850 119.875 119.900 119.925 119.950 119.975
	APP-L, APP-I, Also used for APP Direction finding or APP Surveillance radar	119.100 119.125 119.150 119.175 119.200 119.225 119.250 119.275 119.400 119.425 119.450 119.475 119.700 119.725 119.750 119.775 120.000 120.025 120.050 120.075 120.200 120.225 120.250 120.275 120.400 120.425 120.450 120.475 120.600 120.625 120.650 120.675 120.800 120.825 120.850 120.875 121.000 121.025 121.050 121.075 121.100 121.125 121.150 121.175 121.200 121.225 121.250 121.275 121.400 **121.425 121.450** 123.800 123.825 123.850 123.875 124.000 124.025 124.050 124.075 124.700 124.725 124.750 124.775 125.100 125.125 125.150 125.175 125.500 125.525 125.550 125.575 126.500 126.525 126.550 126.575 127.700 127.725 127.750 127.775 127.900 127.925 127.950 127.975
	APP-U	120.300 120.325 120.350 120.375 121.300 121.325 121.350 121.375 124.200 124.225 124.250 124.275 124.400 124.425 124.450 124.475 124.600 124.625 124.650 124.675 124.800 124.825 124.850 124.875 125.000 125.025 125.050 125.075 125.200 125.225 125.250 125.275 125.400 125.425 125.450 125.475 125.600 125.625 125.650 125.675

		125.800 125.825 125.850 125.875 126.000 126.025 126.050 126.075 126.300 126.325 126.350 126.375
ACC 118.900-118.975MHz 119.300-119.375MHz 120.500-120.575MHz 120.700-120.775MHz 120.900-120.975MHz 123.700-123.775MHz 124.500-124.575MHz 125.300-125.375MHz 125.700-125.775MHz 125.900-125.975MHz 126.100-126.175MHz 127.500-127.575MHz 128.100-128.175MHz 128.300-128.375MHz 128.700-128.775MHz 132.050-134.575MHz 135.825-135.975MHz	ACC-L Also used for ACC-L Surveillance Radar	126.100 126.125 126.150 126.175 127.500 127.525 127.550 127.575 128.300 128.325 128.350 128.375 128.700 128.725 128.750 128.775
	ACC-U ACC-L	118.900 118.925 118.950 118.975 119.300 119.325 119.350 119.375 120.500 120.525 120.550 120.575 120.700 120.725 120.750 120.775 120.900 120.925 120.950 120.975 123.700 123.725 123.750 123.775 124.500 124.525 124.550 124.575 125.300 125.325 125.350 125.375 125.700 125.725 125.750 125.775 125.900 125.925 125.950 125.975 128.100 128.125 128.150 128.175 132.050 132.075 132.100 132.125 132.150 132.175 132.200 132.225 132.250 132.275 132.300 132.325 132.350 132.375 132.400 132.425 132.450 132.475 132.500 132.525 132.550 132.575 132.600 132.625 132.650 132.675 132.700 132.725 132.750 132.775 132.800 132.825 132.850 132.875 132.900 132.925 132.950 132.975 133.000 133.025 133.050 133.075 133.100 133.125 133.150 133.175 133.200 133.225 133.250 133.275 133.300 133.325 133.350 133.375 133.400 133.425 133.450 133.475 133.500 133.525 133.550 133.575 133.600 133.625 133.650 133.675 133.700 133.725 133.750 133.775 133.800 133.825 133.850 133.875 133.900 133.925 133.950 133.975 134.000 134.025 134.050 134.075 134.100 134.125 134.150 134.175 134.200 134.225 134.250 134.275 134.300 134.325 134.350 134.375 134.400 134.425 134.450 134.475 134.500 134.525 134.550 134.575 135.825 135.850 135.875 135.900 135.925 135.950 135.975
FIS 120.100-120.175MHz 123.900-123.975MHz 124.100-124.175MHz 124.900-124.975MHz 126.700-126.775MHz 126.900-126.975MHz	FIS-L FIS-U	120.100 120.125 120.150 120.175 123.900 123.925 123.950 123.975 124.100 124.125 124.150 124.175 124.900 124.925 124.950 124.975 126.700 126.725 126.750 126.775 126.900 126.925 126.950 126.975 127.100 127.125 127.150 127.175

127.100-127.175MHz 127.300-127.375MHz 128.500-128.575MHz 134.600-135.800MHz		127.300 127.325 127.350 127.375 128.500 128.525 128.550 128.575
	FIS-U Also used for General purpose communications	134.600 134.625 134.650 134.675 134.700 134.725 134.750 134.775 134.800 134.825 134.850 134.875 134.900 134.925 134.950 134.975 135.000 135.025 135.050 135.075 135.100 135.125 135.150 135.175 135.200 135.225 135.250 135.275 135.300 135.325 135.350 135.375 135.400 135.425 135.450 135.475 135.500 135.525 135.550 135.575 135.600 135.625 135.650 135.675 135.700 135.725 135.750 135.775 135.800
VOLMET/ATIS 126.200-126.275MHz 126.400-126.475MHz 126.600-126.675MHz 126.800-126.875MHz 127.000-127.075MHz 127.200-127.275MHz 127.400-127.475MHz 127.600-127.675MHz 127.800-127.875MHz 128.000-128.075MHz 128.200-128.275MHz 128.400-128.475MHz 128.600-128.675MHz 128.800-128.875MHz	VOLMET/ATIS	126.200 126.225 126.250 126.275 126.400 126.425 126.450 126.475 126.600 126.625 126.650 126.675 126.800 126.825 126.850 126.875 127.000 127.025 127.050 127.075 127.200 127.225 127.250 127.275 127.400 127.425 127.450 127.475 127.600 127.625 127.650 127.675 127.800 127.825 127.850 127.875 128.000 128.025 128.050 128.075 128.200 128.225 128.250 128.275 128.400 128.425 128.450 128.475 128.600 128.625 128.650 128.675 128.800 128.825 128.850 128.875
AOC	AOC	128.900-132.025(Except 128.950MHz)
DATA LINK	DATA LINK	136.000-136.975
AIR-TO-AIR	AIR-TO-AIR	123.450 128.950 (TIBA)
NOT ALLOTED	NOT ALLOTED	122.000-123.675(Except 123.100MHz, 123.450MHz)

Note: The allotment of 12 yellow highlighted frequencies for ACC services has not been included in the Asia-Pacific conference outcomes.

VHF COM Frequency Allotment Plan for APAC Region (March 2024)



GENERAL STRATEGY ON ASSIGNMENT OF AND MIGRATION TO SI CODE (revised)

Considering that, when formulating the general strategy:

a) It was previously shared that radars using SI code cannot detect II-only transponders unless a work-around known as the II/SI code operation is used;

b) Even if a radar using SI code supports the II/SI code operation, it will not be able to detect an II-only transponder if that transponder is already locked to a matching II code by a radar using that matching II code. A way to overcome this is for II radars to also use the II/SI code operations whereby it will only lock out SI-capable transponders and not II-only transponders. However, it is difficult to ensure that all radars (including old radars) can support the II/SI code operations in the near future;

c) Transponders that support only II codes are unlikely to disappear totally. Even with strict enforcement by ICAO, there will still be aircraft not subjected to ICAO's provision;

d) While it is possible to configure the lock-out coverage to be smaller than the designated operating coverage, such configuration may not be intuitive and may be subjected to error;

e) The European region is reserving II codes 14 and 15 (and their matching SI codes) for special use (i.e. research/test and military purposes). However, the situation in APAC region is different and do not have the same conditions that allow the reservation of II 14 and 15 (and their matching SI code);

f) The Surveillance Panel is deliberating on a proposal to include a **requirement** for use of II/SI code operations for radars using SI code and a **recommendation** for the use of II/SI code operations for radars using II code; and

g) The strategy is to be kept simple,

The following general strategy has been agreed ~~is thus proposed~~ for the assignment of SI codes:

a) The ICAO APAC regional office will assign SSR Mode S II or Mode S SI codes in accordance with the planning criteria in *Appendix A-1*, at the same time ensuring continued support for Mode S II-only transponders;

b) The ICAO APAC regional office will only assign an SI code if the radar can support II/SI code operations;

c) The ICAO APAC regional office will only assign an SI code to radars having overlapping coverage with another radar using "matching" II code when the radar using "matching" II code can support II/SI code operations;

d) The ICAO APAC Regional Office will assume that the designated operating coverage is the same as the lockout coverage. There will be a 5NM buffer between the coverages of two radars using the same II or SI code. States can, as necessary, select a lockout coverage that is smaller than the Designated Operational Coverage; and

e) ~~The ICAO APAC regional office will generally avoid assigning II 14 and 15 (and their matching SI codes) to new radars.~~ The ICAO APAC regional office will not reserve II codes 14 and 15 (and their matching SI codes) for special use like the case of Europe region. Instead, ICAO APAC regional office will have the full flexibility to assign II 14 and 15 (and their matching SI codes) like the rest of the II and SI codes.

The following general strategy for migration has been agreed ~~is proposed~~:

a) States with Mode S radars that can support II/SI code operation are encouraged to coordinate this functionality with the ICAO APAC regional Office to assign or re-assign SI codes to these radars.

b) The ICAO APAC Regional Office may also approach certain States to start migrating to SI codes.

Appendix A-1

The following planning criteria for assigning SSR Mode S II or SSR Mode S SI codes have been agreed by the Surveillance Panel and will be incorporated in the ICAO Aeronautical Surveillance Manual (DOC 9924)

(Editorial Note: Some of the texts below are edited from the original material in DOC. 9924)

Table 1: Considered interrogator (interrogator for which an Interrogator Code is demanded)
Mode S II-only interrogator
Operating on II code
Can operate with Mode S II-only and Mode S II/SI transponders

Case	**Capability of the overlapping interrogator**	**Operating code**	**Condition**	**Transponder Type**
A	A Mode S II only	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
B	Mode S SI operating with II code (1)	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
C	Mode S SI operating with SI code (1)	Any SI code, including a “matching” SI code	Overlap OK	II/SI
D	Mode S II/SI+ operating with II code (2)	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
E	Mode S II/SI+ operating with SI code (2)	Non-matching SI code	Overlap OK	II-only and II/SI
		Matching SI code	No overlap	

Note 1: Mode S SI means Mode S II/SI capable interrogator which does not support the II/SI code operation
Note 2: Mode S II/SI+ means Mode S II/SI capable interrogator which does support the II/SI code operation

Table 2: Considered interrogator (interrogator for which an Interrogator Code is demanded)
Mode S II/SI interrogator that does not support the use of II/SI code operation.
Operating on II code
Can operate with Mode S II-only and Mode S II/SI transponders

Case	**Capability of the overlapping interrogator**	**Operating code**	**Condition**	**Transponder Type**
A	A Mode S II only	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
B	Mode S SI operating with II code (1)	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
C	Mode S SI operating with SI code (1)	Any SI code, including a “matching” SI code	Overlap OK	II/SI
D	Mode S II/SI+ operating with II code (2)	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
E	Mode S II/SI+ operating	Non-matching SI	Overlap OK	II-only and II/SI

	with SI code (2)	code		
		Matching SI code	No overlap	

Note 1: Mode S SI means Mode S II/SI capable interrogator which does not support the II/SI code operation
Note 2: Mode S II/S+I means Mode S II/SI capable interrogator which does support the II/SI code operation

Table 3: Considered interrogator (interrogator for which an Interrogator Code is demanded)
Mode S II/SI interrogator that does not support the use of II/SI code operation.
Operating on SI code
Can only operate with Mode S II/SI transponders

Case	Capability of the overlapping interrogator	Operating code	Condition	Transponder Type
A	A Mode S II only	Any II code including the matching II code	Overlap OK	II/SI
B	Mode S SI operating with II code (1)	Any II code including the matching II code	Overlap OK	II/SI
C	Mode S SI operating with SI code (1)	Different SI code	Overlap OK	II/SI
		Same SI code	No overlap	
D	Mode S II/SI+ operating with II code (2)	Any II code including the matching II Code	Overlap OK	II/SI
E	Mode S II/SI+ operating with SI code (2)	Different SI code	Overlap OK	II/SI
		Same SI code	No overlap	

Note 1: Mode S SI means Mode S II/SI capable interrogator which does not support the II/SI code operation
Note 2: Mode S II/SI+ means Mode S II/SI capable interrogator which does support the II/SI code operation

Table 4: Considered interrogator (interrogator for which an Interrogator Code is demanded)
Mode S II/SI+ interrogator that supports the use of II/SI code operation.
Operating on II code
Can operate with Mode S II-only and Mode S II/SI transponders

Case	Capability of the overlapping interrogator	Operating code	Condition	Transponder Type
A	A Mode S II only	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
B	Mode S SI operating with II code (1)	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
C	Mode S SI operating with SI code (1)	Any SI code including a matching SI code	Overlap OK	II/SI
D	Mode S II/SI+ operating with II code (2)	Different II code	Overlap OK	II-only and II/SI
		Same II code	No overlap	
E	Mode S II/SI+ operating with SI code (2)	Any SI code including a matching SI code	Overlap OK	II-only and II/SI

Note 1: Mode S SI means Mode S II/SI capable interrogator which does not support the II/SI code operation
Note 2: Mode S II/SI+ means Mode S II/SI capable interrogator which does support the II/SI code

operation

Table 5: Considered interrogator (interrogator for which an Interrogator Code is demanded) **Mode S II/SI+ interrogator that supports the use of II/SI code operation.** **Operating on SI code** Can operate with Mode S II-only and Mode S II/SI transponders				
Case	**Capability of the overlapping interrogator**	**Operating code**	**Condition**	**Transponder Type**
A	A Mode S II only	Non-matching II code	Overlap OK	II-only and II/SI
		Matching II code	No overlap	
B	Mode S SI operating with II code (1)	Non-matching II code	Overlap OK	II-only and II/SI
		Matching II code	No overlap	
C	Mode S SI operating with SI code (1)	Different SI code	Overlap OK	II/SI
		Same SI code	No overlap	
D	Mode S II/SI+ operating with II code (2)	Any II code including a matching II code	Overlap OK	II-only and II/SI
E	Mode S II/SI+ operating with SI code (2)	Different SI code	Overlap OK	II-only and II/SI
		Same SI code	No overlap	

Note 1: Mode S SI means Mode S II/SI capable interrogator which does not support the II/SI code operation
Note 2: Mode S II/SI+ means Mode S II/SI capable interrogator which does support the II/SI code operation

ATM and Airspace Safety Deficiencies List (Updated 01 November 2024)

	Deficiencies			Corrective Action		
States/facilities	**Description**	**Date first reported**	**Remarks**	**Executing body**	**Target date**	**Priority ****
	WGS-84 Requirements of Paragraph 1.2.1 of Annex 15					
Afghanistan	WGS-84 - Not implemented	24/6/2014		Afghanistan	TBD	A
Brunei Darussalam	WGS-84 - Not implemented	24/6/2014		Brunei Darussalam	~~TBD~~ 31/12/2025	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
Vanuatu	WGS-84 – Not implemented	2/7/1999	Implemented at main airports	Vanuatu	1999	A
	AIP Format Requirements of Chapter 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
~~Nauru~~	~~AIP Format - Not implemented~~	~~7/7/99~~	~~ATM/AIS/SAR/SG/18 (June 2008) was advised work soon to start~~	~~Nauru~~		~~A~~
	AIS Quality Management System Requirements of Paragraph 3.6.1 of Annex 15 Quality Management System - Not implemented					
Afghanistan	AIS Quality Management System - Not implemented	24/6/2014		Afghanistan	TBD	A

	Deficiencies			Corrective Action		
States/facilities	**Description**	**Date first reported**	**Remarks**	**Executing body**	**Target date**	**Priority ****
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~~ 31/03/2026	A
Cambodia	AIS Quality Management System - Not implemented	24/6/2014		Cambodia	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~~ 30/09/2024	A
Marshall Islands	AIS Quality Management System - Not implemented	24/6/2014		Maldives	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~~ 31/12/2025	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

	Deficiencies			Corrective Action		
States/facilities	**Description**	**Date first reported**	**Remarks**	**Executing body**	**Target date**	**Priority ****
~~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~~
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
	Aeronautical Data Area of Responsibility - 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
	Designation of Restricted Areas - requirements of Annex 2 (Definitions) to ensure that restricted areas are designated above the land areas or territorial waters of a State					

	Deficiencies			Corrective Action		
States/facilities	**Description**	**Date first reported**	**Remarks**	**Executing body**	**Target date**	**Priority ****
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	December 2022	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
	<u>Airspace Classification</u> Requirements of Paragraph 2.6 of Annex 11					
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
Macao, 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</u> Requirements of Doc 4444 PANS-ATM Section 11.4 (Message Types and their Application)		Note: the threshold for a Deficiency is 5% 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			

	Deficiencies			Corrective Action		
States/facilities	**Description**	**Date first reported**	**Remarks**	**Executing body**	**Target date**	**Priority ****
Maldives	DEP message transmission	09/08/2019	DEP messages inconsistently transmitted Conclusion APANPIRG/27/12 and ICAO correspondence	Maldives	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	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/6 56%	Afghanistan	2019	U
Bangladesh	Asia/Pacific SAR Plan	17/05/2019	~~APSAR/WG/8 65%~~ APSAR/WG/9 65%	Bangladesh	2019	U
Bhutan	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/8 28%	Bhutan	2019	U
Brunei Darussalam	Asia/Pacific SAR Plan	17/05/2019	APSAR/WG/4 63%	Brunei	2019	U
Cambodia	Asia/Pacific SAR Plan	6/07/2015	~~APSAR/WG/4 76%~~ APSAR/WG/9 76%	Cambodia	2019	U
Macao, China	Asia/Pacific SAR Plan	6/07/2015	~~APSAR/WG/4 85%~~ APSAR/WG/9 88%	Macao, China	2019	U
Cook Islands	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/8 62%	Cook Islands	2019	U
DPR Korea	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/8 71%	DPR Korea	2019	U

	Deficiencies			Corrective Action		
States/facilities	**Description**	**Date first reported**	**Remarks**	**Executing body**	**Target date**	**Priority ****
French Polynesia	Asia/Pacific SAR Plan	17/05/2019	APSAR/WG/8 84%	French Polynesia	2019	U
Kiribati	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/4 26%	Kiribati	2019	U
Lao PDR	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/4 57%	Lao PDR	2019	U
~~Malaysia~~	~~Asia/Pacific SAR Plan~~	~~17/05/2019~~	~~APSAR/WG/8 85%~~ APSAR/WG/8 92%	~~Malaysia~~	~~2019~~	~~U~~
Maldives	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/8 78%	Maldives	2019	U
Marshall Islands	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/5 17%	Marshall Islands	2019	U
Micronesia	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/5 17%	Micronesia	2019	U
Mongolia	Asia/Pacific SAR Plan	17/05/2019	~~APSAR/WG/5 73%~~ APSAR/WG/9 89%	Mongolia	2019	U
Myanmar	Asia/Pacific SAR Plan	6/07/2015	~~APSAR/WG/4 67%~~ APSAR/WG/9 69%	Myanmar	2019	U
Nauru	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/4 0%	Nauru	2019	U
Nepal	Asia/Pacific SAR Plan	6/07/2015	~~APSAR/WG/7 56%~~ APSAR/WG/9 66%	Nepal	2019	U
New Caledonia	Asia/Pacific SAR Plan	17/05/2019	APSAR/WG/8 78%	New Caledonia	2019	U
Pakistan	Asia/Pacific SAR Plan	17/05/2019	~~APSAR/WG/8 89%~~ APSAR/WG/9 89%	Pakistan	2019	U
Palau	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/5 17%	Palau	2019	U
Papua New Guinea	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/7 54%	Papua New Guinea	2019	U
~~Philippines~~	~~Asia/Pacific SAR Plan~~	~~6/07/2015~~	~~APSAR/WG/8 86%~~ APSAR/WG/9 90%	~~Philippines~~	~~2019~~	~~U~~
Samoa	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/4 0%	Samoa	2019	U

	Deficiencies			Corrective Action		
States/facilities	**Description**	**Date first reported**	**Remarks**	**Executing body**	**Target date**	**Priority ****
Solomon Islands	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/4 0%	Solomon Islands	2019	U
Sri Lanka	Asia/Pacific SAR Plan	17/05/2019	~~APSAR/WG/8 83%~~ APSAR/WG/9 84%	Sri Lanka	2019	U
Thailand	Asia/Pacific SAR Plan	17/05/2019	~~APSAR/WG/8 82%~~ APSAR/WG/9 85%	Thailand	~~2019~~ 2025	U
Timor-Leste	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/4 0%	Timor-Leste	2019	U
Tonga	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/4 70%	Tonga	2019	U
Tuvalu	Asia/Pacific SAR Plan	28/05/2022	APSAR/WG/7 0%	Tuvalu	2024	U
Vanuatu	Asia/Pacific SAR Plan	6/07/2015	APSAR/WG/4 0%	Vanuatu	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 and 2020. Afghanistan had submitted data for the period January to July 2021, but no further LHD reports were received after August 2021.	Afghanistan	~~RASMAG/27~~ TBD	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.)					

	Deficiencies			Corrective Action		
States/facilities	**Description**	**Date first reported**	**Remarks**	**Executing body**	**Target date**	**Priority ****
Afghanistan	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/23	Remaining monitoring burden of 50% (RASMAG/29) MAAR informed ICAO that all known airframes in Afghanistan have complied with the monitoring requirement (November 2022). Deficiency retained due to the unknown status of the Afghanistan aeronautical authority responsible for ensuring monitoring is conducted.	Afghanistan	~~RASMAG/24~~ TBD	A
India	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/29	Remaining monitoring burden of 48% (RASMAG/29)	India	TBD	A
~~Mongolia~~	~~Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)~~	~~RASMAG/28~~	~~Remaining monitoring burden of 43% (RASMAG/28)~~ Remaining monitoring burden of 18% (RASMAG/29)	~~Mongolia~~	~~TBD~~	~~A~~
Nepal	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/28	~~Remaining monitoring burden of 45% (RASMAG/28)~~ Remaining monitoring burden of 45% (RASMAG/29)	Nepal	TBD	A
~~New Zealand~~	~~Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)~~	~~RASMAG/28~~	~~Remaining monitoring burden of 36% (RASMAG/28)~~ Remaining monitoring burden of 11% (RASMAG/29)	~~New Zealand~~	~~TBD~~	~~A~~
~~Pakistan~~	~~Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)~~	~~RASMAG/22~~	~~Remaining monitoring burden of 45% (RASMAG/26)~~ Remaining monitoring burden of 27% (RASMAG/29)	~~Pakistan~~	~~RASMAG/24~~	~~A~~
~~Papua New Guinea~~	~~Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)~~	~~RASMAG/28~~	~~Remaining monitoring burden of 69% (RASMAG/28)~~ Remaining monitoring burden of 15% (RASMAG/29)	~~Papua New Guinea~~	~~TBD~~	~~A~~

	Deficiencies			Corrective Action		
States/facilities	**Description**	**Date first reported**	**Remarks**	**Executing body**	**Target date**	**Priority ****
Philippines	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/29	Remaining monitoring burden of 40% (RASMAG/29)	Philippines	TBD	A
~~Solomon Islands~~	~~Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)~~	~~RASMAG/28~~	~~Remaining monitoring burden of 50% (RASMAG/28)~~ Remaining monitoring burden of 0% (RASMAG/29)	~~Solomon Islands~~	~~TBD~~	~~A~~
	Data Link Performance Monitoring and Analysis Requirements of Paragraph 2.28 and/or 3.3.5.2 of Annex 11 not met					
India	Post-implementation monitoring not implemented	13/07/2017	Performance monitoring and analysis was reported for the Chennai and Kolkata FIRs, but was not reported for the Mumbai FIR.	India	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.~~ (FIT-Asia/14): Disabled the ADS-C function from the ATM system due to an application issue, and CPDLC/HF is used beyond VHF coverage.	~~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.

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Updated on 16 Dec. 2020

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Afghanistan							
Annex 14 Volume I	**Herat International Airport**	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.				A
	Kabul International Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.				A
	Kandahar International Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.				A
	Mazar-e-Sharif Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.				A
Annex 14 Volume I PANS-Aerodromes PANS-AIM	AIP	**Status of Certification of Aerodromes in AIP**	Effective from 1 Jan 2021	Status of certification of aerodromes yet to be published in AIP AD 1.5.				A

Updated on ~~22 June 2023~~ 12 June 2024

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	<u>Bangladesh</u>							
Annex 14 Volume I	**Hazrat Shahjalal International Airport, Dhaka**	**Runway/ Taxiway**	**ICAO mission April 2009**	Runway strip width insufficient (280m strip not available for the full length of runway);	runway strip in accordance with Annex 14, Volume I will be provided	CAABD	Runway strip width 280m available for the full length of runway (Mitigation measures for storm water drain on the western side strip, is being replaced with concrete hollow pipes into graded surface. ~~45% of the construction work has been done and total work will be completed by June 2024. No obstructions on graded area).~~ Construction work has been completed for around 1000m out of the 3200m length of the runway and the total work will be completed by June 2025. No obstructions on graded area).	A

Updated on 16 Dec. 2020

Identification		**Deficiencies**			**Corrective Action**			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
Annex 14 Volume I	**<u>Brunei Darussalam</u>** **Brunei International Airport**	**Taxiway**	ICAO Mission of April 2011	non provision of enhanced taxiway centre line marking in accordance with Para 5.2.8 of Annex 14, Volume I Objects on taxiway strips; vegetation on pavement joints and maintenance of joints	Both Northern Parallel Taxiway and Southern Parallel Taxiway Centre line have been repainted yellow and enhanced with black borders on each side.	Airport Operator (DCA Aerodrome Division)		A A
		Apron		non provision of ICAO compliant signage in accordance with section 5.4 Annex 14, Volume I	Airfield signages have always been provided at BIA that follow ICAO standards and measurement. Recent replacement of old and faded labels have also been completed in 2018.	Airport Operator (DCA Aerodrome Division)		A
		Rescue and Fire Fighting (RFF):		non provision of direct access for the rescue and fire fighting vehicles from the fire station into the runway;	Duly noted that there is no direct access for fire fighting vehicles to the runway at the moment, but one will be concluded within the second phase of the Airfield Pavement Rehabilitation Project.	Airport Operator (DCA Aerodrome Division)	4th Qtr. 2022	A

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
		Wildlife Hazards:		Establishing a national bird control committee in accordance with APANPIRG Conclusion 18/1.	Aerodrome Division headed by Head of Aerodrome to firstly establish an in-house committee and will cooperate with Regulatory Division	Airport Operator (DCA Aerodrome Division)	4th Qtr. 2021	B
	Brunei International Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.				A
Annex 14 Volume I PANS-Aerodromes PANS-AIM	AIP	**Status of Certification of Aerodromes in AIP**	Effective from 1 Jan 2021	Status of certification of aerodromes yet to be published in AIP AD 1.5.				A

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Updated on ~~16 Dec. 2020~~ 25 June 2024

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	China							
Annex 14 Volume I	**Hualien Airport**	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.				A
	Taichung Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.				A
	Tainan Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.				A
~~**Annex 14 Volume I PANS-Aerodromes PANS-AIM**~~	~~AIP~~	~~**Status of Certification of Aerodromes in AIP**~~	~~Effective from 1 Jan 2021~~	~~Status of certification of some of the aerodromes used for international operations yet to be published in AIP AD 1.5.~~	~~The AIP will be amended to include this deficiency.~~	~~Civil Aviation Administration of China (CAAC)~~	Published the Status of Certification in AIP AD 1.5 with effect from 15 May 2024. Resolved	~~A~~

Updated on ~~25 June 2023~~ 25 June 2024

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	India							
Annex 14, Volume I	**Mumbai International Airport**	**Runway**	**AGA mission January 2009**	Runway strip is insufficient 300m strip width is not available for the full length of runway 09/27 in accordance with 3.4.3 of Annex 14, Volume I.	280m strip width for full length of runway 09/27 will be made available	MIAL	**31 Dec 2026** Land acquisition in progress. MIAL has filed temporary exemption with DGCA for non-compliance. Due to presence of slum in beginning of RWY 09/27 south – RWY strip 280m not available.	A
Annex 14 Volume I	**Chandigarh Airport**	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified. – Defence Aerodrome				A
Annex 14 Volume I	**Goa Airport**	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified. – Defence Aerodrome				A
Annex 14 Volume I	**Port Blair Airport**	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified. – Defence Aerodrome				A
Annex 14 Volume I	**Pune Airport**	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified. – Defence Aerodrome				A
Annex 14 Volume I	**Srinagar Airport**	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified. – Defence Aerodrome				A

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	India							
Annex 14	**GORAKHPUR (VEGK)**	**Aerodrome Certification**	25 June 2024	Aerodrome yet to be certified. – Defence Aerodrome				A
Volume I	**HINDAN (VIDX)**	**Aerodrome Certification**	25 June 2024	Aerodrome yet to be certified. – Defence Aerodrome				A
Annex 14	**JODHPUR (VIJO)**	**Aerodrome Certification**	25 June 2024	Aerodrome yet to be certified. – Defence Aerodrome				A
Volume I	**VISAKHAPATNAM (VOVZ)**	**Aerodrome Certification**	25 June 2024	Aerodrome yet to be certified				A

Updated on 16 June 2023

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Kiribati							
Annex 14 Volume I	**Christmas Island Airport, Kiritimati**	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.	Issued with the Interim Certificate since the Operator is not yet fully complied to the requirements	Airport Kiribati Authority	31 Dec 2023	A
	Bonriki International Airport, Tarawa	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.	The Aerodrome Operator is not yet fully complied to the requirements	Airport Kiribati Authority	31 Dec 2023	A
Annex 14 Volume I PANS-Aerodromes PANS-AIM	AIP	**Status of Certification of Aerodromes in AIP**	Effective from 1 Jan 2021	Status of certification of aerodromes yet to be published in AIP AD 1.5.	The AIP will be amended to include this deficiency	Civil Aviation Authority of Kiribati (CAAK)	15 Oct 2023	A

Updated on 11 July 2023

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
Annex 14 Volume I	**Lao PDR** **Wattay International Airport**	**Taxiway**	**ICAO Mission of March 2011**	Provision of stop bars at runway-holding position in accordance with Para 5.3.20 of ICAO Annex 14, Volume I	AOL request exemption to DCAL and proposed to install in Long Term Plan.	Airport of Laos (AOL)	DCA exempt of runway hold position lights in accordance to AOL and mention in the Certification.	A
		Wildlife Hazards:		Establishing a national bird control committee in accordance with APANPIRG conclusion 18/1.	DCAL to propose prime minister decree and establish national committee accordingly.	Department of Civil Aviation of Lao PDR (DCAL)	To be completed in 2024	B
	Luang Prabang International Airport	**Taxiway**		Provision of runway hold position lights in accordance with Para 5.3.19 of ICAO Annex 14, Volume I on new taxiways	Under consideration by Airports of Laos to purpose for support the budgets and installation	AOL	We have planned budgets and installation during 2021 to 2025	A
		Aerodrome Certification	Effective from 1 Jan 2021	Aerodrome yet to be certified.		DCAL and AOL	Aerodrome Certification will be completed in December 2023 (on Process)	A
	Savannakhet International Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.		DCAL and AOL	Aerodrome Certification will be completed in December 2024	A

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Pakse International Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.		DCAL and AOL	Aerodrome Certification will be completed in December 2024	A

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Updated on ~~29 June 2022~~ 17 July 2024

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	<u>Malaysia</u>							
Annex 14 Volume I	**Kuantan Haji Ahmad Shah Airport**	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.	Coordination among Ministry of Transport, Ministry of Defense and Airport Operator are being conducted to get the aerodrome certified	Ministry of Transport and Ministry of Defense	~~31 December 2021~~ June 2025	A
	Labuan Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.	Coordination among Ministry of Transport, Ministry of Defense and Airport Operator are being conducted to get the aerodrome certified	Ministry of Transport and Ministry of Defense	~~31 December 2021~~ Dec. 2024	A

Updated on 16 Dec. 2020

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Marshall Islands							
Annex 14 Volume I PANS-Aerodromes PANS-AIM	AIP	**Status of Certification of Aerodromes in AIP**	Effective from 1 Jan 2021	Status of certification of aerodromes yet to be published in AIP AD 1.5.				A

Updated on 16 Dec. 2020

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Micronesia (Federated States of)							
Annex 14 Volume I	**Pohnpei International Airport**	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.				A
	FM Chuuk International Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.				A
	Yap International Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.				A
	Kosrae Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.				A
Annex 14 Volume I PANS-Aerodromes PANS-AIM	AIP	**Status of Certification of Aerodromes in AIP**	Effective from 1 Jan 2021	Status of certification of aerodromes yet to be published in AIP AD 1.5.				A

AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

Updated on 16 Dec. 2020

Identification		**Deficiencies**			**Corrective Action**			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	<u>Nauru</u>							
Annex 14 Volume I	**Nauru International Airport**	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.				A
Annex 14 Volume I PANS-Aerodromes PANS-AIM	AIP	**Status of Certification of Aerodromes in AIP**	Effective from 1 Jan 2021	Status of certification of aerodromes yet to be published in AIP AD 1.5.				A

Updated on 16 Dec. 2020

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Palau							
Annex 14 Volume I PANS-Aerodromes PANS-AIM	AIP	**Status of Certification of Aerodromes in AIP**	Effective from 1 Jan 2021	Status of certification of aerodromes yet to be published in AIP AD 1.5.				A

Updated on ~~26 June 2023~~ 27 March 2024

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	<u>Philippines</u>							
Annex 14 Volume I	**Kalibo International Airport, Akla**	**Aerodrome Certification**	Effective from 1 Jan 2021	Permanent aerodrome certificate yet to be issued.			~~Temporary Aerodrome Certificate issued with validity from 31 Dec. 2022 until 30 June 2023 as per Aerodrome Certificate issued on 22 Dec. 2022.~~ Temporary Aerodrome Certificate issued with validity from 2 Jan. 2024 until 30 June 2024 Status of Aerodrome Certification as of 22 Feb. 2024 (As per CAAP Website)	A
	Puerto Princesa International Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Permanent aerodrome certificate yet to be issued.			~~Temporary Aerodrome Certificate issued with validity from 8 Jun 2023 – 9 Dec 2023 issued on 9 Jun 2023~~. Temporary Aerodrome Certificate issued with validity from 10 Dec. 2023 – 10 Jun. 2024. Status of Aerodrome Certification as of 22 Feb. 2024 published in CAAP Website.	A
	Bohol-Panglao International Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Permanent aerodrome certificate yet to be issued.			~~Temporary Aerodrome Certificate issued with validity from 28 Jun 2023 – 29 Dec 2023 (Awaiting the approval of the Director General of Temporary Certificate).~~	A

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
							Temporary Aerodrome Certificate issued with validity from 30 Dec. 2023 – 29 Jun. 2024. Status of Aerodrome Certification as of 22 Feb. 2024 published in CAAP Website.	
	~~**Ninoy Aquino International Airport RPLL**~~	~~**Aerodrome Certification**~~	~~Effective from 8 March 2022~~	~~Permanent aerodrome certificate yet to be issued.~~			~~Temporary Aerodrome Certificate issued with validity from 1 May 2023 – 30 Nov 2023 issued on 28 Apr 2023.~~ Permanently certified on 22 Dec. 2023. As per CAAP Website. Note: AIP AD 1.5 is yet to be amended. **Resolved**	A
	Diosdado Macapagal International Airport RPLC	**Aerodrome Certification**	6 March, 2023	Permanent aerodrome certificate yet to be issued.			~~Temporary Aerodrome Certificate issued with validity until 23 Jun 2023.~~ Temporary Aerodrome Certificate issued with validity from 7 Jan. 2024 until 7 Jul. 2024. Status of Aerodrome Certification as of 22 Feb. 2024 published in CAAP Website.	A

Updated on 16 Dec. 2020

Identification		**Deficiencies**			**Corrective Action**			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
Annex 14 Volume I	**Mongolia** **Buyant-Ukhaa Airport**	**Taxiway**	**ICAO Mission of July 2011**	provision of runway hold position lights in accordance with Para 5.3.19 of ICAO Annex 14, Volume I.	The runway hold position lights will be provided in accordance with Para 5.3.19 of ICAO Annex 14, Volume I.	Civil Aviation Authority of Mongolia	The RWY hold position marking and mandatory signs were provided to avoid runway incursions on the maneuvering area. Because of the existing International scheduled flights will be transferred to new airport in 2020, the additional runway hold position lights are unrequired to install.	A
		Apron: Airfield signage		Provision of ICAO compliant signage in accordance with section 5.4 Annex 14, Volume I and to cut the vegetation in front of the signs.	The signage will be provided in accordance with section 5.4 Annex 14, Volume I. The vegetation in front of the signs will be cut	Civil Aviation Authority of Mongolia	The work on cutting the vegetation in front of the signs was completed in 2017 within the totally 119560 m² area including, taxiway strip, glide path antenna and apron area, as per Aerodrome manual of, in scope of Aerodrome maintenance plan. [Note: Partially completed]	A

Updated on 15 June 2021

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Myanmar							
Annex 14 Volume I	**Yangon International Airport**	**Runway/ Taxiway**	**ICAO mission April 2010**	Provision of RESA in accordance with Section 3.5 of Annex 14, Volume I requirements;	RESA will be provided	Yangon Aerodrome Company Limited	(Risk Assessment conducted by the operator submitted on 10 Aug 2018.) RESA for RWY 21 was completed on 15 Nov 2018. ___________________ Revised date- **31 Dec 2021**	A
		Bird Hazard		Establishment of a national bird committee in accordance with APANPIRG Conclusion 18/1.	Establish National Bird Committee	Department of Civil Aviation	Guideline for Wildlife Hazard Management at Aerodromes, DCA-GM-AGA 08 has been developed and published on 29 Oct 2018) Revised date- **30 Nov 2021**	B

Updated on ~~8 June 2021~~ 20 June 2024

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
Annex 14, Volume I	**<u>Nepal</u>** **Tribhuvan International Airport**	**Runway/ taxiways**	**ICAO Mission of February 2008**	Insufficient runway strip, refer recommendations given in section 3.4 of Annex 14, Volume I.	Provide runway strip as per ICAO recommendations	Air Transport Capacity Enhancement Project (ATCEP) under Civil Aviation Authority of Nepal	~~Construction works to provide sufficient strip towards runway 20 already started with target of completion in 2023~~. Construction works are in progress to improve and provide airside infrastructures in accordance with Ultimate Master Plan of Tribhuvan International Airport, which will provide sufficient runway strip with target complete implementation of the plan by 2026.	A

Updated on ~~16 Dec. 2020~~ 27 March 2024

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
Annex 14 Volume I	**Samoa** **Faleolo International Airport**	**Runway Strip**	**ICAO Mission of Oct. 2015**	Insufficient Runway Strip				A
		Aerodrome Pavements		Lack of maintenance of aerodrome pavements in accordance with Annex 14, 10.2				U
~~**Annex 14 Volume I PANS-Aerodromes PANS-AIM**~~	~~**AIP**~~	~~**Status of Certification of Aerodromes in AIP**~~	~~Effective from 1 Jan 2021~~	~~Status of certification of aerodromes yet to be published in AIP AD 1.5.~~			Published the status of certification in AIP AD with effect from 30 Nov. 2023. Resolved	A

Updated on ~~16 Dec. 2020~~ 27 March 2024

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Solomon Islands							
Annex 14 Volume I	**Honiara International Airport/Henderson Field**	**Runway Strip**	**ICAO Mission of Oct. 2015**	Insufficient Runway Strip				A
		RESA		RESA at both ends of runway not provided				U
		Aerodrome Pavements		Lack of maintenance of aerodrome pavements in accordance with Annex 14, 10.2				U
~~**Annex 14 Volume I PANS-Aerodromes PANS-AIM**~~	~~**AIP**~~	~~**Status of Certification of Aerodromes in AIP**~~	~~Effective from 1 Jan 2021~~	~~Status of certification of aerodromes yet to be published in AIP AD 1.5.~~			Published the status of certification in AIP AD 1.1.5 with effect from 8 Sep. 2022. **Resolved**	~~A~~

Updated on 15 June 2022

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	<u>Sri Lanka</u>							
Annex 14 Volume I	**Bandaranaike International Airport**	**Runway/ Taxiway**	**ICAO mission April 2010**	Provision of 280m strip width for the full length of precision approach CAT I runway in accordance with the standard 3.4.3, Annex 14, Volume I; remove obstacles from runway strip; flush the strip with the adjacent runway shoulder.	runway strip in accordance with Annex 14, Volume I will be provided, obstacles from strip will be removed and flush strip with adjacent runway shoulder.	CAASL	Statistical analysis submitted by AASL has been accepted in 2021. Request made to submit the improved risk assessment with necessary amendments within 2022.	A
				Establishment of a national bird committee in accordance with APANPIRG Conclusion 18/1.	National Bird Committee will be established.		A meeting to be held with all stakeholders to establish the Committee and to ratify the TOR by end of September 2022.	A

Updated on ~~1 June 2023~~ 28 June 2024

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	<u>Thailand</u>							
Annex 14, Volume I	**Phuket International Airport**	**Runway**	**AGA mission of July 2009**	RESA to satisfy Section 3.5 of Annex 14, Volume I requirements.	RESA will be provided at the end of both RWY09 and RWY27 to satisfy Section 3.5 of Annex 14, Volume I requirements. Remark: - Dimension of RESA RWY09 is 150x190 m. - Dimension of RESA RWY27 is 150x120 m.	Airports of Thailand Public Company Limited	The construction is expected to be completed in 2024. Airports of Thailand Public Company Limited already has had the contractor for this construction's project and the safety assurance and project management documentation has been approved by the Civil Aviation Authority of Thailand to ensure that the aerodrome can continue to operate safely during the project. Currently, the construction progress is ~~44.67%~~ 81.23%	U
				Runway strip width insufficient (280m runway strip for precision approach runways in accordance with Para 3.4.3 of Annex 14, Volume I.	300m runway strip width will be made available. Except 111.4m length at the beginning of RWY09 (60m strip length before RWY09 threshold plus 51.4m length beyond the threshold), the runway strip width will be extended 150m on the right	Airports of Thailand Public Company Limited	The construction is expected to be completed in 2024. Airports of Thailand Public Company Limited already has had the contractor for this construction's project and the safety assurance and project management documentation has been approved by the Civil	A

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
					side of RWY09 centre line and 90.27m on the left side of the runway centre line (due to the marsh near the runway).		Aviation Authority of Thailand to ensure that the aerodrome can continue to operate safely during the project. Currently, the construction progress is ~~44.67%~~ 81.23%	
	Krabi Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.	Certify the aerodrome in accordance with aerodrome certification requirements	The Civil Aviation Authority of Thailand and Department of Airports	31 December ~~2023~~ 2024	A
	Surat Thani Airport	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.	Certify the aerodrome in accordance with aerodrome certification requirements	The Civil Aviation Authority of Thailand and Department of Airports	31 December ~~2023~~ 2024	A

Updated on ~~14 June 2023~~ 17 June 2024

Identification		**Deficiencies**			**Corrective Action**			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	<u>Timor-Leste</u>							
Annex 14 Volume I	**Commander-in-Chief of the FALINTIL – Kay Rala Xanana Gusmão International Airport, Suai**	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.	~~To be certify for its designed category (3C) the significant safety issue relating to AD strip (local houses and habitants must be relocated!) should be resolved. Currently AD is occasionally in use for domestic general aviation and helicopters only.~~ To be certify for its designed category (3C) the significant safety issue relating to AD strip (local houses and habitants must be relocated!) should be resolved. • There is ongoing process of reallocation of the houses and habitants within the AD strip; • There is a process of the establishment of the manuals, SOPs, various Airport	Gov. TL and ANATL as AD operator	Estimated date: ~~31 December 2023~~ 31 December 2024	A

Identification		Deficiencies			Corrective Action			
Requirements	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date of completion	Priority for action**
					committees (ASC-RSCA, ERC) • Currently AD is occasionally in use for domestic general aviation and helicopters only.			

Updated on ~~27 June 2023~~ 27 March 2024

Identification		**Deficiencies**			**Corrective Action**			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	<u>Tonga</u>							
Annex 14 Volume I	**Fua'amotu International Airport**	**Runway Strip**	**ICAO Mission of Oct. 2015**	Insufficient Runway Strip	1. File of difference to ICAO Annex 14 Volume I 3.4.4 through CMA-OLF and the publication of significant difference in the AIP Tonga - CAR 139.C.2.2 details that the strip width for aerodrome reference code number 4, non-precision runway must extend laterally on each side of the centre line of the runway and its extended centre line throughout the length of the strip to the minimum distance of 75m. 2. Provide 240m runway strip width at Fuaámotu International Airport.	CAD Office	1. 28 December 2023 2. 31 December 2030	A

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
Annex 14 Volume I PANS-Aerodromes PANS-AIM	**AIP**	**Status of Certification of Aerodromes in AIP**	Effective from 1 Jan 2021	Status of certification of aerodromes yet to be published in AIP AD 1.5.	1. Collate and update status of certification of Aerodromes in Tonga into the AIP Tonga.	TAL	28 December 2023 (AIRAC Effective Date) Published the status of certification in AIP AD 1.5 with effect from 2 Nov. 2023. **Resolved**	A

Updated on 1 Nov. 2022

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Tuvalu							
Annex 14 Volume I	**Funafuti International Airport**	**Aerodrome Certification**	Effective from 1 Jan 2021	Aerodrome yet to be certified.	Aerodrome yet to be certified.		Part 139 Aerodrome Certification in progress for 2023	A
Annex 14 Volume I PANS-Aerodromes PANS-AIM	**AIP**	**Status of Certification of Aerodromes in AIP**	Effective from 1 Jan 2021	Status of certification of aerodromes yet to be published in AIP AD 1.5.	Status of certification of aerodromes yet to be published in AIP AD 1.5.		Update Tuvalu AIP Info	A

Updated on ~~16 Dec. 2020~~ 27 May 2024

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	~~Vanuatu~~							
~~Annex 14 Volume I PANS-Aerodromes PANS-AIM~~	~~AIP~~	**~~Status of Certification of Aerodromes in AIP~~**	~~Effective from 1 Jan 2021~~	~~Status of certification of aerodromes yet to be published in AIP AD 1.5.~~			Published the status of certification in AIP AD 1.5 with effect from 30 Nov. 2023. **Resolved**	~~A~~

Updated on 02 April 2024 05 June 2024

Identification		Deficiencies			Corrective Action			
Requirements	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date of completion**	**Priority for action****
	Viet Nam							
Annex 14 Volume I PANS-Aerodromes PANS-AIM	AIP	**Status of Certification of Aerodromes in AIP**	Effective from 1 Jan 2021	Status of certification of one of the aerodromes used for international operations yet to be published in AIP AD 1.5.	Certify aerodromes used for international operations	CAAV	**WORK IN PROGRESS** Lien Khuong is a domestic aerodrome used for international operation under the Article 80 of the revised Civil Aviation Law of Vietnam. Up to now, CAAV only permits charter flights to Lien Khuong aerodrome. CAAV does not permit to operate scheduled commercial flights to Lien Khuong aerodrome because the aerodrome has not been recognized as an international aerodrome. CAAV published the status of certification of 13 domestic aerodromes in AIP, AD 1.5 in the AIP Amendment No 03/2020, issued on November 30th 2020 (including Lien Khuong aerodrome). **Corrective Action Plan (CAP):** - The Prime Minister agreed on adding Lien Khuong aerodrome in the list of international aerodromes of master planning of network of aerodromes of Viet Nam (Decision 648/QD-TTg dated June 07th 2023). CAAV approved a plan of Airports Corporation of VietNam (ACV) to upgrade Lien Khuong into an international aerodrome (Document	A

Identification		Deficiencies			Corrective Action			
Requirements	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date of completion	Priority for action**
							~~100/CHK-QLC dated 05/01/2023).~~ ~~It is intended to complete the procedure for upgrading, publishing Lien Khuong as an international aerodrome in AIP by the Quarter II of 2024.~~ ~~**Target date of completion:**~~ ~~Quarter II of 2024~~ **CORRECTIVE ACTION PLAN (CAP):** The CAAV has issued the Aerodrome Certificate No. 1830/GCNKT-CHK dated April 15th 2024 to grant Lien Khuong Airport used for international operation. The effective date of Aerodrome Certificate of Lien Khuong International Airport is from June 13th 2024. The CAAV has published the status of Aerodrome Certificate of Lien Khuong International Airport in AD 1.5 of the AIP published on May 04th 2024 and effective from June 13th 2024. **Target date of completion:** June 13th 2024 **Resolved**	

* Priority for action to remedy the shortcoming is based on the following safety assessments:

"U" priority = Urgent requirements having a direct impact on safety and requiring immediate corrective actions. Urgent requirement consisting of any physical, configuration, material, performance, personnel or procedures specification, the application of which is urgently required for air navigation safety.

"A" priority = Top priority requirements necessary for air navigation safety. Top priority requirement consisting of any physical, configuration, material, performance, personnel or procedures specification, the application of which is considered necessary for air navigation safety.

"B" priority = Intermediate requirements necessary for air navigation regularity and efficiency. Intermediate priority requirement consisting of any physical, configuration, material, performance, personnel or procedures specification, the application of which is considered necessary for air navigation regularity and efficiency.

REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE CNS FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirement	**States/facilities**	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action**
Reliable ground to ground communication as specified in the regional Air Navigation Plan (Doc.9673) Tables CNS II-1; CNS II-2 & CNS II-3	Afghanistan and Pakistan	Unreliability of AFS communication between Afghanistan and Pakistan was brought to the notice of APANPIRG/21. Lack of reliability in the AFS including data communication between Kabul and Karachi and ATS voice communication between Lahore and Kabul was identified.	September 2010	A follow-up COM coordination meeting held in July 2019 discussed way forward	1. Site visits in Pakistan by expert from the VSAT service provider were made in February and March 2016. Remedial recommendations were provided to CAA. Pakistan. Pakistan requested ICAO to provide assistance in establishing VSAT link in 2022. 2. Both Afghanistan and Pakistan agreed to as first step to recover the VSAT connection by upgrading terminals in Lahore and Karachi. Afghanistan will provide assistance and does the Network Configuration settings; 3. A VPN link was established between Karachi and Kabul through UK. Now the VPN link between UK and Kabul is un-serviceable. 4. Both States also agreed to implement CRV as soon as practical to resolve the existing COM deficiencies. 5.Pakistan has joined CRV and is actively coordinating with Afghanistan to restore the communication link between Afghanistan and Pakistan. Pakistan expected to restore the connection by the end of 2024.	CAA. Afghanistan and CAA. Pakistan	~~June 2020~~ End of 2024	A

APANPIRG Reporting Form on Air Navigation Deficiencies in the MET Field

REPORTING FORM ON (OPEN) AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ Facilities** (Index No.)	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
MWO and SIGMET service (Annex 3: Chapter 3, 3.4 and Chapter 7)	**Democratic Peoples' Republic of Korea** (DPRK) (AP-MET-16)	Requirements for MWO and SIGMET service not established for Pyongyang FIR	2008	Reported by ICAO Regional Office mission	Establish MWO to provide required service, including SIGMET information for Phnom Penh FIR. **See notes below for more information.**	GACA, Democratic Peoples' Republic of Korea	TBC	A
Meteorological observations and reports. (Annex 3: Chapter 4)	**Kiribati** (AP-MET-02)	METAR from Kiribati not available on regular basis.	1998	Reported by airlines	Equipment to be installed and arrangements to be made for regular observations and reports, including: training of personnel; maintenance of equipment; calibration and verification of meteorological observations; and proper/secure transmission of data. **See notes below for more information.**	State designated MET authority	TBC	A
Meteorological information for operators and flight crew members, including forecasts provided by the WAFCs (Annex 3: Chapter 9)	**Kiribati** (AP-MET-18)	WAFC forecasts not available for inclusion in flight briefings and documentation	2008	Reported by TCB CAEMSA-SP Technical Expert	Implement procedures and systems for the required meteorological information to be supplied to operators and flight crew members, including forecasts generated from the digital forecasts provided by the WAFCs. **See notes below for more information.**	State designated MET authority	TBC	U
Meteorological information for operators and flight crew members, including forecasts provided by the WAFCs (Annex 3: Chapter 9)	**Nauru** (AP-MET-19)	WAFC forecasts not available for inclusion in flight briefings and documentation	2008	Reported by TCB CAEMSA-SP Technical Expert	Implement procedures and systems for the required meteorological information to be supplied to operators and flight crew members, including forecasts generated from the digital forecasts provided by the WAFCs. **See notes below for more information.**	State designated MET authority	TBC	U
Meteorological observations and reports. (Annex 3: Chapter 4)	**Nauru** (AP-MET-21)	METAR/SPECI service not provided	2008	Reported by TCB CAEMSA-SP Technical Expert	Equipment to be installed and arrangements to be made for regular observations and reports, including: training of personnel; maintenance of equipment; calibration and verification of meteorological observations; and proper/secure transmission of data. **See notes below for more information.**	State designated MET authority	TBC	U

REPORTING FORM ON (OPEN) AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ Facilities** (Index No.)	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
Provision of SIGMET information (Annex 3, Chapter 7)	**Nauru** (AP-MET-24)	Lack of SIGMET issued for the Nauru FIR.	Sep 2011	IATA deemed this situation unsafe and unacceptable to airline operations.	Implement procedures for SIGMET information to be issued by the designated meteorological watch office/s concerning the occurrence or expected occurrence of specified en-route weather and other phenomena in the atmosphere that may affect the safety of aircraft operations. **See notes below for more information.**	State designated MET authority	TBC	U
Provision of SIGMET information (Annex 3: Chapter 7)	**Nepal** (AP-MET-14)	Requirements for issuance and dissemination of SIGMET information for Kathmandu FIR have not been fully implemented	2000		Implement procedures for SIGMET information to be issued by the designated meteorological watch office/s concerning the occurrence or expected occurrence of specified en-route weather and other phenomena in the atmosphere that may affect the safety of aircraft operations. **See notes below for more information.**	State designated MET authority	TBC	A
Reporting of information on volcanic eruptions to civil aviation units. (Annex 3, 3.6, 4.8)	**Papua New Guinea** (AP-MET-04)	Information on volcanic activity not provided regularly to ATS units, MWOs and VAACs.	1995	Observed by States concerned. Reported at the WMO/ICAO Workshop on Volcanic Ash Hazards (Darwin, 1995)	Establish arrangements for State volcano observatories to send the required volcano observation information as quickly as practicable to the associated ACC/FIC, MWO and VAAC. **See notes below for more information.**	Rabaul Volcano Observatory, NWS and ASL of Papua New Guinea	TBC	A
Provision of SIGMET for volcanic ash (Annex 3: Chapter 7)	**Papua New Guinea** (AP-MET-08)	Requirements for issuance and proper dissemination of SIGMET for volcanic ash have not been fully implemented	Dec 2003	Reported by airlines, noted by Volcanic Ash Advisory Centres and confirmed by ICAO mission	Implement procedures for SIGMET information to be issued by the designated meteorological watch office/s concerning the occurrence or expected occurrence of volcanic ash. **See notes below for more information.**	NWS of Papua New Guinea	TBC	U
Provision of SIGMET information (Annex 3, Chapter 7)	**Papua New Guinea** (AP-MET-22)	Lack of SIGMET issued for the Port Moresby FIR.	Sep 2011	IATA deemed this situation unsafe and unacceptable to airline operations.	Implement procedures for SIGMET information to be issued by the designated meteorological watch office/s concerning the occurrence or expected occurrence of specified en-route weather and other phenomena in the atmosphere that may affect the safety of aircraft operations. **See notes below for more information.**	State designated MET authority	TBC	U

REPORTING FORM ON (OPEN) AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		**Deficiencies**			**Corrective action**			
Requirements	**States/ Facilities** (Index No.)	**Description**	**Date first reported**	**Remarks**	**Description**	**Executing body**	**Target date for completion**	**Priority for action ***
Meteorological information for operators and flight crew members, including forecasts provided by the WAFCs (Annex 3: Chapter 9)	**Solomon Islands** (AP-MET-20)	WAFC forecasts not available for inclusion in flight briefings and documentation	2008	Reported by TCB CAEMSA-SP Technical Expert	Implement procedures and systems for the required meteorological information to be supplied to operators and flight crew members, including forecasts generated from the digital forecasts provided by the WAFCs. **See notes below for more information.**	State designated MET authority	TBC	U
Reporting of information on volcanic eruptions to civil aviation units. (Annex 3: 3.6, 4.8)	**Tonga** (AP-MET-17)	Information on volcanic activity not provided regularly to ATS units, MWOs and VAACs	2008	Reported by TCB CAEMSA-SP technical expert	Establish arrangements for State volcano observatories to send the required volcano observation information as quickly as practicable to the associated ACC/FIC, MWO and VAAC. **See notes below for more information.**	MOI and MEIDECC	TBC	U

NOTES ON THE (OPEN AND CLOSED) AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION				
Index No.	**State**	**Update Date**	**NOTES ON OPEN AND CLOSED DEFICIENCIES**	**Status**
AP-MET-01	Solomon Islands	December 2020	Removed from the open List; APANPIRG/31 Conclusion 31/19, refers.	Closed
AP-MET-02	Kiribati	September 2023	MET SG/27 was informed that: • Kiribati is now delivering observations regularly but is continuing work on upgrading its observing facility before providing resolution information.	**Open**
		September 2017	APANPIRG/28 noted that Kiribati should: • Verify the status of implementation of CAP; and • Work together with ICAO to develop and properly record the remaining steps of the CAP to resolve the Deficiency.	
AP-MET-03	Indonesia	September 2017	Removed from the open List, APANPIRG/28 Conclusion 28/29 refers.	Closed
AP-MET-04	Papua New Guinea	September 2023	MET SG/27 was informed that: • VAACs Darwin and Wellington are planning a series of exercises in the next six months with the Papua New Guinea (PNG) State Volcano Observatory and MWO to address the PNG volcanic activity information and SIGMET deficiencies, along with the Nauru SIGMET deficiency (due to PNG providing SIGMETs on Nauru's behalf).	**Open**
		November 2022	APANPIRG/33 noted MET SG/26 recommended that Papua New Guinea: • Conduct additional corrective actions, including seeking confirmation from the recipient operational units and providing evidence of the relevant established procedures; and • Submit an official report to ICAO providing complete details of the action taken.	

NOTES ON THE (OPEN AND CLOSED) AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION				
Index No.	**State**	**Update Date**	**NOTES ON OPEN AND CLOSED DEFICIENCIES**	**Status**
		September 2017	APANPIRG/28 noted that Papua New Guinea should: • Verify the status of implementation of CAP; and • Work together with ICAO to develop and properly record the remaining steps of the CAP to resolve the Deficiency.	
AP-MET-05	–	–	This Index No. is not used.	Closed
AP-MET-06	Indonesia	September 2017	Removed from the open List, APANPIRG/28 Conclusion 28/29 refers.	Closed
AP-MET-07	Philippines	November 2019	Removed from the open List, Conclusion APANPIRG/30/19, refers.	Closed
AP-MET-08	Papua New Guinea	September 2023	MET SG/27 was informed that: • VAACs Darwin and Wellington are planning a series of exercises in the next six months with the Papua New Guinea (PNG) State Volcano Observatory and MWO to address the PNG volcanic activity information and SIGMET deficiencies, along with the Nauru SIGMET deficiency (due to PNG providing SIGMETs on Nauru's behalf).	**Open**
		September 2017	APANPIRG/28 noted that Papua New Guinea should: • Verify the status of implementation of CAP; and • Work together with ICAO to develop and properly record the remaining steps of the CAP to resolve the Deficiency.	
AP-MET-09	Cambodia	September 2018	Removed from the open List, APANPIRG/29 Decision 29/23 refers	Closed
AP-MET-10	–	–	This Index No. is not used.	Closed
AP-MET-11	Cambodia	September 2018	Removed from the open List, APANPIRG/29 Decision 29/24 refers	Closed
AP-MET-12	Lao PDR	September 2018	Removed from the open List, APANPIRG/29 Decision 29/24 refers	Closed
AP-MET-13	–	–	This Index No. is not used.	Closed
AP-MET-14	Nepal	December 2023	APANPIRG/34 considered the deficiency could be removed from the Open List subject to receiving confirmation of the regular dissemination of the Kathmandu FIR SIGMET information in IWXXM form (in addition to TAC form)	**Open**
		September 2023	MET SG/27 noted that: • Nepal made significant progress towards rectification of the deficiency, including confirmation of the regular issuance of SIGMET information in 2022, successful participation in the annual APAC regional SIGMET tests, coordination of SIGMET with neighbouring MWOs, and validation from users of receipt of the SIGMET information. • Nepal was not disseminating SIGMET information in the IWXXM form in addition to the dissemination of SIGMET information in the TAC form, as required by Annex 3. • Nepal was in the process of procuring a solution to provide SIGMET in IWXXM form. • APANPIRG may review the status of the deficiency and remove it from the Open List, subject to Nepal confirming in writing to ICAO, and validated by RODB Bangkok, that the regular dissemination of SIGMET information in IWXXM form in addition to TAC form.	
		September 2017	APANPIRG/28 noted that Nepal should: • Verify the status of implementation of CAP; and • Work together with ICAO to develop and properly record the remaining steps of the CAP to resolve the Deficiency.	

NOTES ON THE (OPEN AND CLOSED) AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION				
Index No.	**State**	**Update Date**	**NOTES ON OPEN AND CLOSED DEFICIENCIES**	**Status**
AP-MET-15	–	–	This Index No. is not used.	Closed
AP-MET-16	Democratic People's Republic of Korea	September 2017	APANPIRG/28 noted that DPRK should: • Verify the status of implementation of CAP; and • Work together with ICAO to develop and properly record the remaining steps of the CAP to resolve the Deficiency.	**Open**
AP-MET-17	Tonga	September 2023	MET SG/27 was informed that: • Tonga is developing an MOU between organisations involved in providing and sharing volcanic activity information, which includes the procedures to be followed.	**Open**
		November 2022	APANPIRG/33 noted MET SG/26 recommended that Tonga: • Conduct additional corrective actions, including seeking confirmation from the recipient operational units and providing evidence of the relevant established procedures; and • Submit an official report to ICAO providing complete details of the action taken.	
		September 2017	APANPIRG/28 noted that: • Removal of the Deficiency from the open List is subject to the concurrence of the ATS units, MWOs and VAACs concerned that the Deficiency is resolved.	
		June 2018	MET SG/22 noted that: • VAAC Wellington was coordinating with Tonga on the validation of corrective action taken to resolve the Deficiency.	
		29 May 2017	MOI, Civil Aviation Division, advised that: • Relevant operating procedures implemented in the units concerned and case studies of real volcanic events presented as evidence of the State volcano observatory's issuance of the required volcano observation information.	
		10 May 2013	Ministry of Infrastructure (MOI), Civil Aviation Division, advised that: • MOU established between the national authority providing volcano monitoring (Ministry of Lands, Environment, Climate Change and Natural Resources – MLECCNR) and the national authority providing meteorological service for international air navigation (MOl) for the reporting of volcanic activity to the associated ACCs, MWOs and VAACs in accordance with the relevant ICAO SARPs.	
AP-MET-18	Kiribati	September 2023	MET SG/27 was informed that: • Kiribati, Nauru and Solomon Islands are working with their local users to determine whether there is any requirement for local WAFS information provision.	**Open**
		September 2017	APANPIRG/28 noted that Kiribati should: • Verify the status of implementation of CAP; and • Work together with ICAO to develop and properly record the remaining steps of the CAP to resolve the Deficiency.	
AP-MET-19	Nauru	September 2023	MET SG/27 was informed that: • Kiribati, Nauru and Solomon Islands are working with their local users to determine whether there is any requirement for local WAFS information provision.	**Open**

NOTES ON THE (OPEN AND CLOSED) AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION				
Index No.	**State**	**Update Date**	**NOTES ON OPEN AND CLOSED DEFICIENCIES**	**Status**
		September 2017	APANPIRG/28 noted that Nauru should: • Verify the status of implementation of CAP; and • Work together with ICAO to develop and properly record the remaining steps of the CAP to resolve the Deficiency.	
AP-MET-20	Solomon Islands	September 2023	MET SG/27 was informed that: • Kiribati, Nauru and Solomon Islands are working with their local users to determine whether there is any requirement for local WAFS information provision.	**Open**
		September 2017	APANPIRG/28 noted that Solomon Islands should: • Verify the status of implementation of CAP; and • Work together with ICAO to develop and properly record the remaining steps of the CAP to resolve the Deficiency.	
		June 2019	MET SG/23 requested the Secretary in conjunction with support from other States to provide Solomon Islands with assistance in preparing the full report on rectification of the Deficiency.	
AP-MET-21	Nauru	September 2017	APANPIRG/28 noted that Nauru should: • Verify the status of implementation of CAP; and • Work together with ICAO to develop and properly record the remaining steps of the CAP to resolve the Deficiency.	**Open**
AP-MET-22	Papua New Guinea	September 2023	MET SG/27 was informed that: • VAACs Darwin and Wellington are planning a series of exercises in the next six months with the Papua New Guinea (PNG) State Volcano Observatory and MWO to address the PNG volcanic activity information and SIGMET deficiencies, along with the Nauru SIGMET deficiency (due to PNG providing SIGMETs on Nauru's behalf).	**Open**
		September 2017	APANPIRG/28 noted that Papua New Guinea should: • Verify the status of implementation of CAP; and • Work together with ICAO to develop and properly record the remaining steps of the CAP to resolve the Deficiency.	
AP-MET-23	Solomon Islands	November 2022	Removed from the open List; refer to: • Conclusion APANPIRG/33/14 – *Update of information in APANPIRG Air Navigation Deficiencies Reporting Form*; • APANPIRG/33 WP/14 – *STATUS OF AIR NAVIGATION DEFICIENCIES IN THE ASIA/PAC REGION*; • APANPIRG/33 WP/13 – *METEOROLOGY SUB-GROUP (MET SG/26) REPORT*; and • APANPIRG/33 IP/08 – *RECTIFICATION OF APANPIRG AN DEFICIENCY AP-MET-23*	Closed
		October 2021	MET SG/25 requested the Solomon Islands, with assistance from its partner States, to conduct additional corrective action to enable the MET SG to confirm that Solomon Islands had fully resolved the Deficiency; maintain a log of all SIGMETs issued over at least one month to capture the operational WC-, WS- and WV-SIGMETs, plus any test WV-SIGMETs; pass the details [of the log] to the ad hoc group [on AN Deficiencies] to compare against SIGMETs received by RODB Brisbane [MET SG/25, Action No. 25/10]. Subject to Solomon Islands demonstrating resolution of the issues concerning content, format and timeliness of SIGMET information (as discussed in MET SG/25, WP/12) and sustainable provision of ICAO-compliant SIGMET service, MET SG would support the removal of Deficiency AP-MET-23 from the APANPIRG open list. Therefore, to facilitate the removal of the Deficiency from the open List, MET SG/25 requested the Secretariat coordinate with the Solomon Islands to report the resolution of the Deficiency to APANPIRG [MET SG/25, Action No. 25/11].	

NOTES ON THE (OPEN AND CLOSED) AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION				
Index No.	**State**	**Update Date**	**NOTES ON OPEN AND CLOSED DEFICIENCIES**	**Status**
		June 2019	MET SG/23 requested the Secretary in conjunction with support from other States to provide Solomon Islands with assistance in preparing the full report on rectification of the Deficiency.	
		September 2017	APANPIRG/28 noted that Solomon Islands should: • Verify the status of implementation of CAP; and • Work together with ICAO to develop and properly record the remaining steps of the CAP to resolve the Deficiency.	
AP-MET-24	Nauru	September 2023	MET SG/27 was informed that: • VAACs Darwin and Wellington are planning a series of exercises in the next six months with the Papua New Guinea (PNG) State Volcano Observatory and MWO to address the PNG volcanic activity information and SIGMET deficiencies, along with the Nauru SIGMET deficiency (due to PNG providing SIGMETs on Nauru's behalf).	**Open**
		September 2017	APANPIRG/28 noted that Nauru should: • Verify the status of implementation of CAP; and • Work together with ICAO to develop and properly record the remaining steps of the CAP to resolve the Deficiency.	

Acronyms/Abbreviations/Definitions (used in this document)

ACC — Area control centre
ASL — Air Services Ltd.
ATS — Air traffic services
CAEMSA-SP — Cooperative Agreement for the Enhancement of Meteorological Services to Aviation - South Pacific
CAP — Corrective action plan
FIC — Flight information centre
FIR — Flight information region
GACA — General Administration of Civil Aviation
IATA — International Air Transport Association
MEIDECC — Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communication
MET — Meteorological
METAR — Aerodrome routine meteorological report *(in meteorological code)*
MWO — Meteorological watch office
NWS — National Weather Service
SIGMET — Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather and other phenomena in the atmosphere that may affect the safety of aircraft operations
SPECI — Aerodrome special meteorological report *(in meteorological code)*
TBC — To be confirmed
TCB — Technical Cooperation Bureau (of ICAO)

Acronyms/Abbreviations/Definitions (used in this document)

VAAC — Volcanic ash advisory centre

WAFC — World area forecast centre

— END OF SECTION —

LIST OF FOCAL POINT FOR AIR NAVIGATION DEFICIENCIES

Updated: 25 November 2024

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