INTERNATIONAL CIVIL AVIATION ORGANIZATION

**TWENTY NINTH MEETING OF THE ASIA/PACIFIC
AIR NAVIGATION PLANNING AND IMPLEMENTATION
REGIONAL GROUP (APANPIRG/29)**

Bangkok, Thailand, 3 to 5 September 2018

Agenda Item 3:   **Performance Framework for Regional air navigation planning and implementation**

3.4   **CNS**

**REPORT ON THE TWENTY SECOND MEETING OF
CNS SUB-GROUP**

(Presented by Chairman of CNS SG)

SUMMARY

This paper presents the report of the Twenty Second Meeting of the CNS Sub-group (CNS SG/22) held at the ICAO Regional Office, Bangkok, Thailand, from 16 – 20 July 2018. The meeting is invited to review the report and adopt the draft Decisions and Conclusions formulated by the CNS Sub-group.

This paper relates to **Strategic Objectives:**

   A: *Safety – Enhance global civil aviation safety*
   B: *Air Navigation Capacity and Efficiency—Increase the capacity and improve the efficiency of the global aviation system*
   E:*Environmental Protection — minimize the adverse environment effects of civil aviation activities.*

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1.   **INTRODUCTION**

1.1   The Twenty Second Meeting of the CNS Sub-group was held from 16 to 20 July 2018. The meeting was attended by 105 participants from 28 States/Administrations and 2 International Organizations namely IATA and ICCAIA. Representative from Honeywell also participated in the meeting. A summary of the meeting report for consideration by APANPIRG/29 is provided in the **Attachment A** to this paper. Full report and papers of the meeting are available on the following webpage: https://www.icao.int/APAC/Meetings/Pages/2018-CNS-SG22.aspx

2.   **DISCUSSION**

2.1   The meeting considered 20 Working Papers, 33 Information Papers, and 2 flimsies covering its 12 Agenda Items.

2.2   In accordance with APANPIRG Decision 26/65 that Sub Groups were empowered to adopt Conclusions and Decisions on technical and operational matters, accordingly the CNS SG/22 meeting adopted following 8 Conclusions and 1 Decision:

Conclusion CNS SG/22/2	-	Arrangement for Conducting IP Connectivity Test
Conclusion CNS SG/22/3	-	CRV Implementation Plan and VoIP ICD
Conclusion CNS SG/22/4	-	ATN/BBIS States/Administration Use CRV for AFTN/AMHS Traffic
Decision CNS SG/22/5	-	Revised Terms of Reference for the SWIM TF
Conclusion CNS SG/22/6	-	Asia/Pacific SWIM Survey
Conclusion CNS SG/22/7	-	Updated AFTN/ATSMHS Routing Directory
Conclusion CNS SG/22/11	-	The Catalogue of Asia and Pacific Flight Inspection and Flight Validation Service Providers
Conclusion CNS SG/22/15	-	Revised ADS-B Implementation and Operations Guidance Document (AIGD)
Conclusion CNS SG/22/17	-	Amendment of Asia/Pacific Seamless ATM Plan Version 2.

2.2.1   Conclusion CNS SG/22/17 – Amendment of Asia/Pacific Seamless ATM Plan was also reviewed by ATM SG/6. It was stated that proposals for amendment to the *Asia/Pacific Seamless ATM Plan* did not require an APANPIRG Conclusion; however, the specific matter was important to highlight to State planners, so the Conclusion was considered to have merit on that basis, and was subsequently endorsed by the ATM SG.

2.2.2   The contents of above Conclusions adopted by the CNS SG are provided in the **Attachment B** to this paper for easy reference.

2.3   Based on the outcome of discussions on various Agenda Items, the meeting developed 8 Draft Conclusions for consideration by APANPIRG/29 Meeting, some of which were forwarded to ATM SG/6 for consideration and endorsement. List of these draft Conclusions are shown below:

Draft Conclusion CNS SG/22/1	-	Using IPS Router between BBIS Administrations
Draft Conclusion CNS SG/22/8	-	Revised Strategy for Implementation of Communication systems to support Air Navigation Service
Draft Conclusion CNS SG/22/9	-	Support Allocation of Radio Spectrum for Space Based VHF Communications
Draft Conclusion CNS SG/22/10	-	PBN-In-A-Page (Version 2.0)
Draft Conclusion CNS SG/22/12	-	Ground Based GNSS Status Monitoring
Draft Conclusion CNS SG/22/13	-	Transition Planning for RNP APCH Chart Identification from RNAV to RNP

Draft Conclusion CNS SG/22/14   -   Revised ADS-B Version 2 ADS-B Out Forward Fit
                                                  Equipage

Draft Conclusion CNS SG/22/16   -   Proposal for Amendment to PANS-ATM (Doc 4444) on
                                                  ADS-B Related Phraseologies

2.3.1   All Draft Conclusions are included in **Attachment C** to this paper for consideration
by APANPIRG/29 meeting.

2.4   The ATM SG/6 meeting noted that the following four Draft Conclusions had been
referred to APANPIRG for adoption and to ATM/SG for information:

    Draft Conclusion CNS SG/22/1 - Using IPS Router between BBIS Administrations;

    Draft Conclusion CNS SG/22/8 - Revised Strategy for Implementation of
        Communication systems to support Air Navigation Service;

    Draft Conclusion CNS SG/22/9 - Support allocation of radio spectrum for space based
        VHF communications; and

    Draft Conclusion CNS SG/22/10 - PBN-IN-A-PAGE (Version 2.0).

2.5   To better enhance the collaboration with the ATM SG, the CNS SG has taken an initiative
to coordinate the following three Draft Conclusions with ATM SG as they contain ATM related issues
before put up these draft conclusions for consideration by the APANPIRG/29 meeting since they were
(a) inter-regional and/or (b) economic related in nature:

    Draft Conclusion CNS SG/22/12 (Ground Based GNSS Status Monitoring);

    *Draft Conclusion CNS SG/22/13 (Transition Planning for RNP APCH Chart
    Identification from RNAV to RNP); and*

    *Draft Conclusion CNS SG/22/16 (Proposal for Amendment to PANS-ATM -Doc. 4444 on
    ADS-B Related Phraseologies)*

2.5.1   The ATM SG/6 meeting considered that there was insufficient basis to support CNS
SG/22/12.

2.5.2   For CNS SG/22/13 and CNS SG/22/16, the ATM SG/6 made editorial changes to become
Draft Conclusion ATM SG/6-5 and Draft Conclusion ATM SG/6-7 respectively.

2.5.3   The ATM SG/6 meeting reviewed Draft Conclusions CNS SG/22/14 (Revised ADS-B
Version 2 ADS-B Out Forward Fit Equipage) to become Draft Conclusion ATM SG/6-6. Thus, these
three draft conclusions which are shown in the report of ATM SG are also duplicated in Attachment C
to this paper.

2.6   The proposed revision to the strategy on communication systems to support ANS is
provided in **Appendix G** and the updated PBN in-a-page (Version 2.0) is provided in **Appendix I** to
this paper. For easy reference, the number of appendices used the Summary Report carry the same
Appendices numbers as those in the full report of CNS SG/22 meeting.

2.7   The updated ATN/AMHS, AIDC and the ADS-B implementation status in the Asia and Pacific Regions are provided in the **Appendix A** and **Appendix L** to CNS SG/22 meeting report.

3.   ACTION BY THE MEETING

3.1   The meeting is invited to note information provided in this paper and to:

a)   review the summary report on the outcome of CNS SG/22 meeting provided in **Attachment A**;

b)   note the Conclusions adopted and Decision endorsed by CNS Sub-group provided in **Attachment B**; and

c)   consider adoption of draft Conclusions developed or endorsed by the CNS Sub-group in **Attachment C**.

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Agenda Item 1:   Election of Vice *Chair* of the Sub-group and adoption of agenda

1.1   Proposed by Thailand, seconded by Bangladesh and Macao-China, Mr. Amit Kumar Banerjee, Executive Director (CNS-OM), Airports Authority of India, was unanimously elected as Vice Chairman of the CNS Sub-group.

1.2   The tentative agenda with slight changes was adopted by the meeting.

Agenda Item 2:   Review outcomes of APANPIRG/28 meeting and other meetings relevant to CNS Sub-group

Asia/Pacific Ministerial Conference on Civil Aviation

2.1   The meeting noted that States/Administrations were requested to take necessary follow up actions in achieving implementation of PBN, Common Ground/Ground Telecommunication Network and enhanced surveillance capability including ADS-B in APAC Region by 2022 as stated in the Beijing Declaration adopted by the Conference.

2.2   The meeting invited PBNICG, ACSICG and SURICG to be fully aware of the requirements and take necessary follow-up actions to achieve the objectives of Beijing Declaration in the respective areas.

Relevant Action Items from DGCA Conf/54

2.3   The meeting reviewed the CNS SG related action items of the 27 Action Items adopted by the Conference. Action Item 54/4 – Automation Interface between Flight Information Regions (AIDC); 54/5 – Managing Interference to Global Navigation Satellite System (GNSS); 54/7 – Implementation of Performance based Communication and Surveillance (PBCS) in Asia Pacific; 54/13 – Paving way for Interoperability of Air Traffic Management System (ATMS); 54/20 – Set up 2020 as the target for CRV implementation for all ANSP to optimize cost benefit, etc.

Outcome of APANPIRG/28 Meetings on CNS Matters

2. 4   The meeting reviewed the actions taken by APANPIRG/28 on the 2 Decisions and 11 Conclusions resulted from the Twenty First Meeting of the CNS Sub-group (CNS SG/21). The meeting noted the actions having been taken and the progress achieved by States and the Secretariat, CNS related outstanding Conclusion had been completed. The status of the follow-up actions to the Conclusions/Decisions is provided in Attachment to the working paper.

Agenda Item 3:   Aeronautical Fixed Service (AFS)

Outcomes of the Fifth Meeting of the ACSICG/5 including CRV OG/3 & OG/4, Secretariat

3.1   The Fifth Meeting of the Aeronautical Communication Services (ACS) Implementation Co-ordination Group (ACSICG/5) of APANPIRG was held in Bangkok, Thailand, from 12 to 14 June 2018.

3.2   The meeting reviewed and updated the ATN/AMHS/AIDC implementation status in the APAC Region provided in **Appendix A** to CNS SG/22 meeting report.

Air Traffic Service Message Handling Service (AMHS) over IPS

3.3   The BBIS and BIS Administrations were encouraged to use IPS routers for AMHS connections. As the APAC Region moving forward to utilize the Common aeRonautical Virtual Private Network (CRV), Multi-Protocol Label Switching (MPLS) will be the primary routing protocol for the network. Thus, ATN router's IDRP function will be disabled. BBIS States should connect with each other using IPS router when CRV is utilized. The meeting recommended to gradually phase out the use of ATN router to reduce operational cost while improving service restore time as less equipment are involved. The meeting endorsed the following Draft Conclusion:

Draft Conclusion CNS SG/22/1: Using IPS Router between BBIS Administrations	
What: That, utilize IPS router and encourage to phase out X.25 and IP SNDCF (ATN) router by allowing IPS routers to inter-connect between BBIS Administrations when CRV or other inter-regional IP networks being utilized.	**Expected impact**: ☐ Political / Global ☒ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: Compliance with ICAO Doc. 9896	**Follow-up**: ☒Required from States
When: 5-Sep-2018	**Status**: Draft to be adopted by PIRG
Who: ☒ APANPIRG ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other:	

ATSMHS Transition from X.25 Protocol to IP Suites

3.4   CRV network provides IP interface only which requires change from the existing AMHS connections with X.25 protocol to the IP network protocol. For existing AMHS connections over X.25 (ATN Router) that IP connectivity test had not been conducted previously, additional IP link connectivity tests shall be carried out before migration from X.25 to IP protocol when joining the CRV. These additional tests shall be supplemented in the TMC. Accordingly, the CNS SG/22 meeting adopted Conclusion **CNS SG/22/2 on Arrangement for Conducting IP Connectivity Test**.

AMHS FTBP for MET IWXXM Data

3.5   The ACSICG meeting took a note of the report of AFSG/22 meeting on AMHS FTBP for MET IWXXM data and considered the following three issues:

1) Security: MET User has to make arrangement for scanner, screener or filter. Attachments to AMHS as a FTBP could be attacked with virus or malware.

2) Bandwidth: to analyze the AMHS User capability and its potential bandwidth requirement. IWXXM attachment as FTBP would result in fivefold increasing of bandwidth when compared to legacy format - TAC. TAC will be continued to be distributed in addition to IWXXM distribution. Thus, the bandwidth requirement from MET generated system to AMHS will be six times larger than current requirement.

3) AMHS User capability: need for iWXXM generated systems to be registered with AMC. States/Administrations are required to verify with AMC before distribute iWXXM data. This is a critical step to ensure the readiness of the service.

Support for the exchange of IWXXM formatted MET data via AMHS

3.6   New Zealand MetService had established a Disaster Recovery (DR) centre in Auckland. This DR centre uses a P3 AMHS connection to the Airways AMHS system. Testing of

the Kelburn AMHS connection to the Airways Development AMHS system included the exchange of attachments in the form of File Transfer Body Parts (FTBPs). The NZ MetService is positioned for the exchange of Meteorological (MET) data in IWXXM format via AMHS.

CRV OG/3

3.7   The Third Meeting of the Common aeRonautical VPN Operations Group of APANPIRG was held from 18 to 20 December 2017 in Bangkok.

3.8   The main achievements of CRV OG/3 meeting are listed below:

- The transition period to CRV from 2018 to 2020 should be harmonized between stakeholders to achieve the benefits of CRV implementation;

- Confirmed CRV Pilot Project Test Plan/Pilot Service Acceptance Testing;

- Technical Trial on APAC CRV was successfully conducted by Hong Kong China and Thailand in December 2017 to verify its operational readiness;

- Synchronized the starting and ending dates of CRV contract commencing 1 January 2018 and would end on 31 December 2023 for the initial 5-year period and plus 5 one-year term option. Any States join after 31 December 2023, the CRV program needs to be approved by mutual agreement between ICAO / CRV OG and PCCW Global. Additional charges may be incurred by the new users and the minimum contract commitment should be no less than 12 months;

- Final review of the CRV engineering package; and

- COM centres in APAC Region may connect with Khabarovsk and/or with Irkutsk centres via CRV.

CRV OG/4

3.9   The Fourth Meeting of the Common aeRonautical VPN Operations Group was held from 18 to 20 April 2018 in Fiji. A CRV Workshop focusing solution for Pacific States was conducted on 16-17 April 2018.

3.10   The main achievements of CRV OG/4 meeting are listed below:

- Noted that a mini CRV workshop was conducted in March 2018 in Cairo. Coordination for CRV implementation with MID Region would be further discussed at the CRV OG/5;

- The meeting discussed the procedure to accommodate additional potential partners to join CRV and agreed that new applications outside of CRV operation concept need to be approved by CRV OG;

- Noted the SWIM TF/2 outcome and the requirement for communication infrastructure including CRV to support SWIM. The meeting considered that there is a need to provide more information back to the SWIM Task Force on the purpose of the CRV. The CRV will be uniquely placed to be able to provide private IP (not public internet) connections between States for the exchange of SWIM. CRV OG requested that the SWIM Task Force engages the OG to further discuss the communications infrastructure requirements. It may be beneficial to conduct the CRV OG and the SWIM Task Force at the same time so that a

constructive conversation can be achieved. The meeting also noted the need to develop an initial Architecture for SWIM and urged the SWIM Task Force to engage with the CRV OG to work towards ensuring that viability of the CRV to carry SWIM;

- CRV pilot project had been further delayed. The meeting urged States involved with pilot project for Proof of Concept take all efforts working together with PCCW Global to complete the pilot project as early as possible;

- made progress of the CRV Pilot Project Test Plan/Pilot Service Acceptance Testing for the confirmation of key aspects of the CRV network; and

- States/Administrations were requested to note the proposed changes to (a)-1 Terms and Conditions between PCCW Global and CRV User and to review the proposed contract end dates amendments with their legal teams.

CRV Implementation Plan and VoIP and Analog Voice ICD for CRV

3.11   The meeting noted the CRV Implementation Plan endorsed by the ACSICG. The plan serves as guidance for States/Administrations who wish to join the CRV. The CRV implementation roadmap, implementation requirements and stakeholders' (CRV members and CRV service provider) responsibilities etc. are contained in the plan. The updated 'National CRV Points of Contact', 'Local CRV Points of Contact' had been included in the Plan.

CRV Voice over Internet Protocol (VoIP) and Analog Voice ICD

3.12   The VoIP ICD was developed as a companion to the IP ICD to include VoIP and Analog Voice interfaces for voice access to CRV. The VoIP and Analog Voice ICD will be useful as a guideline for Ground to Ground Voice communications. The CNS SG/22 endorsed Conclusion **CNS SG/22/3 for CRV Implementation Plan and VoIP ICD** formulated by CRV OG/4 meeting.

Transition from Point-to-Point BBIS & BIS State to CRV Network connection

3.13   Based on a proposal from Fiji and ACSICG, BBIS States/Administration were encouraged to commence the transition of AMHS to CRV network as early as possible to allow more BIS State/Administrations to establish connections over CRV. Hong Kong China proposed and the meeting agreed to follow up the following topics from a regional perspective:

1) A need to review the Router Routing in CRV;

2) A need to review how to determine outage between two locations using CRV; and

3) A need for BBIS to review their CRV transition plan with respective BISs and keep the ICAO posted with a view to implement IWXXM in the APAC by 2020.

The Secretariat will bring up these items in the next CRV OG/5 meeting to be hosted in Hong Kong, China in December 2018 for follow-up actions. Accordingly, the meeting adopted Conclusion **CNS SG/22/4 for ATN/BBIS States/Administration Use CRV for AFTN/AMHS Traffic**.

IPv4 and IPv6 planning

3.14   As the IPv4 address is depleting and would not sustain the Air-to-Ground communication that will be based on Internet Protocol Suite (IPS). It was noted that ARINC

Standards for airborne equipment and air-ground interoperability currently are based on IP Version 4 (IPv4) (e.g. ARINC 664, ARINC 822A, etc.). IP Version 6 (IPv6) deployment now is growing around the world. Around 25% of worldwide traffic is now full IPv6 (end 2017) against less than 1% 5 years ago (end 2012). The AEEC IPS Subcommittee develops some steps of the proposed approach as mentioned in the paper.

IPv4 Address in the CRV Implementation Plan

3.15   The ACSICG reconfirmed the use of APAC IPv4 addresses placed at the Appendix B to CRV Implementation Plan. When adopted the IPv4 address assignment, it was not clearly specified the address is designated for State, ANSP, Service provider (e.g. CRV provider), or for AMHS. Therefore, the meeting agreed that the designated IPv4 address will be assigned for CRV Customer Edge (CE) router as proposed by ACSICG. This would allow ANSPs who subscribed service with CRV can share the service with their respective applications (e.g. AMHS, AFTN, ADS-B, AIM and SWIM) as needed.

Second Meeting of the APAC SWIM Task Force

3.16   The meeting noted the outcome of the Second Meeting of the APAC SWIM Task Force (SWIM TF/2) which was held in Bangkok from 9 to 12 April 2018.

3.17   The meeting noted the progress and updates made by tasks leaders on the assigned tasks, and further follow up action items against each task. The meeting also noted the needs for SWIM education identified by the SWIM Task Force.

3.18   Considering the nature of Task Force work plan and the statements of work developed, the meeting agreed to the revised TOR of SWIM Task Force. The main changes in the TOR are the report path directly to the CNS Sub-group rather than through ACSICG. Consequential changes to the list of coordinating bodies in the Region listed in the TOR. In any case, a specific task of the SWIM Task Force has been designed to perform the horizontal coordination with all the TF/WG under APANPIRG which have a contribution to or a dependency on the SWIM implementation. Accordingly, the meeting made **Decision CNS SG/22/5 on the Revised Terms of Reference for the SWIM TF** endorsed by the ACSICG/5 meeting.

Survey on Implementation of APAC SWIM Services

3.19   The meeting noted the proposed survey (part of Task 2-1-1) to support the work of SWIM Task Force and the future planning of SWIM services in the APAC Region. The purpose of the survey is to invite States to provide information on new services being implemented and/or to be implemented. The result of the survey would be useful for determining services which should be implemented with higher priority and for building SWIM service catalog in APAC region.

3.20   As the revised draft on SWIM survey was still under review, the Chairman suggested the SWIM TF to review the draft through proper channels to formalize the review process from SWIM TF. The survey placed in **Appendix E** to CNS SG/22 meeting report should be distributed to States and shared with stakeholders in different fields including international organizations to evaluate the SWIM services when it is circulated through an ICAO State letter. The meeting adopted Conclusion **CNS SG/22/6 for Asia/Pacific SWIM Survey** and urged States to respond the survey.

AIDC Implementation Task Force

3.21   The meeting noted that the APA Task Force updated the AIDC implementation priorities against the hot-spot identified by RASMAG and APANPIRG. The progress and target dates of implementation are highlighted below:

- Jakarta and Chennai - Oct. 2019;

- Jakarta and Ujung Pandang - Oct. 2019;

- Jakarta /Melbourne FIRs - Oct. 2019;

- Chennai and Kuala Lumpur was implemented on 15 May 2017 with a limited set of messages and LOA to be signed soon;

- Manila and Fukuoka - coordination in progress;

- Manila and Taipei - 4Q2018;

- Manila and Hong Kong - 1Q2019;

- Manila and Ho Chi Minh - 1Q2019;

- Manila and Singapore - 4Q2018;

- Manila and Kota Kinabalu - 4Q2019;

- Manila and Ujung Pandang - 4Q2018;

- Urumqi/Lahore - New IDD service provider selected by Pakistan and communication being improved and LHD reduced;

- Beijing/Ulaanbaatar - coordination is underway for testing and implementation;

- Hong Kong/Guangzhou - AIDC operational trial planed for 2Q2018; and

- Mumbai/Karachi and Muscat – coordination is underway for implementation and Mumbai side is ready (new hot-spot 1 identified by RASMAG/22).

3.22   The meeting also noted that a Proposal for Amendment (PfA) to ANP Table CNS II APAC-1-AIDC Implementation Plan to reflect the latest requirements for AIDC implementation had been processed through a consolidated PfA with serial No.: APAC-II 18/01 - CNS-MET/AIM with ref: AN 3/3 - AP005/18 (CNS/MET/AIM) dated 30 January 2018. States/Administrations were notified of the approval in June 2018 with the AIDC implementation plan which was further updated by APA TF/4 meeting.

3.23   The meeting noted that the AIDC Task Force had collected and analysed a number of implementation issues classified into categories with recommended solutions. The meeting noted some recommended solutions to the identified issues. For the AFTN latency issue as an example the recommended solution includes the parameters adjustment and use of dedicated links instead of AFTN and/or through joining the CRV service.

Review AFTN Routing Directory Changes

3.24   The meeting noted the proposed changes in the AFTN Routing Directory based on the changes proposed from Hong Kong-China, Japan, Republic of Korea and India. Some consequential changes have been also made with consideration of new AMHS circuits between States having made and some circuit had been withdrawn. The meeting also noted some other changes highlighted in the Report of ACSICG/5 including the name change of the directory to AFTN/ATSMHS Routing Directory for the Asia and Pacific Regions.

3.25   Hong Kong China reminded that once CRV is fully implemented in the Region, further routing directory changes would be required as more and more direct connections via VPN would be possible and the relation between the routing directory and the directory service registered in AMC should be addressed. The meeting agreed to refer these concerns to CRV OG and ACSICG for further consideration in its future meetings, and adotped Conclusion **CNS SG/22/7 on the Revised AFTN/ATSMHS Routing Directory** formulated by the ACSICG/5 meeting.

Updates on the APAC AMC Information

3.26   The meeting noted the work being carried out by AEROTHAI regarding updates on APAC AMC information. States/Administrations were urged to make necessary updates to the AMC information with the forms attached to ACSICG/5/IP/7:

− Appendix F – Pro forma for modification of AMHS MD Identifier and/or Addressing Scheme (for major change); and

− AMC Information Form for updating AMHS implementation and other information.

3.27   With regards to AMHS User Capabilities information to prepare for IWXXM information exchange, AEROTHAI was tasked to contact AMC and request information on AMHS User Capabilities form. AEROTHAI will coordinate with regional Point of Contacts of MTA to provide information of AMHS User Capabilities for updates to AMC.

Strategy for Implementation of Communication Systems to support ANS

3.28   ACSICG/5 meeting proposed further changes to the Strategy for Implementation of Communication Systems to support Air Navigation Service in the Asia/Pacific Region based on the latest developments. The meeting reviewed the proposed changes and endorsed the following draft Conclusion for consideration by APANPIRG:

Draft Conclusion CNS SG/22/8: Revised Strategy for Implementation of Communication systems to support Air Navigation Service	
What: That, the revised Strategy for implementation of Communication systems to support Air Navigation Service provided in **Appendix G** to the Report be adopted.	**Expected impact**: ☐ Political / Global ☐ Inter-regional ☒ Economic ☐ Environmental ☒ Ops/Technical
Why: The Strategy for implementation of Communication systems for APAC Region was adopted by APANPIRG in 2017. The strategy requires to be updated based on the latest development.	**Follow-up**: ☒ Required from States
When: 5-Sep-2018	**Status**: Draft to be adopted by PIRG
Who: ☒ APANPIRG ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other:	

AIDC Implementation Status in India

3.29   Through the paper, India updated the meeting about their AIDC implementation status in India. The current and planned AIDC implementation with adjacent ATSUs in the sub Region were introduced in the paper. Some major issues involved in the implementation of AIDC observed by India were highlighted and shared with the meeting.

Implementation of Futuristic Telecommunication Infrastructure (FTI) in India

3.30   India informed the meeting that AAI was implementing Futuristic Telecommunication Infrastructure (FTI) which will provide high availability SLA based Telecommunication links in between 92 AAI locations using Latest Technology equipment and communications infrastructure. Performance of all telecommunication links will be continuously monitored at Network Operation Control Centre (NOCC) at Delhi and Bangalore for various performance parameters to meet the global ATM application performance requirement.

Extensible Markup Language (XML) Operational Consideration

3.31   The USA stated that the GANP ASBU specifies for flight plan/clearance/transfer to utilize XML based format Flight Information Exchange Model (FXXM) and Aeronautical Information Exchange Model (AIXM). The communication infrastructure (AMHS and CRV) is expected to support both SWIM traffic and legacy messages. In such case, AMHS is expected to support XML/GML based IWXXM and legacy TAC messages until the TAC is phased out. The Flight and Flow Information for a Collaborative Environment (FF-ICE) has been included in ASBU Block 1. Therefore, additional CRV bandwidth with additional cost would be required. There was also a concern that FTBP attachment could be infected by malicious virus. USA was requested to prepare a working paper with more concrete proposals for consideration by the next CRV OG in December 2018, and for further review in the back-to-back CRV OG and SWIM TF meetings in early 2019.

Validation of FF-ICE Operation under the SWIM Environment

3.32   Japan shared with the meeting on the information of the project of the International Interoperability Harmonization and Validation (IIH&V) to validate the Flight and Flow Information for a Collaborative Environment (FF-ICE) Provisions and operational process.

3.33   In connection with XML and FF-ICE discussions, Australia stated that the GANP establishes a global planning framework for standards development and implementation of operational improvements. It is driven first and foremost by the formulation of performance benefits including Global Interoperability and their verifiable attainment. States/Administrations and PIRGs should step up to their new role as main driving force and participate proactively in existing ways of interaction between themselves and with ICAO standard making bodies, as well as create new ways as necessary to ensure that:

    1) their performance problems are considered and given the appropriate priority in the global context;

    2) solutions to performance issues in one area of the world duly account for the implications to the rest of the world; and

    3) global interoperability issues are addressed from the very beginning and through the lifecycle of any operational improvement and associated supporting technologies.

Introduction on the National FPL Processing in China

3.34   China informed the meeting that in order to cope with the rapid growth of air traffic and facilitate ATC operation, the ATMB developed a centralized flight plan processing system called FIMS (Flight Information Management System) in Shanghai in 2014. Later it successfully became national FIMS center for processing nationwide flight plans. The main function and benefits of FIMS

was introduced in the paper. In response to a query, it was clarified that AFTN is used to interact with ATC systems.

Agenda Item 4: Aeronautical Mobile Communications Service and Aeronautical electromagnetic spectrum utilization

4.1   Under this agenda item, the meeting discussed several papers and the relevant part of ACSICG/5 Report on the aeronautical mobile communication.

Study on undetected simultaneous transmissions

4.2   Hong Kong China shared with the ACSICG/5 meeting on the outcome of their study on undetected simultaneous transmissions which impose potential safety risks to air navigation services. As part of the Safety Management System (SMS), Hong Kong China had proactively conducted technical analysis on the air-ground VHF communication at the Hong Kong International Airport (HKIA). The measures implemented to mitigate the potential risks was introduced. Hong Kong China also recommended to develop some regional guidance materials on the subject.

Space-based VHF Voice Communication Service

4.3   The meeting discussed a proposal made by Singapore at ACSICG/5 meeting on a potential solution using VHF radios relay installed on satellites. It was stated that there are no space-based ADS-B like solutions for the case of VHF communication, as Direct Controller Pilot Communication (DCPC), to support radar-like separation minima in these areas.

4.4   Singapore has been working with satellite and communications vendors - Gomspace AS (Gomspace) and Singapore Technologies Engineering Electronics (STEE) to conduct design studies and trials/proof-of-concept for satellite-mounted VHF voice communication relay system ("space-based VHF") on Low Earth Orbit (LEO) satellites. Introduction on the ConOps included a constellation of 64 clusters of satellites operating at 600 km altitude in near-equatorial orbit. The design study was expected to be completed by the end of 2018 and followed by a proof-of-concept (POC) demonstration in end of 2019. The POC would include launching of a few satellites equipped with the VHF relay stations. Therefore, ICAO was requested to provide three frequencies for the POC. CAAS is working with the Singapore radio regulator, on ITU allocation of VHF frequencies for space-based VHF voice services purpose, to table for WRC-2023 agenda approval at WRC-2019. In this connection, States and ICAO were invited to support the ITU application process of allocating the aeronautical VHF frequency band for space-based VHF communication service for use during the POC trials planned from 2018 to 2023.

4.5   Considering the space-based VHF communication services is a first-of-its-kind, innovative solution for use in association with appropriate surveillance sensors such as space-based ADS-B, to provide radar-like separation minima in oceanic and domestic airspace, including the category R airspace as specified in the seamless ATM plan, the meeting endorsed the operation requirement for such communication service and supported the POC study. Based on the discussions during the meeting, the draft Conclusion from ACSICG/5 was amended and endorsed for consideration by APANPIRG.

Draft Conclusion CNS SG/22/9 (ACSICG/5/9) – Support allocation of radio spectrum for space based VHF communications	
What: That, a) States and ICAO be invited to initiate and support the ITU application process of allocating an appropriate aeronautical VHF frequency band for space-based aeronautical mobile communication service for WRC-2023;	**Expected impact**: ☐ Political / Global ☒ Inter-regional ☒ Economic ☒ Environmental

b) States and ICAO be invited to take note of the potential benefits of space-based VHF aeronautical mobile communication service to enhance safety, capacity and efficiency of air navigation services by supporting the Proof-of-Concept tests; and c) ICAO is invited to assign three aeronautical VHF channels for the duration of the Proof-of-Concept tests.	☒ Ops/Technical
Why: There is a need to support the POC study on space based VHF aeronautical mobile communication for Category R and other suitable airspaces in order to provide seamless VHF communication service to support radar like separation minima in those area.	**Follow-up**: ☒Required from States and ICAO
When: 5-Sep-2018	**Status**: Draft to be adopted by PIRG
Who: ☒CNS Sub-group ☒APAC States ☒ICAO APAC RO ☒ICAO HQ ☐Other:	

Improvement of the Radio Wave Environment in Incheon Intl. Airport

4.6   Republic of Korea informed ACSICG/5 meeting that the Incheon International Airport (IIA) had completed Phase 3 construction plan including opening Terminal 2 in January 2018. The Phase 4 plan includes expansion of Terminal 2 and construction of 4th runway. Thus, additional frequencies for surface movement communications would be required. The best signal selection (BSS) was used only for a few frequencies to overcome radio interference in 2017. The signals were transmitted from spots at air side and measured reception level at Terminal 1 and Terminal 2 (where receivers installed). When using BSS, receiving sensitivity is generally good in the whole area of air side.

Using VoIP for Safety Critical Communication

4.7.   Frequentis AG made a presentation to ACSICG/5 meeting on seamless migration to IP providing information on the needs, and benefits of domain specific standards on the example of ED-137 for VoIP in air traffic management. For controllers and pilots, utilization of VoIP networks translates into poor audio quality unless adequate counter-measures are taken both on the physical layer (to provide redundancy and interfaces) and the application layer (to provide domain related functionality).

SATVOICE Trial in Australia

4.8   Airservices recently conducted a trial of SATVOICE technology in lieu of HF in oceanic and remote airspace. Overall, trial participants concluded that SATVOICE could be used as primary means of controller-pilot communications supporting RCP400, but that the configuration of the equipment used during the trial would need to be changed to improve dialling times, call volume, and ability to manage calls. The decision to implement an operational system is dependent on the lifecycle of a number of ancillary systems and the imminent installation of the new Air Traffic Management system, CMATS.

Airport Low-Level Wind Information – ALWIN

4.9   Japan informed the meeting about the Airport Low-level Wind INformation (ALWIN) had commenced operation at Tokyo International Airport and Narita International Airport since April 2017. The ALWIN provides detailed wind information such as direction, speed, wind shear, or turbulence, etc., on the final approach paths to pilot through ACARS. The system was jointly developed by the Japan Aerospace eXploration Agency (JAXA) and Japan Meteorological Agency

(JMA). In the light of relevancy to other Sub-groups, Japan was invited to share their finding with the MET Sub-group and ATM Sub-group for consideration, and continue to keep the CNS Sub-group abreast on the latest development.

Airport Surface Operation based on AeroMACS and BDS

4.10   China presented information on the Aeronautical Mobile Airport Communications System (AeroMACS) which was being developed to provide a new broadband wireless communications capability for safety critical communications in the airport surface domain, providing connectivity to aircraft and other ground vehicles as well as connections between other critical airport fixed assets. It was informed that AeroMACS based applications had been developed at 10 airports in China since 2014. The AeroMACS development has progressed from basic system performance testing to D-TAXI assistance application for aircraft and ground vehicles movement. In response to a query, it was clarified that the AeroMACS based applications provide situation awareness reference for pilot through EFB and it does not replace those ACARS based applications such as D-ATIS and PDC.

The Regional Preparatory Activities for WRC-2019

4.11   The meeting noted the regional preparatory activities for WRC2019 including the outcome of Third meeting of APT Regional Preparatory Group meeting for ITU World Radiocommunication Conference (WRC-19) held in Perth, Australia in March 2019. Regarding WRC-19 Agenda Item 1.10, the ICAO studies had determined that the GADSS requirements can be satisfied using systems operating within existing frequency allocations. Hence no action to modify Article 5 of the Radio Regulations will be required. However, it appears likely that amendments will be required to Chapters VI, VII and VIII of the Radio Regulations to facilitate the introduction of GADSS. This development in particular on "no spectrum is necessary for GADSS" was provided to ITU-R WP5B on 26 October 2017 and also was expressed by the ICAO representative at APG19-3 WP5 and its draft group meetings held in March 2018 in Perth, Australia.

4.12   The outcome of APG19-3 on APT preliminary views is generally in line with ICAO position. A comparison table containing the regional preliminary views of APT/APG against ICAO approved position is provided in Appendix A to WP/18 for easy reference.   The APG19-4 meeting hosted by Republic of Korea is scheduled for 7-12 January 2019 in either Seoul or Busan. The APG19-5 meeting hosted by Japan is scheduled for 31 July 2019 to 6 August 2019. The focal points nominated by the Civil Aviation Administrations in the APAC Region were encouraged to participate in the APT APG meetings. The meeting reviewed and updated the focal points designated by States for WRC-2019 which is provided in **Appendix H** to CNS SG/22 meeting report.

Agenda Item 5:   Navigation
                        PBN implementation and implementation of SBAS and GBAS system

5.1   India provided information on its PBN implementation status. Five (5) city-pair routes were implemented using RNAV 5 navigation specification and RNAV 2 routes were being considered between Kolkata and Mumbai. RNAV1/RNP1 SIDs and STARs had been implemented for 15 airports and more procedures would be developed for other airports. In addition, numbers of Baro-VNAV approaches had been designed and waiting for approvals from the regulatory.

5.2   India introduced information on SBAS and GBAS implementation. APV1 services and en-route operations (RNP 0.1) are available over Indian Landmass and over Indian FIR respectively using GPS Aided Geo Augmented Navigation (GAGAN). Two geostationary satellites are available and another one will be certified in July/August 2018. LPV procedures were developed for 12 runway ends and ground validation/FAS Data Block was completed for three airports. More than 200 LPV procedures for selected airports would be completed by 2019. In addition, India

informed that GBAS system was installed at the Chennai airport and certification process would be begun in two phases.

5.3   The meeting showed interest in India's GBAS and SBAS implementation and deliberated issues on flight validation and certification of GLS, rationale for the selection of GBAS equipment, selection criteria of runway for SBAS implementation and SBAS implementation strategy. India answered that GLS would be used after the flight validation and certification using their own flight validation aircraft, and current GBAS system, SLS-4000 and BLOCK II software was selected because it was the only certified software available in the market. Regarding SBAS implementation, airports were selected to support VFR operations in remote areas because many aircrafts operating those areas were certified for GAGAN as a result of mandate of it by 2019. Nevertheless, India would accept aircraft not certified for GAGAN. Australia mentioned that they had experience on the mandate of navigation systems, such as GNSS and ADS-B, and would share their experience with India.

MSAS Status and future plan

5.4   Japan informed the meeting of current MSAS status and future MSAS plan. MSAS is providing GPS augmented information for non-precision approaches (NPA, RNP 0.3). Decision for LPV implementation was made on 13 March 2018. As the decommission of MTSAT-2 in 2020, the JCAB started the development of the next stage SBAS using Quasi-Zenith Satellite System (QZSS), which would start operation with single QZSS (GEO) satellite configuration in 2020. In addition, L5 augmentation signal with PRN196 (QZS2: QZO) for Dual Frequency Multi Constellation (DFMC) SBAS validation became available on September 23 2017.

5.5   Japan also provided the study result of possibility and condition to use MSAS in other States. The study showed the footprint of MSAS covered wide area in Southeast Asia Pacific island country and Oceania region, met NPA accuracy.

World status of GBAS

5.6   Japan provided GBAS implementation status information obtained from the GBAS Working Group (GWG) met at Montreal, Canada from 17 to 20 April 2018 and 19th International GBAS Working Group held in Krakow, Poland from 15 to 18 May 2018. Japan introduced the different level of GBAS implementation of 10 States and Eurocontrol, and the development of airborne systems of aircraft manufacturers, Airbus and Boeing.

5.7   Nepal asked the meeting about the recommended period of GNSS signal monitoring before the GBAS implementation. Singapore proposed to use available ionospheric threat model or to adapt available algorithms from other States as there is no specific criteria for this. The Secretariat appreciated Japan for the consolidated information on global GBAS implementation status.

GBAS status update in Japan

5.8   Japan provided information on the current GBAS implementation status. GBAS installation in Haneda airport would be completed by the end of March 2019. After the operational evaluation, the commencement of CAT-I operation would begin by the end of March in 2021. The common ionospheric threat model for GBAS in the APAC region was used for the system development. Japan also informed that they supported studies on GBAS Approach Service Type (GAST)-D in the low latitude regions, VHF Data Broadcast (VDB) frequency compatibility criteria, GAST-E/F standardization and advanced approach procedures with GBAS.

5.9   Regarding influence analysis on GBAS by snow cover, Japan confirmed that there is no particular difference in the pseudo-range correction value and Vertical Position Error (VPE), and a slight difference in correction value error distribution (σ_pr_gnd). In addition, Japan informed that

they established a technical review board for the safety verification and approval of GBAS. Once they finished safety assessment, they would inform the meeting of the result in the future.

GBAS R&D activities in Japan

5.10   Japan introduced the recent activities of Electronic Navigation Research Institute (ENRI) for research and development of GBAS. ENRI conducted ionospheric effects on low-latitude region (Okinawa) and transition region from low to mid-magnetic latitude region (Tokyo) to improve the common ionospheric threat model for GBAS in the APAC region. ENRI assessed the impacts of ionospheric scintillations on the integrity monitors of GAST-D and reported preliminary analysis results of responses of a cycle-slip monitor, code-carrier-divergence (CCD) monitor, and the ionospheric spatial gradient monitor to the ICAO Navigation Systems Panel (NSP) Ionosphere Gradient Mitigation (IGM) ad hoc group. In addition, responses of the dual-solution pseudo-range ionospheric gradient monitoring algorithm (DSIGMA range-domain) would be provided to the group for evaluation of impacts of scintillations on availability and continuity of GAST-D in the low latitude region.

5.11   As a part of validation of GAST-D SARPs, ENRI, in collaborated with the Technical University Braunschweig (TUBS), Germany proved interoperability of GAST-D ground and airborne subsystems developed by different parties using the experimental prototype of the GAST-D ground system and airborne software developed by ENRI. ENRI has also been studying the development of next generation GNSS augmentation systems including GAST-E/F concept development and validation to contribute GAST-E/F SARPs development by ICAO. In addition, ENRI, in collaboration with the University of Electro Communications (UEC), Japan continuously analyzes the operational impact of anomalous propagation of VHF radio waves caused by the sporadic E (Es) layer, which may influence the GBAS VHF data broadcast (VDB), VOR, ILS LOC or VHF COM.

Review Report of the PBNICG/5 meeting
Development of regional transition plan: RNP APCH chart identification from RNAV to RNP

5.12   The meeting reviewed the outcomes of the PBN Workshop for Pacific Islands States, the Quality Assurance Workshop for Instrument Flight Procedures and the Fifth Meeting of the Performance Based Navigation Implementation Coordination Group (PBNICG/5) held on 30 April 2018, 1 May 2018 and from 2 to 4 April 2018 respectively and necessary follow-up work to be conducted.

5.13   The meeting was informed of global PBN implementation status and activities conducted by ICAO Panels/Study Group and ICAO PBN Programme Office. Among them, the meeting noted that following the amendment of Annex 6, only RNP AR operations were required specific operational approval and the other PBN operations would follow regulator's approval process, such as the approval of Operations Manual where PBN operations were defined and the oversight to the operator's PBN operations.

5.14   The meeting reviewed the updated information on PBN-in-a-page. The updated PBN-in-a-page reflected the proposal of amendment of *ICAO PANS-ATM (Doc 4444)*, which will be applicable in November 2018 as well as the changed criteria of it. It also included PBCS requirements applicable to separations based on RNP navigation specification and operational requirements of Aeronautical Information Management (AIM). After the review, the meeting endorsed the following Draft Conclusion:

Draft Conclusion CNS SG/22/10 (PBNICG/5/1) – PBN-IN-A-PAGE (Version 2.0)	
What: That,	**Expected impact**:

a) The PBN-in-a-page (Version 2.0) in **Appendix I** to the report be adopted as a regional supporting material and be published on the ICAO Regional Office website. *Note – The contents of the PBN-in-a-page was extracted from ICAO documents including Doc 9613, Doc 8168 Vol. II, Doc 4444, and Annex 15. The PBN-in-a-page should be used as a quick reference during PBN airspace designing and PBN implementation planning.* b) ICAO Regional Office forward the PBN-in-a-page (Version 2) to the relevant Panels and Study Groups for their information and consideration.	☐ Political / Global ☐ Inter-regional ☐ Economic ☒ Environmental ☒ Ops/Technical
Why: The current version of PBN-in-a-page needs to be updated to reflect the amendments of the PANS-ATM and the implementation of PBCS. It also needs to be forwarded to the relevant ICAO bodies for their information and consideration.	**Follow-up**: ☒Required from States
When: 5-Sep-2018	**Status**: to be adopted by PIRG
Who: ☒APANPIRG ☒APAC States ☐ICAO APAC RO ☒ICAO HQ ☒Other: ICAO APAC RSO	

5.15   The meeting was informed that PBNICG/5 discussed common PBN implementation challenges faced by States and recognized following challenges and interests to be considered by the regulator and ICAO when planning PBN implementation assistance:

- Lack of involvement of top management regarding PBN;
- Lack of flight validation pilots and training;
- Operation of PBN incapable aircraft;
- Regulator's capability for the PBN operational approval;
- Challenge with the military;
- Challenging terrain environment;
- Need for more PBN training for Air Traffic Controllers to make them more confident in PBN, like mixed mode operations between PBN and non-PBN approved aircraft;
- Interest in the anticipated implementation of SBAS/GBAS by sharing experience in a workshop;
- Advanced training of Procedure Designers; and
- Training of safety oversight

5.16   The meeting reviewed the proposed draft of *Catalogue of Asia and Pacific Flight Inspection and Flight Validation Service Providers* in **Appendix J**, which was the result of the survey on Asia/Pacific flight validation and flight inspection providers' capability. Accordingly, the meeting adopted Conclusion CNS SG/22/11 for **The Catalogue of Asia and Pacific Flight Inspection and Flight Validation Service Providers.**

5.17   The meeting was informed of the outcomes of the PBN Workshop for Pacific Islands States and the Quality Assessment Workshop for Instrument Flight Procedures. The PBN workshop identified areas that need to be improved for the PBN implementation of Pacific Islands States, such as PBN implementation plan development, trainings for procedure design, PBN operational approval and air traffic controllers, etc. and asked to review the possibility of PBN Go Team support for Pacific Islands States. The quality assessment workshop recognized that some States had been experiencing difficulties in conducting their quality assurance activities and safety oversight because of the lack of resources and considering delegating some of their functions to the third party.

5.18   Regarding the PBN implementation status in the region, the meeting was informed that the implementation information on ICAO Regional Dashboard based on third party data and the Air Navigation Implementation Status based on APAC Seamless ATM monitoring (https://portal.icao.int/space/Pages/ANPage.aspx) was different each other. The former showed 63% implementation while the latter showed on 46% implementation. The meeting was also informed that no new PBN implementation plan was received but two States submitted their updated PBN plan and six States would update their PBN plan.

5.19   The meeting was informed that the PBNICG/5 discussed on real-time GNSS status monitoring on the ground. Considering no direct relationship between the failure or the removal of a core satellite of GNSS or an SBAS reference Station and aircraft performance, different algorisms used for avionics designs, and various available ranging sources and sensors, provision of real-time GNSS status monitoring is impractical for GNSS ABAS operations and RAIM prediction for RNP APCH will be sufficient to users and ATC services. However, regarding the use of GBAS and SBAS, ground based real time monitoring information may be provided based on a valid operational requirement.

5.20   Australia mentioned that States should be aware when implementing PBN using GNSS as the enabling technology that GNSS/RAIM unavailability is dependent on the application. For example, an aircraft conducting operations based on RNP APCH (0.3NM) may experience an outage, whereas an aircraft in the same geographic area conducting operations using RNP2 will not. In this reason, PBN training for pilot and air traffic controllers should include these differences in the training material so that pilots and air traffic controllers could be aware of the different applications of PBN and disseminate GNSS status information selectively.

5.21   In view of the foregoing, the meeting endorsed following Draft Conclusion:

Draft Conclusion CNS SG/22/12 – Ground Based GNSS Status Monitoring	
What: Recognizing that the availability of GNSS is crucial for GNSS based PBN procedures, that the performance of GNSS on the ground may be different from that in the aircraft, and that the States should determine essential radio navigation services for GNSS based approach, landing or take-off, which require timely warnings on the GNSS status to ATC services, That, States be urged to: a) define the essential radio navigation services for GNSS based operations; b) be aware that requirement for air traffic controllers to provide real time GNSS status monitoring to aircraft for GNSS ABAS procedures may not be required; c) ensure that GNSS/RAIM unavailability prediction be provided to users; d) ensure that pilot reports as far as practical on GNSS status should be provided to ATC for dissemination to other aircraft	**Expected impact**: ☒ Political / Global ☒ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical

as real time GNSS information; and e) reflect their operational procedures within AIC and/or AIP.	
Why: As GNSS on board performance might be different from GNSS performance observed on the ground, pilot might be confused if there is any difference between the two environments. Therefore, ground based GNSS status monitoring information used for ABAS should be used as advice to ATS.	**Follow-up**: ⊠Required from States
When: 5-Sep-2018	**Status**: to be adopted by PIRG
Who: ⊠Sub groups ⊠APAC States ⊠ICAO APAC RO ☐ICAO HQ ⊠Other: ICAO APAC RSO	

5.22   The meeting reviewed ICAO's new plan on the transition of RNP APCH chart identification from RNAV to RNP that was issued in Electronic Bulletin (EB2018/11) and Circular 353. The Secretariat explained the roles of ICAO PBN Programme Office in ICAO Headquarters, Regional Office and States, global, coordination process between ICAO Headquarters, Regional Office and States, related stakeholders to be included in the regional transition plan development, and the timeline for the transition plan (see **Figure 1**).
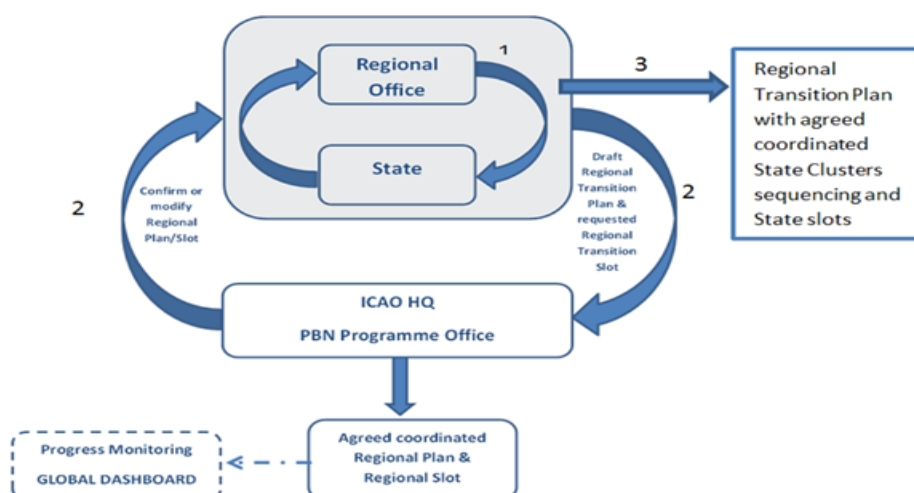
Figure 1 – Global, regional and State coordination process

5.23   The meeting also reviewed the result of a survey on the published RNP APCH procedures of both international and domestic airports collected from ICAO iSTAR application, JeppView software and States. The result showed 916 airports of 39 Member States, Administrations and territories have 1,786 GNSS-based approach procedures (see **Figure 2**)

Figure 2 – Status of published RNP APCH procedures by APAC States/Administrations

5.24 The meeting was informed that the PBNICG/5 discussed various topics related to the chart identification transition including the development of regional transition plan, division of geographical area, grouping State cluster, coordination process, timeline of the regional plan development, and procedure publication planned. Among the topics discussed, the biggest concern of the PBNICG/5 was PBN approach procedure publication, which was already approved or would be approved in near future. As mentioned in the EB2018/11, if States waits until regional and State transition plan is published, the delays of publication will be significant.

5.25 Recognizing the importance of the RNP APCH chart identification matters, the meeting endorsed the following Draft Conclusion:

Draft Conclusion CNS SG/22/13 (PBNICG/5/4) – Transition Planning for RNP APCH CHART Identification from RNAV to RNP	
What: Recognizing ICAO Circular 353, *Transition Planning for Change to Instrument Flight Procedure Approach Chart Identification from RNAV to RNP* was published to provide guidance on the development of global, regional and State transition plan, and ICAO Regional Office has to develop a draft transition plan within twelve month of the publication of the Circular 353, That, a) States begin internal coordination on the State transition plan and provide the number of RNP APCH procedures published and planned, required duration and desired time slot; b) ICAO Regional Office draft a regional transition plan on RNP APCH chart identification in coordination with relevant regional contributory bodies of APANPIRG, sub-regional ATM coordination groups and regional stakeholders; and c) ICAO Regional Office to conduct a meeting or workshop to discuss regional transition plan once regional transition plan template is provided by ICAO PBN Programme Office.	**Expected impact**: ☒ Political / Global ☒ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical

Why: Transition of RNP APCH chart identification is related to various stakeholders, which need effective management and global, regional and State level coordination.	**Follow-up**: ⊠Required from States
When: 5-Sep-2018	**Status**: Draft to be adopted by PIRG
Who: ⊠APANPIRG ⊠APAC States ⊠ICAO APAC RO ⊠ICAO HQ ⊠Other: ICAO APAC RSO	

5.26   The meeting considered necessary to coordinate Draft Conclusion CNS SG/22/12 (Ground Based GNSS Status Monitoring) and Draft Conclusion CNS SG/22/13 (Transition Planning for RNP APCH Chart Identification from RNAV to RNP) with ATM Sub Group as these two Draft Conclusions contains ATM related issues.

Update of GBAS in Australia

5.27   Australia provided updated information on Ground Based Augmentation Systems in Australia. Airservices would continue to support the two Honeywell SLS-4000 systems installed at Sydney and Melbourne through configuration changes and rule changes to optimise the GBAS Landing Service (GLS) for suitably equipped aircraft. Airservices had been exploring options to extend the service below CAT-I, including by disabling geometry screening and the use of GAST-D equipment. In particular, the presence of a SBAS signal has the potential to increase the utility of the SLS-4000. Australia expected that airlines would request Airservices to install another GBAS at Brisbane airport following installation of the new parallel runway

5.28   The paper aroused interest by the meeting in deliberating many questions related to the GBAS implementation including operational benefits comparing to ILS, GLS procedure certification, and need for avionics upgrade. The meeting was informed that GLS approaches are more stable than ILS procedures because of no signal distortions or interruptions affected by ground traffics and a constant course formed by digital information, which reduces pilots' workloads. For the same reason, ATC will have more flexibility in surface operations as the need to protect ILS sensitive and critical areas could be removed. In addition, Australia informed that Airservices developed procedures based on ICAO Doc 8168, PANS-OPS criteria and most aircraft are capable of GLS. Honeywell added that new aircraft equip multi-mode receivers (MMR), which is capable of both ILS and GLS approaches.

Satellite Based Augmentation System Development in Australia

5.29   Australia provided an update on Satellite Based Augmentation System in Australia. The Australian Federal Government announced funding to acquire a SBAS – the project was established by Geoscience Australia in July 2018, and has formed a governance board with Airservices and CASA to certify the SBAS for Safety-of-Life services. SBAS has the potential to support CAT-I-like instrument flight procedures without the need for ILS. The broadcast nature of the technology makes it ideal for Australia with its geographic extent and low population density. The SBAS testbed provided by Lockheed Martin would continue to operate through to January 2019 and would inform the acquisition process as well as providing information to support the New Zealand business case.

5.30   China asked economic benefits and operational strategy of SBAS/GBAS procedures comparing to maintaining conventional procedures. Australia mentioned that as a result of GNSS mandate in 2016, all IFR aircraft operating in Australia are capable of RNP APCH. In this regard, there would be almost no additional cost for the SBAS implementation. In addition, ILS procedures serving parallel runways may be replaced by SBAS/GBAS procedures or maintained as back-up procedures in the future. Australia added that half of the conventional navigation aids serving non precision approach (NPA) procedures were decommissioned and the remaining aids are used as a

back-up to GNSS. The meeting noted that route and procedure optimization may rely on the removal of conventional navigation aids, which removes the constraints they impose on area navigation based on GNSS.

GBAS installations

5.31   Honeywell presented GBAS development and deployment status, and GBAS avionics equipment status. Honeywell informed that under the Aviation System Block Upgrade (ASBU) plan, GBAS is listed as a Block "0" Technology which means it's a mature technology and provides operational benefits now. GBAS has presently been deployed to 15 airports worldwide providing CAT-I Precision Landing Approach capability. Using Honeywell's Block II-S system architecture, two programs, one in the US and one in Europe under SESAR, are working to certify CAT-II operations. CAT-III capability is underdevelopment. Both aircraft original equipment manufacturers (OEM), Airbus and Boeing, have embraced the technology and offer it as either standard equipment or an option on all models of the aircraft. In addition, Honeywell mentioned that GBAS has many operational benefits which can aid ANSPs and Airport in addressing environmental and capacity issues when it is coupled with PBN procedures.

5.32   Lao PDR asked whether GLS system has monitoring system similar to ILS system. Honeywell informed that GLS ground system provides the same monitoring functions and pilot's operational procedures are the same as ILS as the FMS provides the same flags if the system failure occurs. Australia added that if GBAS fails, pilots could choose non-precision RNP APCH. In addition, the meeting noted that the SLS-4000 also provides a Constellation Prediction Service, which will notify ATC if the GLS will be unavailable due to poor geometry of the GPS satellite constellation for a short time into the future, which allows ATC to stop clearing aircraft using GLS until the relevant service resumed.

ISTF technical paper publication

5.33   Japan provided information on the publication of a technical paper presenting the APAC GBAS ionospheric threat model developed by Ionospheric Studies Task Force (ISTF), which was dissolved in 2016. The technical paper was published in the technical journal, GPS Solutions under the title of "Ionospheric delay gradient model for GBAS in the Asia-Pacific region" and is available at the journal's website: https://link.springer.com/article/10.1007/s10291-017-0662-1
 as an Open Access article.

PBN implementation in Pakistan

5.34   Pakistan presented the current PBN implementation status and future plans of Pakistan. The meeting was informed that eight (8) out of nine (9) airports listed in ICAO Regional Air Navigation Plan (RNAP) had RNP1 STARs (where required) and RNP APCH procedures and the other one airport was being planned for flight validation. Overall 43 out of 44 runway ends (97.7%) were implemented RNP APCH. RNP1 SIDs were implemented for two (2) airports, three (3) airports were under finalization, and the other airports would be completed by the end of 2019. For en-route PBN implementation, Pakistan transformed 18 international ATS Routes serving major traffic flows into RNP10 and RNAV5 for regional harmonization. According to APAC Seamless ATM Plan, RNP2 routes would be considered for ATS routes while RNAV2 would be used as a temporary measure if allowed.

Agenda Item 6:   Surveillance

Third Meeting of the Surveillance Implementation Coordination Group

6.1   The meeting reviewed the outcome of the Third Meeting of the Surveillance Implementation Coordination Group (SURICG/3) was held in Denarau, Fiji from 25 to 27 April 2018.

Revise ADS-B Version 2 ADS-B Out Forward Fit Equipage

6.2   The meeting noted the necessity to amend the APANPIRG Conclusion 26/44 which was adopted in 2015 through APANPIRG/26/44 regarding forward fitment mandate for ADS-B avionics compliant with Version 2 ES (equivalent to RTCA DO260B) from 8 June 2018.

6.3   The above Conclusion encouraged States to adopt forward fitment mandate effective two years after the European forward fitment effective date was considered reasonable and achievable. On 6 March 2017, the European Commission issued Implementing Regulation 2017/386, which included an amendment to remove the ADS-B "forward fitment" requirement and rely solely on the 7 June 2020 mandate date for Version 2 ADS-B fitment. With such change, the forward fitment mandate date recommended in the APANPIRG conclusion will be two years earlier than the European ADS-B mandate. Hence, there is a need to review and amend APANPIRG conclusion.

6.4   The meeting agreed to propose shifting the forward-fit mandate date to be aligned with the U.S. fitment date. Hence, the meeting endorsed the following draft Conclusion:

Draft Conclusion CNS SG/22/14 (SURICG/3/1) - **Revised ADS-B Version 2 ADS-B Out Forward Fit Equipage**	
What: Review APANPIRG Conclusion 26/44 regarding fitment of Version 2 ES ADS-B, to revise the applicable date as per the below: That, States/Administrations in APAC Region be strongly encouraged to mandate that registered aircraft with a maximum certified take-off mass exceeding 5 700 kg or having a maximum cruising true airspeed capability greater than 250 knots, with a date of manufacture on or after 1 January 2020 be equipped with ADS-B avionics compliant with Version 2 ES (equivalent to RTCA DO-260B) or later version.	**Expected impact**: ☐ Political / Global ☒ Inter-regional ☒ Economic ☐ Environmental ☒ Ops/Technical
Why: Alignment with United States and (revised) European dates.	**Follow-up**: ☐Required from States
When: 5-Sep-2018	**Status**: Draft to be adopted by PIRG
Who: ☒ APANPIRG ☒ APAC States ☒ ICAO APAC RO ☐ICAO HQ ☐Other:	

Baseline ADS-B Service Performance Parameters

6.5   A proposal was raised to amend Baseline ADS-B Service Performance Parameters adopted by APANPIRG/18 in 2007. It was proposed to change the maximum Aircraft Update interval from 5 seconds to 12 seconds for Category 1 (Tier 1) 5NM separation, to align with lower update rate radar services currently in service and ICAO Circular 326. The meeting discussed the proposal and considered that in most cases the minimum update is based on the concept of the performance based surveillance. The meeting then agreed to the revised Baseline ADS-B Service Performance Parameters presented by PNG, New Zealand and Australia. The meeting further agreed to incorporate the revised Baseline ADS-B Service Performance Parameters into the AIGD as Appendix 6.

Safeguard ATC operations from problematic ADS-B avionics

6.6   Hong Kong, China presented their implementation of the mechanism and procedures with an exclusion list in safeguarding ATC operations from problematic ADS-B within Hong Kong

FIR. Aircraft consistently transmitting erroneous ADS-B data would be considered for entering into the exclusion list, the flight plan of the concerned aircraft would be pre-processed to alert the air traffic controllers in the electronic flight strips. Coordination with adjacent Area Control Centre (ACC) would be needed to alert upstream ACC that the concerned aircraft would be denied from access to the exclusive ADS-B airspace within HKFIR.

6.7   The aircraft will be removed from the exclusion list once notification from the aircraft operators/regulatory authorities is received that the problem has been rectified, and performance monitoring shows the observed problem has been resolved. The Meeting encouraged States/Administrations using ADS-B for operation to implement similar provisions with reference to the AIGD and endorsed the proposal to include Hong Kong China's experience into the AIGD.

Amendment to Guidance Material on Generation, Processing & Sharing of ASTERIX Category 21 ADS-B Messages

6.8   The meeting endorsed the recommended amendments to the "Guidance Material on Generation, Processing & Sharing of ASTERIX Category 21 ADS-B Message" which was adopted by APANPIRG/23 in 2012 through conclusion 23/31 and available at the following website: https://www.icao.int/APAC/Documents/edocs/cns/Guidance%20Material%20on%20ASTERIX.pdf

6.9   The meeting agreed to the proposed amendments in order to align with the development in 2018. Accordingly, the changes presented to the meeting are also agreed to incorporate into the amended Guidance Material on Generation, Processing & Sharing of ASTERIX Category 21 ADS-B Messages into the AIGD as Appendix 7.

ADS-B Implementation and Operations Guidance Document (AIGD)

6.10   The meeting further reviewed and agreed to the multiple amendments proposed to the AIGD using the Request for Change Form. The meeting agreed to consolidate other changes to the AIGD proposed at SURICG/3 meeting in addition to those amendments highlighted above and adopted **Conclusion CNS SG/22/15** for **Revised ADS-B Implementation and Operations Guidance Document (AIGD).**

ATC Automation Requirements and Space based ADS-B

6.11   Most ATC systems that support terrestrial ADS-B will already also support space based ADS-B without modification. The meeting noted relevant detailed issues with both ADS-B ground stations and space based ADS-B. There were 3 strategies to be recommended for consideration together with the APANPIRG ADS-B Guidance Document. The strategies that may be used to allow an ATC automation system to accept either terrestrial or space based ADS-B:

   a) Contracting an ATM supplier to upgrade or replace the ATC system;

   b) Performing the adaptation "in house" or by contracting 3rd parties to do so alternatives:

      − Making ADS-B "look like" an existing sensor input;

      − Changing the ATM system software/hardware to process ADS-B (more desirable)

   c) Consultants, ADS-B ground station providers and Space based ADS-B service providers are likely to be willing to provide support.

DATA Sharing and Operationalization of ADS-B based Surveillance Services

6.12   India had installed 21 ADS-B sensors out of which 20 are installed in the mainland and 1 in Port Blair Island in Bay of Bengal. 10 more ADS-B ground receivers were being installed for en-route surveillance. India was installing an ADS-B at the Campbell Bay Naval station in the South Andaman Sea for data sharing purpose. ADS-B data from ADS-B stations at Langkawi in Malaysia and Aceh in Indonesia can be shared with India. Indonesia and Malaysia expressed they are willing to share the surveillance data between States.   Three States were urged to implement ADS-B data derived from Campbell, Aceh and Langkawi in order to reduce occurrences of LHDs.

Issues with ADS-B Implementation

6.13   Papua New Guinea Air Services Limited (PNGASL) had deployed three (3) ADS-B sites across PNG and has plans for at least another five (5) sites. It was further informed that the physical installation of the equipment was relatively simple, issues with data transmission, site security and operational practices had proved challenging. PNGASL established tools for the ongoing fleet monitoring issues, both in terms of ADS-B data output and flight planning. The most productive method for improving compliance was to NOTAM expectation of de-prioritisation and/or delays for non-compliant operators.

The SEA/BOB ADS-B WG/13 Report

6.14   The meeting noted that the Report of the Thirteenth Meeting of the South-East Asia/Bay of Bengal Sub-Regional ADS-B Implementation Working Group (SEA/BOB ADS-B WG/13, 14-16 November 2017 in Colombo, Sri Lanka) was reviewed by SURICG/3 and outcomes was consolidated in the meeting report of SURICG/3.

The DAPs WG/1 Meeting Report

6.15   The meeting also noted that the Report of the First Meeting of DAPs Working Group (Mode S DAPs WG/1, held in March, 2018) was reviewed by SURICG/3, and SURICG/3 adopted the revised ToR of Mode S DAPS Working Group through Decision SURICG/3/3. The revised ToR provided in Appendix F to the meeting report includes wider scope of the related study and need to conduct Mode S DAPs performance evaluation.

Mode S DAPs Implementation and Operation Guidance Document (DAPs IGD)

6.16   The initial structure of DAPs IGD was developed by DAPs working group based on the framework of the well-developed ADS-B Implementation and Operation Guidance Document (AIGD), with adaptation to suit the contents of Mode S DAPs implementation. The meeting noted the structure of the Mode S DAPs IGD endorsed by SURICG/3 meeting.

Appendices including implementation checklist

6.17   The meeting further noted that a working team comprising China, Hong Kong China, Japan, Malaysia, Singapore and Thailand will work offline to populate the various section of the DAPs IGD. In addition, New Zealand will provide support on ad-hoc basis. The meeting also noted the breakdown of tasks to be completed were assigned to members of the drafting group for the IGD with target date for completion by 30 July 2018.

6.18   In the light of the latest development on ATM systems and surveillance systems in States/Administrations, the meeting strongly encouraged members to attend the SURICG, and relevant SEA/BOB ADS-B WG, and Mode S DAPs WG.

Update on Drone and UAV issues

6.19   New Zealand presented a brief overview on near misses between drones and commercial aircraft around NZAA International Airport. 4 near misses have been recorded since 6 March 2018, the closest reported as having the drone coming within 5 metres of a B772 with 278 passengers on-board. New Zealand has both regulatory rules and a drone booking system in place to enable drones to fly safely within controlled airspace but clear of IFR aircraft. Despite this, recent near misses between drones and IFR aircraft have meant that Airways NZ is now actively looking for other solutions. According to the APAC Surveillance Strategy, the Member States/Administrations were encouraged to closely monitor the development on detection and surveillance of Drone and UAV and provide such information for sharing with SURICG at its future meetings.

Prevent Operational Risks of ATC Automation System Interconnected Environment

6.20   China provided a case of ATC automation system failure, and highlighted that the system interconnection and data exchanges by the core ATC automation systems have already become true in many busy ATC centres, and it will develop continuously in the future. Although it brings a better system coordination and higher redundancy for security, more potential risks are also introduced at the same time. The meeting appreciated the useful information for sharing with the meeting. It has become more and more critical and IP network is used between automation systems. It was advised to consider prevention method in the configuration or filtering and also consider the source of timing.

Regional SSR Mode S Interrogator Identifier Codes

6.21   The meeting noted the status of Mode S Interrogator Identifier (II) codes coordinated by and registered with the ICAO APAC Regional Office. States/Administrations were urged to review the Third Edition of the SSR Mode S II codes list (published in May 2017) provided in the ICAO portal site (RO-APAC group) under CNSDOCS, and coordinate with the ICAO Regional Office for registration of II codes before use, particularly at radar sites located close to the airspace of adjacent States.

6.22   The meeting noted that the ICAO APAC office has a plan to issue new Edition of SSR Mode S II code List by the end of 2018. States/Administrations were then urged to provide the required information to ICAO Regional Office for coordination and updating the list by the end of 2018.

Mode S Conspicuity Code- PfA to ANP - Asia and Pacific Regions, Vol. II

6.23   The meeting noted that SURICG/3 meeting adopted a proposal to use Mode A Code A1000 as the regional Mode S conspicuity code for the future requirements. The meeting noted that the amendment proposal to the ANP – Asia and Pacific Regions, Vol. II was relevant to Part IV – Air Traffic Management (ATM) section. Although the rationale in the paper is justified, the SURICG/3 meeting considered it more appropriate for ATM SG to review and take action on the proposal. In this connection, the meeting reviewed and endorsed a Working Paper prepared by Australia and Co-chairs of SURICG for consideration by the ATM SG/6 meeting. Japan and Thailand expressed their agreement to the proposed PfA to RANP. Accordingly, the meeting endorsed the draft Conclusion presented in the paper. SURICG co-chair from Hong Kong China was requested to present the Working Paper as shown in IP/2 to ATM SG.

Need for Harmonized Implementation of Digital Tower

6.24   Hong Kong China introduced trials on digital tower to fulfil individual operational needs and called for development of uniform approach with common standards and guidance materials to ensure harmonized implementation. Through discussions, the meeting was of the view that there is a difference between the Remote Tower as defined in ASBU B1-Remote Air Traffic Service (B1-RATS) and the function of visual observation that can be achieved either through direct observation or indirect observation utilizing a visual surveillance system. The meeting suggested to do some further investigation before asking for SARPs development. The meeting also suggested to have this listed as one of the agenda items for the planned APAC surveillance workshop scheduled for 5-6 November 2018.

Review of ADS-B Specific Phraseologies

6.25   New Zealand proposed a review of DOC 4444, Chap 12, 12.4.3 ADS-B Phraseologies. The current ADS-B Phraseologies in the PANS-ATM can, and do generate confusion to both pilots and ATC and unnecessary RTF. It was therefore proposed, where the functionality for MODE S and ADS-B is derived from the same source the phraseologies used must be the same for both, i.e. using SSR phraseologies to avoid confusion.

6.26   In 2014, IATA presented WP7 to ADS-B SITF/13 on issues identified with ATC ADS-B phraseologies, for which flight crew had no method to comply. As the result of discussion by ADS-B SITF/13 meeting, a review and amendment was made to the ICAO APAC ADS-B Implementation and Operations Guidance Document (AIGD), Section 9.9 Phraseology. Accordingly, DOC4444, Ed 16, Chapter 12 Phraseologies, para 12.4.3, to identify "IF" and "WHAT" ADS-B phraseologies should be removed.

6.27   Where ICAO elects to retain specific ADS-B phraseologies, there should be clear guidance to Controllers and/or Pilots on the use of the phraseology, given that the ability to determine aircraft ADS-B transmitter functionality is not available to either Controllers or Pilots through current flight planning, aircraft or ATM systems.

6.28   IATA and Kiribati strongly support the proposal to remove confused phraseologies or adding explanatory notes to PANS-ATM. Accordingly, the meeting endorsed the following drat Conclusion for further consideration by ATM SG/6 meeting:

Draft Conclusion CNS SG/22/16 - Proposal for amendment to PANS-ATM (Doc 4444) on ADS-B related Phraseologies (WP/14)	
What: That, ICAO be invited to amend the PANS-ATM to remove the following phraseologies from DOC 4444, Chapter 12, paragraph 12.4.3: 12.4.3.5 "RE-ENTER ADS-B AIRCRAFT IDENTIFICATION' 12.4.3.7 "TRANSMIT ADS-B IDENT" 12.4.3.10 "STOP SQUAWK TRANSMIT ADS-B ONLY" or "STOP ADS-B TRANSMISSION, SQUAWK (CODE) ONLY" 12.4.3.11 "TRANSMIT ADS-B ALTITUDE" 12.4.3.13 "STOP ADS-B ALTITUDE TRANSMISSION [(WRONG INDICATION, or reason)]"	**Expected impact**: Expected impact: ☐ Political / Global ☒ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: Where functionality is derived from the same source for both MODE S and ADS-B, a common phraseology SHALL be used. Using different phraseologies for the same function generates confusion for both ATC and Pilot, resulting in unnecessary RTF congestion.	**Follow-up**: ☒Required from States/Administrations
When: 5-Sep-2018	**Status**: Draft to be adopted by PIRG
Who: ☒ APANPIRG ☒APAC States ☒ICAO APAC RO ☒ICAO HQ ☐Other:	

ADS-B Implementation Status

6.29   New Zealand provided updates on the implementation status of ADS-B and Mode S DAPS. New Zealand updated the meeting on ADS-B progress. From May 24th 2018 ADS-B is being used to provide 3 and 5NM surveillance separation in both ADS-B RAD and ADS-B NRA. The New Zealand Civil Aviation Authority (NZCAA) will Mandate ADS-B in the NZZC FIR in two phases:

> ➢ Phase one: NZZC FIR - all controlled airspace above FL245 commencing midnight Dec 31 2018;

> ➢ Phase two: NZZC FIR – Proposed ADS-B mandate for all controlled airspace commencing midnight 31 Dec. 2021;

> ➢ The ADS-B Rules and Mandate for use of ADS-B FL245 and above are published in "Advisory Circular" AC91-24 (24th July 2018) and "Notice of Requirement" NTC-91.258 (20 July 2018) and relate to Civil Aviation Rule Parts 21, 43 and 93, and specifically to:

>> o Rule Part 91, Amendment 30, rules 91-253 to 91-258A Automatic Dependent Surveillance-Broadcast Systems,

>> o NZ's mandate has been included as "AC91-24 Rev 0" which has been issued on 24 Jul 2018:-
>> https://www.caa.govt.nz/assets/legacy/Advisory_Circulars/AC91-24.pdf

>> o "NTC 91.258":- is available at
>> https://www.caa.govt.nz/assets/legacy/rules/notices/Notice-NTC-091-258.pdf

> ➢ Further info can be obtained at adsb@caa.govt.nz

6.30   The meeting participants were requested to forward the information to those airlines/operators who fly or intend to fly into New Zealand.

6.31   The meeting noted the ADS-B Implementations Status in the APAC Region is provided in **Appendix L** to CNS SG/22 meeting report.

Mode S DAPS QNH Data

6.32   New Zealand updated the meeting on continuing testing of DAPS QNH data to enable safety net processing. The paper highlighted a newly noted issue in QNH processing where some aircraft output a QNH value to one decimal point (e.g, 1019.1) and that the aircraft systems tend to round the decimal point up or down to the nearest whole value for pilot use. This is in contrast with DOC 4444 Procedures for Air Navigation Services, Air Traffic Management, Section 4, sub-para 4.10.4.7, which states that altimeter settings provided to aircraft shall be rounded down to the nearest lower whole hectopascals. This is a further consideration which needs to be taken into consideration when implementing DAPS QNH data for safety net processing

Surveillance Coverage in Indian Airspace and Integration of Surveillance Data in ATS Automation System

6.33   India presented information of the existing Indian airspace structure and their development of Airspace Management Strategy to maintain uniform service levels through Upper Airspace harmonization. India has also harnessed appropriate CNS technology, including the use of advanced ATM Automation systems, to cope with the growth of air traffic.

6.34   The presentation highlighted one of the major ANS initiatives in enhancing safety, efficiency and increasing airports & airspace capacity through implementation of a new state-of-the-art ATS Automation system, enhanced and overlapping ATS surveillance/VHF coverage enabling harmonization of upper airspace within the Kolkata FIR. India will be installing an ADS-B at the Campbell bay Naval station in the South Andaman Sea for data sharing purpose. ADS-B data from ADS-B stations at Langkawi in Malaysia and Aceh in Indonesia can be shared with India. ADS-B data sharing with Malaysia and Indonesia will help to reduce the LHDs and LLDs in the FIR boundary. A letter of agreement to share the data needs to be signed.

6.35   India and Myanmar were encouraged to overcome challenges and to have the planned ADS-B data sharing implemented as early as possible.

Surveillance Environment in Australia

6.36   Australia presented an overview of the surveillance environment in Australia. Over the past 20 years Australia has significantly increased surveillance coverage through a combination of ADS-B, Mode S radar, wide/local area multilateration, and primary radar. Surveillance is now used by almost every ATC for separation, safety nets/alerts, traffic synchronization, and situational awareness. Australia continues to invest in ADS-B technology through ground station deployment and efforts to lower the cost of ADS-B equipment on VFR-only aircraft. However, while ATC is a critical user of ADS-B OUT, ADS-B IN avionics continue to proliferate through the general and regional aviation communities, improving the safety and efficiency of flight operations.

Improvements of the ASDE System after Installation of MLAT System

6.37   Through the paper, Republic of Korea shared the meeting with their improved ASDE system after installation of MLAT system at IIAC. The MLAT supports the automatic labeling functions, eliminates shadow areas, enhances the position accuracy for ground targets and provides stable ground control service in bad weather. Those States installed MLAT system were invited to consider to build the system that meets their objective.

Agenda Item 7: Review and updates on Seamless ATM Reporting and outcome of GANIS/SANIS

Application of RNAV 2 to the surveillance airspace in PARS Phase II

7.1   The Secretariat presented the survey result on RNAV 2 and RNP 2 navigation specification implementation. The result showed that 7 out of 9 States/Administrations agreed to allow the use of both RNP 2 and RNAV 2 navigation specification during in the Preferred Aerodrome/Airspace and Route Specification (PARS) Phase II, which ends 02 November 2022. In addition, 5 responses answered more than 90% of their aircraft were capable for RNP2 operations while 3 responses were less than 20%. Regarding RNP2 operational approval status, one responded more than 90% of approvals while others were less than 50% including 4 with no RNP2 approvals. For the intention of RNAV 2 implementation in Category S airspace, 2 States preferred RNP2 implementation while the others answered they would implement or consider RNAV2 implementation.

7.2   Considering the expected difficulties in implementing RNP 2 navigation specification in PARS Phase II that begins on 07 November 2019, the Secretariat proposed to amend the paragraph 7.24 of Asia/Pacific Seamless ATM Plan, which contains RNP2 implementation in PARS Phase II as follows:

> *7.24All en-route controlled airspace should be designated as being exclusive PBN airspace ~~with mandatory carriage of GNSS~~ utilizing <u>RNAV and</u> RNP navigation specifications, except for State aircraft. Such implementation mandates should be*

harmonized with adjacent airspace. PBN ATS routes should be established in accordance with the following specification:

- *Category S airspace – **RNAV 2 or RNP 2***
- *Category R ~~and S~~ airspace – **RNP 2**.*

*Note: the Asia/Pacific recognizes 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 recognize RNP 2, States should ensure that aircraft operators with RNP 2 approval file designator 'Z' in field 10 and **'NAV/RNP2'** in field 18.*

7.3 The meeting considered the proposal and endorsed the following Conclusion. The meeting also asked the Secretariat further to coordinate with the ATM Sub Group.

Conclusion CNS SG/22/17 – Amendment of Asia/Pacific Seamless ATM Plan Version 2	
What: Recognizing the expected difficulties in implementing RNP2 navigation specification in the Preferred Aerodrome/Airspace and Route Specification (PARS) Phase II, which begins on 7 November 2019, That, Asia/Pacific Seamless ATM Plan Version 2 be amended as proposed in paragraph 7.2 of the report to include RNAV2 in Category S airspace.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: It was recognized that some States are not ready to implement RNP2 navigation specifications mainly because of RNP 2 fleet readiness and the lack of regulation and competency on RNP 2 operational approval.	Follow-up: ☐ Required from States
When: 3-Aug-2018	Status: to be endorsed by ATM Sub Group
Who: ☒ Sub groups ☐APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other:	

Implementation Progress against Seamless ATM Plan Objectives

7.4 Seamless ATM reporting, reflecting the implementation progress of air navigation improvements in the Asia/Pacific (APAC) Region against the objectives set out in the Asia/Pacific Seamless ATM Plan V2.0. The purpose of monitoring the implementation progress is to determine the difficulties and issues, and take corrective actions at APANPIRG, Sub Group, and/or Task Force levels as appropriate.

7.5 The Secretariat presented the status of the regional picture which is available at: https://portal.icao.int/space/Pages/ANPage.aspx (access to iStars through portal procedure is required). The reporting status on some CNS related reporting elements: 110 - PBN Approach; 180 – Ground based surveillance; 220 – AIDC implementation and 270 – ATS Surveillance with data integrated were shown.

7.6 The meeting was informed that as recommended by SURICG/2 and endorsed by CNS SG/21 then noted by APANPIRG/28 meeting, the definition of ADS-B airspace in the database had already been changed to: " % of FIRs where Category S and Category T airspace supporting high-density aerodromes are able to utilize ADS-B for situational awareness and/or separation."

Briefing on the outcome of GANIS/2 and SANIS/1

7.7   The meeting reviewed the outcome summary of the CNS related presentations and discussions at the second Global Air Navigation Industry Symposium & the first Safety Air Navigation Industry Symposium (GANIS/2&SANIS/1) held in Montreal, Canada from 11 - 15 December 2017. The symposium laid the foundations for the Thirteenth Air Navigation Conference to be held from 9 to 19 October 2018. The presentations at the GANIS/2 and SANIS/1 are available the following link: https://www.icao.int/Meetings/GANIS-SANIS/Presentations/Forms/AllItems.aspx

Agenda Item 8:   Review status of CNS deficiencies (APANPIRG Deficiency List)

Updated status of CNS deficiencies

8.1   The outcome of discussions on deficiencies by CNS SG/22 is consolidated into a separate working paper under Agenda Item 4.

Agenda Item 9:   Human Factors and Air Traffic Safety Electronics Personnel (ATSEPs)related training

Competency-based Training and Assessment Programme

9.1   Further to the initial introduction to the main principles of their competency-based training at CNS SG/21 meeting, the Philippines made a presentation with detailed information on their competency-based training and assessment program being implemented by CAA Philippines to enhance the competence of ATSEPs and ensure high operational safety standards in the management, operation, and maintenance of CNS/ATM systems.

9.2   CAA Philippines (CAAP) recognizes the importance of the work of ATSEP in ensuring high operational safety standards in civil aviation. This opt the management to include ATSEPs in the group of aviation professionals including pilots, aircraft mechanics, and air traffic controllers, etc., to undergo training and assessment before allowing to perform an aviation related activities without direct supervision. In January 2017, the *Philippine Civil Aviation Regulation (PCAR)* was amended to include the rules and regulations for the licensing and rating certification of ATSEPs.   The PCAR enumerates among others, the requirements with regards to training and assessment that an applicant must comply before the issuance of License and Rating.

9.3   The Civil Aviation Training Center (CATC-Manila) is providing the classroom training requirements for ATSEPs since 1978, whilst on-the-job training has been informally conducted by the ANSP. However, with the publication of Doc. 7192 - Training Manual for ATSEP, Doc. 10057 - Manual on ATSEP Competency-based Training and Assessment, and Doc. 9868 - Procedures for Air Navigation Services – Training, CAAP gradually adopts the above-mentioned guidance materials and formalized the training and assessment of ATSEPs.

9.4   The steps in ATSEP Training and Assessment Progression were introduced in the presentation. A number of clarifications were also made to the questions asked such as period for initial training required, emergency and conversion training and licensing. The CNS SG meeting recognized the benefits of Competency-based Training for ATSEP and considered also important for Administrations to implement the established training programme and progression. CNS SG would further promote to share information on the national training frameworks at its next meeting. Fiji, Japan and Republic of Korea agreed to share their experience gained at CNS SG/23 meeting.

Agenda Item 10: Cybersecurity of CNS/ATM systems

Outcomes of Asia/Pacific Regional Cybersecurity Symposium

10.1   The meeting noted the outcomes of the ICAO Asia Pacific Regional Cybersecurity Symposium (APAC RCS) held at the Civil Aviation Department Headquarters, Hong Kong China, from 15 to 16 May 2018. The symposium was co-hosted by the Civil Aviation Department of Hong Kong (HKCAD) and the Airport Authority Hong Kong (AAHK). The theme of the Symposium was "Cybersecurity in Air Navigation and Airport Services". The Symposium was attended by 169 participants from 14 States/Administrations, 4 International Organizations (ACI, EASA, CANSO and IATA) and a number of technology/solution providers. A total of 26 presentations were made by various experts under six sessions in the Symposium, covering a wide spectrum of cybersecurity areas in air navigation and airport services. The Symposium has concluded the need to address cybersecurity threats and issues in the Region. The report including the summary of presentations and the questions raised and discussed during the Symposium is available at: https://www.icao.int/APAC/Meetings/Pages/2018-Cyber-Security.aspx. As this topic is aviation security related, the ICAO advised that the papers and presentation materials would be available to States/Administrations upon request.

10.2   There was a proposal again to establish a regional working group under the CNS Sub-group of APANPIRG to deal with the cyber security related issues. Considering the activities being conducted by ICAO HQ through SSGC at global level and three working groups (Airworthiness WG, Aerodromes WG and Current and Future ANS WG) being established. The meeting considered better to wait for the further guidance to be developed at global level to avoid duplicated efforts. The meeting was informed that the first combined meeting of the SSGC Working Groups will be held on 14 August 2018 through a virtual meeting. The States/Administrations in APAC Region are encouraged to monitor the progress and contribute to the efforts of the SSGC by nominating and sending subject matter experts to participate in these Working Groups, as per ICAO State letter 2018/63, to work towards the development of a comprehensive and unified strategy for cybersecurity that can reflect the global and regional environments. In this regard, the meeting deliberated and agreed to keep in view of the forthcoming development to avoid duplicating efforts and to review the situation in the next CNS Sub-group meeting.

FAA National Airspace System (NAS) Security & Enterprise Operations (NASEO)

10.3   The Federal Aviation Administration (FAA) informed the meeting that the National Airspace System Security and Enterprise Office (NASEO), within the FAA Air Traffic Organization, was established to mitigate cyber risks within the National Airspace System (NAS). The FAA described some of the NASEO initiatives, such as Monitoring and Management, TDM-IP Transition and Potential Solution, NAS Control Center Tool Enhancements, Operational Risk Management (ORM) and NAS Cybersecurity Technology in support of its mission.

Agenda Item 11: Certification, procurement procedures of CNS/ATM systems

11.1   Under this agenda, the meeting reviewed WP15 from Nepal and IP26 from Indonesia associated the development of regional guidance material.

Need for Guidance on Performing Safety Assessment of CNS equipment and specifying the required level of Reliability and Availability

11.2   Nepal stated that according to the ICAO PANS-ATM (Doc4444), Chapter 2 which requires safety review of ATS units to include, inter alia, aspects pertaining to operational and technical issues to ensure that communications, navigation, surveillance and other safety significant systems and equipment meet the required level of reliability and availability as defined by the

appropriate authority. Nepal also seeks to learn from the experience of other APAC ICAO Member States on how to determine the "required" levels of reliability and availability for CNS systems and associated training requirements.

11.3   The meeting discussed the issues identified by Nepal. A number of States including Australia, India, Bhutan and Singapore also shared their views with the meeting. The meeting was of the view that the global guidance would be made available at high level and general perspective, and may not fully suit individual and specific needs. The requirement stated in the PANS-ATM may be purposely made generic since the appropriate authority, which knows the operating and construction environments, is in the best position to set the required level of reliability and availability rather than to comply with some quantitative figures set by someone else.

11.4   The meeting also discussed the assessment of reliability figures of procured equipment. The meeting was of the view that such assessment would not come under the purview of ATSEP whose main role is to maintain the procured equipment. Some States said that such assessment, which could be technically complex and time-consuming, was of the domain of 'professional engineers'.

Certification of CNS/ATM Systems in Indonesia

11.5   Indonesia shared with meeting on the certifications issued by the Director General of Civil Aviation (DGCA) to CNS/ATM system of Airnav Indonesia and ATS Unit Provider. The certification procedures are specified in the Civil Aviation Safety Regulation (CASR) Part 171 on the Aeronautical Telecommunication Service Provider. The following aspects and performance of CNS Service are reviewed and assessed:

- Services
- Avaibility
- Accuracy
- Integrity
- Contuinity (Changeover and Standby Power)
- Recovery Time
- MTBF (Mean Time Between Failure)

11.6   The meeting set up an ad hoc working group with participants from Singapore, Australia, Bangladesh, Bhutan, Brunei, Fiji, Hong Kong China, India, Indonesia, New Zealand, Singapore, Sri Lanka, Thailand and Secretariat to discuss and draft structure of the Guidance Material. A side meeting of the ad hoc working group was held in the afternoon on 18 July 2018.

11.7   It was informed that arising from last year Workshop on Procurement and Certification of CNS/ATM services and system, a Regional Guidance document will be drafted to summarize outputs of the Workshop. The Regional Guidance document was about 70% completed and it would be completed by the end of 2018. The side meeting agreed to expand the guidance document by inclusion of headings on the concerned issues proposed by Nepal (WP/15).

11.8   The meeting reviewed the outcome of the ad hoc working group and agreed to the updated structure of the guidance material as provided in **Appendix N** to CNS SG/22 meeting report. The meeting was also reminded that reference may also be made to some relevant regional guidance materials currently available including the Guidance Material for the Asia/Pacific Region for ADS/CPDLC/AIDC ground systems procurement and implementation published in May 2008, and Section 8 of ADS-B Implementation and Operations Guidance Document on Reliability and Availability Considerations.

Any other business/updates on CNS/ATM Systems in Lao PDR.

12.1   Lao PDR informed the meeting that the key air navigation service provider in Lao PDR is the Air Navigation Services which had just been renamed and reorganized from Lao Air Traffic Management in 2018. Comprehensive introduction on the CNS development was presented to the meeting. Both national budget and grand aids project for enhancing the capability and safety of Air Traffic Services over Lao FIR was also introduced. The presentation covered the development and current status of AFS, AMS, NAV and SUR facilities and services in Lao PDR.

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List of Conclusion adopted by CNS SG on behalf of APANPIRG on Technical Matters

Conclusion CNS SG/22/2: Arrangement for Conducting IP Connectivity Test	
What: That, considering the need for supporting the procedure of the X.25 protocol transition to IPS and no IP connectivity test having been conducted for AMHS connections over X.25 using ATN Router. States/Administrations are urged to conduct IP connectivity tests when joining the CRV or through other IP network. Note: These additional tests may be agreed bilaterally through additional agreement for IP connectivity test as supplements to the TMC between Administrations.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: There is a need for alternate simple arrangements for Administrations to conduct the required test without need to amendment TMC.	Follow-up: ☒Required from States
When: 20-Jul-2018	Status: Adopted by CNS Sub-group
Who: ☒ CNS Sub-group ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other:	

Conclusion CNS SG/22/3: CRV Implementation Plan and VoIP ICD	
What: That, a) the CRV Implementation Plan provided in **Appendix B** to the report be adopted as Version 1.0; and b) CRV Voice over Internet Protocol (VoIP) and Analog Voice ICD provided in **Appendix C** be adopted as Version 1.0.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: There is a need to provide guidance to States and Administration for CRV implementation.	Follow-up: ☒Required from States
When: 20-Jul-2018	Status: Adopted by CNS Sub-group
Who: ☒Sub groups ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other:	

Conclusion CNS SG/22/4: ATN/BBIS States/Administration Use CRV for AFTN/AMHS Traffic	
What: That, States/Administrations with ATN/BBIS be urged to implement CRV network as early as possible, to provide AFTN/AMHS routing function for BIS Administrations.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: to ensure compliance with ICAO Doc 9896	Follow-up: ☒Required from States
When: 20-Jul-2018	Status: Adopted by CNS Sub-group
Who: ☒CNS Sub-group ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other:	

Decision CNS SG/22/5: Revised Terms of Reference for the SWIM TF	
What: That, considering the recommendation from CNS SG/21 that SWIM TF report directly to CNS SG, the revised Terms of Reference of SWIM Task Force placed at **Appendix D** to the Report is adopted.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: To reflect a direct reporting line from SWIM TF to CNS SG noting that the TOR already include the requirement to coordinate with other relevant groups formed under APANPIRG and its sub-groups.	Follow-up: ☐Required from States
When: 20-Jul-2018	Status: Adopted by CNS Sub-Group
Who: ☒CNS Sub-group ☐APAC States ☒ICAO APAC RO ☐ICAO HQ ☐ Other:	

Conclusion CNS SG/22/6: Asia/Pacific SWIM Survey	
What: That, States/Administrations are urged to respond to a survey on System-Wide Information Management (SWIM), to be circulated through an ICAO State Letter.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: To commence initial education and information gathering on SWIM understanding and readiness in the APAC Region	Follow-up: ☒Required from States
When: 20-Jul-2018	Status: Adopted by CNS Sub-group
Who: ☒ CNS Sub-group ☒ APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other:	

Conclusion CNS SG/22/7: Revised AFTN/ATSMHS Routing Directory	
What: That, the AFTN/ATSMHS Routing Directory for the APAC Region provided in **Appendix F** is adopted and distributed to States/Administrations.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: A number of new ATSMHS connections had been established and some AFTN circuits had become non-operational, so consequential amendments to the AFTN/ATSMHS Routing Directory are required.	Follow-up: ☒Required from States
When: 20-July-2018	Status: Adopted by CNS Sub-group
Who: ☒CNS Sub-Groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other:	

Conclusion CNS SG/22/11: The Catalogue of Asia and Pacific Flight Inspection and Flight Validation Service Providers	
What: That, *The Catalogue of Asia and Pacific Flight Inspection and Flight Validation Service Providers* (Tenth Edition) in the **Appendix J** to the report be published on the ICAO Regional Office website.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: The information in *the Catalogue of Flight Inspection Units Asia and Pacific Regions (Ninth Edition, October 2009)* is not sufficient to support the flight validation of PBN procedures.	Follow-up: ☒Required from States
When: 20-Jul-2018	Status: Adopted by CNS Sub-group
Who: ☒CNS Sub-group ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☒Other: ICAO APAC RSO	

Conclusion CNS SG/22/15: Revised ADS-B Implementation and Operations Guidance Document (AIGD)	
What: That, the revised ADS-B Implementation and Operations Guidance Document (AIGD) consolidating all changes proposed during SURICG/3 meeting and provided in **Appendix K** to the Report be adopted as Version 11.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: There are a number of updates resulted from SURICG/3 and SEA/BOB ADS-B WG/13 plus some editorial corrections and updates	Follow-up: ☐Required from States
When: 20-July-2018	Status: Adopted by CNS SG
Who: ☒ CNS Sub group ☐APAC States ☒ ICAO APAC RO ☐ICAO HQ	

Conclusion CNS SG/22/17 - Amendment of Asia/Pacific Seamless ATM Plan Version 2	
What: Recognizing the expected difficulties in implementing RNP2 navigation specification in the Preferred Aerodrome/Airspace and Route Specification (PARS) Phase II, which begins on 7 November 2019, That, Asia/Pacific Seamless ATM Plan Version 2 be amended as proposed in paragraph 7.2 of the report to include RNAV2 in Category S airspace.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: It was recognized that some States are not ready to implement RNP2 navigation specifications mainly because of RNP 2 fleet readiness and the lack of regulation and competency on RNP 2 operational approval.	Follow-up:　　☐ Required from States
When: 3-Aug-2018	Status: Draft to be endorsed by ATM Sub Group
Who: ☒ATM Sub groups　☐APAC States　☒ICAO APAC RO　☐ICAO HQ　☐Other:	

This Conclusion (22/17) was endorsed by ATM SG/6 meeting.

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A List of Draft Conclusions from CNS SG/22 for Consideration by APANPIRG/29 Meeting

Conclusion APANPIRG/29/XX (CNS SG/22/1) - Using IPS Router between BBIS Administrations	
What: That, utilize IPS router and encourage to phase out X.25 and IP SNDCF (ATN) router by allowing IPS routers to inter-connect between BBIS Administrations when CRV or other inter-regional IP networks being utilized.	Expected impact: ☐ Political / Global ☒ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: Compliance with ICAO Doc 9896	Follow-up: ☒Required from States
When: 5-Sep-2018	Status: Draft to be adopted by PIRG
Who: ☒CNS Sub-group ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other:	

Conclusion APANPIRG/29/XX (CNS SG/22/8) - Revised Strategy for Implementation of Communication Systems to Support Air Navigation Service	
What: That, the revised Strategy for implementation of Communication systems to support Air Navigation Service provided in **Appendix G** to the Report be adopted.	Expected impact: ☐ Political / Global ☐ Inter-regional ☒ Economic ☐ Environmental ☒ Ops/Technical
Why: The Strategy for implementation of Communication systems for APAC Region was adopted by APANPIRG in 2017. The strategy requires to be updated based on the latest development.	Follow-up: ☒ Required from States
When: 5-Sep-2018	Status: Draft to be adopted by PIRG
Who: ☒ APANPIRG ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other:	

Conclusion APANPIRG/29/XX (CNS SG/22/9) - Support Allocation of Radio Spectrum for Space Based VHF Communications	
What: That, a) States and ICAO be invited to initiate and support the ITU application process of allocating an appropriate aeronautical VHF frequency band for space-based aeronautical mobile communication service for WRC-2023; b) States and ICAO be invited to take note of the potential benefits of space-based VHF aeronautical mobile communication service to enhance safety, capacity and efficiency of air navigation services by supporting the Proof-of-Concept tests; and c) ICAO is invited to assign three aeronautical VHF channels for the duration of the Proof-of-Concept tests.	Expected impact: ☐ Political / Global ☒ Inter-regional ☒Economic ☒ Environmental ☒ Ops/Technical
Why: There is a need to support the POC study on space based VHF aeronautical mobile communication for Category R and other suitable airspaces in order to provide seamless VHF communication service to support radar like separation minima in those area.	Follow-up: ☒Required from States and ICAO
When: 5-Sep-2018	Status: Draft to be adopted by PIRG
Who: ☒CNS Sub-group ☒APAC States ☒ICAO APAC RO ☒ICAO HQ ☐Other:	

Conclusion APANPIRG/29/XX (CNS SG/22/10) - PBN-IN-A-PAGE (Version 2.0)	
What: That, a) The PBN-in-a-page (Version 2.0) in **Appendix I** to the report be adopted as a regional supporting material and be published on the ICAO Regional Office website. *Note – The contents of the PBN-in-a-page was extracted from ICAO documents including Doc 9613, Doc 8168 Vol. II, Doc 4444, and Annex 15. The PBN-in-a-page should be used as a quick reference during PBN airspace designing and PBN implementation planning.* b) ICAO Regional Office forward the PBN-in-a-page (Version 2) to the relevant Panels and Study Groups for their information and consideration.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☒ Environmental ☒ Ops/Technical
Why: The current version of PBN-in-a-page needs to be updated to reflect the amendments of the PANS-ATM and the implementation of PBCS. It also needs to be forwarded to the relevant ICAO bodies for their information and consideration.	Follow-up: ☐Required from States
When: 5-Sep-2018	Status: Draft to be adopted by PIRG
Who: ☒Sub groups ☐APAC States ☒ICAO APAC RO ☒ICAO HQ ☒Other: ICAO APAC RSO	

Conclusion **APANPIRG/29/XX** (CNS SG/22/12) - Ground Based GNSS Status Monitoring	
What: Recognizing that the availability of GNSS is crucial for GNSS based PBN procedures, that the performance of GNSS on the ground may be different from that in the aircraft, and that the States should determine essential radio navigation services for GNSS based approach, landing or take-off, which require timely warnings on the GNSS status to ATC services, That, States be urged to: a) define the essential radio navigation services for GNSS based operations; b) be aware that requirement for air traffic controllers to provide real time GNSS status monitoring to aircraft for GNSS ABAS procedures may not be required; c) ensure that GNSS/RAIM unavailability prediction be provided to users; d) ensure that pilot reports as far as practical on GNSS status should be provided to ATC for dissemination to other aircraft as real time GNSS information; and e) reflect their operational procedures within AIC and/or AIP.	Expected impact: ☒ Political / Global ☒ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: As GNSS on board performance might be different from GNSS performance observed on the ground, pilot might be confused if there is any difference between the two environments. Therefore, ground based GNSS status monitoring information used for ABAS should be used as advice to ATS.	Follow-up: ☒Required from States
When: 5-Sep-2018	Status: Draft to be adopted by PIRG
Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☒Other: ICAO APAC RSO	

The CNS SG considered that PBN training for pilot and air traffic controllers should include these differences in the training material so that pilots and air traffic controllers could be aware of the different applications of PBN and disseminate GNSS status information selectively.
The ATM SG/6 meeting considered that there was insufficient basis to support this draft Conclusion CNS SG/22/12.

Conclusion **APANPIRG/29/XX** (CNS SG/22/13) - Transition Planning for RNP APCH CHART Identification from RNAV to RNP	
What: Recognizing ICAO Circular 353, *Transition Planning for Change to Instrument Flight Procedure Approach Chart Identification from RNAV to RNP* was published to provide guidance on the development of global, regional and State transition plan, and ICAO Regional Office has to develop a draft transition plan within twelve month of the publication of the Circular 353, That, a) States begin internal coordination on the State transition plan and provide the number of RNP APCH procedures published and planned, required duration and desired time slot; b) ICAO Regional Office draft a regional transition plan on RNP APCH chart identification in coordination with relevant regional contributory bodies of APANPIRG, sub-regional ATM coordination groups and regional stakeholders; and c) ICAO Regional Office to conduct a meeting or workshop to discuss regional transition plan once regional transition plan template is provided by ICAO PBN Programme Office.	Expected impact: ☒ Political / Global ☒ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: Transition of RNP APCH chart identification is related to various stakeholders, which need effective management and global, regional and State level coordination.	Follow-up: ☒Required from States
When: 5-Sep-2018	Status: Draft to be adopted by PIRG
Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☒ICAO HQ ☒Other: ICAO APAC RSO	

The above draft Conclusion was amended by ATM SG/6 as shown below:

Draft Conclusion ATM/SG/6-5: Transition Planning for RNP APCH CHART Identification from RNAV to RNP	
What: Recognizing ICAO Circular 353, *Transition Planning for Change to Instrument Flight Procedure Approach Chart Identification from RNAV to RNP* will be finalized to provide guidance on the development of global, regional and State transition plans, and ICAO Regional Office is requested to develop a draft transition plan within twelve months of the final publication of the Circular, that: a) States begin internal coordination on the State transition plan and provide the number of RNP APCH procedures published and planned, and the time required to transition from RNAV (GNSS)/RNAV (RNP) to RNP chart identification; b) ICAO Regional Office drafts a regional transition plan on RNP APCH chart identification in coordination with relevant regional contributory bodes of APANPIRG, sub-regional ATM coordination groups and regional stakeholders; and	Expected impact: ☒ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical

c) ICAO Regional Office conducts a meeting or workshop to discuss the regional transition plan, after a regional transition plan template has been provided by the ICAO PBN Programme Office.	
Why: To commence preparation for the global regional and State planning for transition of approach chart identification from RNAV to RNP.	Follow-up: ☒Required from States
When: 5-Sep-18	Status: Draft to be adopted by PIRG
Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☒Other: RSO	

Conclusion APANPIRG/29/XX (CNS SG/22/14) - Revised ADS-B Version 2 ADS-B Out Forward Fit Equipage

What: Review APANPIRG Conclusion 26/44 regarding fitment of Version 2 ES ADS-B, to revise the applicable date as per the below: That, States/Administrations in APAC Region be strongly encouraged to mandate that registered aircraft with a maximum certified take-off mass exceeding 5 700 kg or having a maximum cruising true airspeed capability greater than 250 knots, with a date of manufacture on or after 1 January 2020 be equipped with ADS-B avionics compliant with Version 2 ES (equivalent to RTCA DO-260B) or later version.	Expected impact: ☐ Political / Global ☒ Inter-regional ☒ Economic ☐ Environmental ☒ Ops/Technical
Why: Alignment with United States and (revised) European dates.	Follow-up: ☐Required from States
When: 5-Sep-2018	Status: Draft to be adopted by PIRG
Who: ☒ CNS Sub group ☒ APAC States ☒ ICAO APAC RO ☐ICAO HQ ☐Other: XX	

The above draft Conclusion was reviewed by ATM SG/6 meeting and became a Conclusion shown below:

Conclusion ATM/SG/6-6: Revised ADS-B Version 2 ADS-B Out Forward Fit Equipage

What: That, States/Administrations in APAC Region be strongly encouraged to mandate that registered aircraft with a maximum certified take-off mass exceeding 5 700 kg or having a maximum cruising true airspeed capability greater than 250 knots, with a date of manufacture on or after 1 January 2020 be equipped with ADS-B avionics compliant with Version 2 ES (equivalent to RTCA DO-260B) or later version. *This Draft Conclusion supersedes Conclusion APANPIRG 26/44.*	Expected impact: ☐ Political / Global ☐ Inter-regional ☒ Economic ☐ Environmental ☒ Ops/Technical
Why: To align Asia/Pacific Region ADS-B Version 2 forward fit equipage with the revised European Commission Regulation 2017/386.	Follow-up: ☐Required from States
When: 5-Sep-18	Status: Draft to be adopted by PIRG
Who: ☐Sub groups ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other:	

Conclusion **APANPIRG/29/XX** (CNS SG/22/16) - Proposal for Amendment to PANS-ATM (Doc 4444) on ADS-B Related Phraseologies	
What: That, ICAO be invited to amend the PANS-ATM to remove the following phraseologies from DOC 4444, Chapter 12, paragraph 12.4.3: 12.4.3.5 "RE-ENTER ADS-B AIRCRAFT IDENTIFICATION' 12.4.3.7 "TRANSMIT ADS-B IDENT" 12.4.3.10 "STOP SQUAWK TRANSMIT ADS-B ONLY" or "STOP ADS-B TRANSMISSION, SQUAWK (CODE) ONLY" 12.4.3.11 "TRANSMIT ADS-B ALTITUDE" 12.4.3.13 "STOP ADS-B ALTITUDE TRANSMISSION [(WRONG INDICATION, or reason)]"	Expected impact: Expected impact: ☐ Political / Global ☒ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: Where functionality is derived from the same source for both MODE S and ADS-B, a common phraseology SHALL be used. Using different phraseologies for the same function generates confusion for both ATC and Pilot, resulting in unnecessary RTF congestion.	Follow-up: ☒Required from States/ Administrations
When: 5-Sep-2018	Status: Draft to be adopted by PIRG
Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☒ICAO HQ ☐Other:	

The above draft Conclusion was further recommended for amendment by ATM SG/6 as shown below:

Draft Conclusion ATM/SG/6-7: Proposal for amendment to PANS-ATM (Doc4444) on ADS-B related Phraseology	
What: Recognizing that: 1. where system functionality is derived from the same source for both MODE S SSR and ADS-B the phraseology used between ATC and pilots should be the same; 2. in almost all cases, the pilot interfaces with the ADS-B system through the SSR transponder interface; and 3. the use of ADS-B-specific phrases may cause confusion between pilots and ATC; ICAO be invited to amend PANS-ATM to remove the following phrases: 12.4.3.5 "RE-ENTER ADS-B AIRCRAFT IDENTIFICATION' 12.4.3.7 "TRANSMIT ADS-B IDENT" 12.4.3.10 "STOP SQUAWK TRANSMIT ADS-B ONLY" or "STOP ADS- B TRANSMISSION, SQUAWK (CODE) ONLY" 12.4.3.11 "TRANSMIT ADS-B ALTITUDE" 12.4.3.13 "STOP ADS-B ALTITUDE TRANSMISSION [(WRONG INDICATION, or reason)]"	Expected impact: ☒ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: To remove phrases from PANS-ATM that cause confusion to pilots and ATC, recognizing that the greater majority of ADS-B installations in aircraft use the same pilot interfaces as the Mode S SSR transponder.	Follow-up: ☐Required from States
When: 5-Sep-18	Status: Draft to be adopted by PIRG
Who: ☐Sub groups ☐APAC States ☒ICAO APAC RO ☒ICAO HQ ☐Other:	

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**STRATEGY FOR IMPLEMENTATION OF COMMUNICATION SYSTEMS
TO SUPPORT AIR NAVIGATION SERVICE
IN THE ASIA/PACIFIC REGION**

Considering that:

1) legacy AFTN circuits are required until the ground systems of ATM Service Providers (ASP) and Airspace Users (AU) in reliant states are compatible with ATS Message Handling Service (AMHS), the successor implementation of the Aeronautical Fixed Service (AFS);

2) the Aeronautical Telecommunication Network (ATN) is specified in ICAO SARPs and technical manuals as the network supporting AFS implemented using either OSI protocols (ATN/OSI) or the Internet Protocol Suite (ATN/IPS) for both ground-ground and ground-air services;

3) many states have implemented ATN and AMHS in accordance with ICAO guidance (regional BBIS providing dual OSI/IPS stack routing at the AMHS level);

4) AN Conf/12 endorsed the Global Air Navigation Plan version 4including the Aviation System Block Upgrades of the Globally Interoperable Services and Data improvement area based on System-Wide Information Management (SWIM) message exchange patterns (specified in the SWIM Operational Concept as IP-based web services);

5) APANPIRG adopted the Seamless ATM Plan (Version 2) in 2016 which includes the regional objective for SWIM and Common aeRonautical VPN (CRV) implementation; and

6) operational precedents of slightly different implementations of this SWIM concept exist in North America and Europe.

THE GENERAL STRATEGY FOR THE IMPLEMENTATION OF THE NECESSARY INTER-STATE COMMUNICATION SERVICES TO SUPPORT THE GLOBAL AIR NAVIGATION PLAN IN THE ASIA/PACIFIC REGION IS AS FOLLOWS:

a) Initiate transition ATSMHS and other applications to Internet Protocol Suite (IPS) based CRV. This would allow ATSMHS to be compatible to other regions using either CRV or other IP based networks.

b) continue deploying the ground-ground ~~ATN~~ backbone network of AMHS Message Transfer Agents (MTA) needed to support operational ground-ground services (as the infrastructure supporting AFTN such as X.25 becomes obsolete) and the air-ground services expected to migrate to ATN/IPS.

c) acknowledge ICAO's acceptance of IP sub-networking and the precedent of PENS in Europe and FTI in North America and consider the consequent potential for superior approaches to APAC's ATN which is deployed as an aggregation of private leased point-to-point and other circuits including the Public Internet;

d) apply guidance from ICAO technical panels primarily the Information Management and Communications panels in progressing regional planning and co-ordination in terms of inter-state exchange of aeronautical, meteorological, flight information, voice communication services and surveillance data;

e) permit **BBIS** and **BIS** ~~and non-backbone~~ States, and States in other regions with connections to the Asia/Pacific region, to connect their Message Transfer Agents (MTA) to ~~backbone~~ **BBIS** States using either the OSI-based ATN Internet Communications Services (ICS) or the ATN IPS on a bilateral basis;

f) permit States with limited traffic to operate only UA terminals connected to the MTA of another State, subject to bilateral agreement. Such connections should use the CRV's IP VPN. In cases where is not practical, use of the public Internet subject to appropriate security provisions and access control is acceptable;

g) complete migration from AFTN to AMHS within the time frame specified in the Regional Air Navigation Plan;

h) once a robust ATN has been established, transition from the OSI-based ATN ICS to the AMHS MTA network using the ATN/IPS as specified in ICAO Doc 9896;

i) consider options for augmenting the operational regional ATN to meet future operational requirements(including virtualizing the ATN over generic sub-networking infrastructure/services capable of supporting other higher-level communication services in addition to the ATN).

IN ORDER TO ACHIEVE THE ABOVE STRATEGY THE FOLLOWING ACTIONS ARE REQUIRED:

i) Enhance AMHS to include the File Transfer Body Part (FTBP) sub-set of extended AMHS in order to support the exchange of IWXXM data using FTBP;

j) Australia, Fiji, New Zealand and USA to replace their obsolete South Pacific AFS Network equipment with a subscription to the CRV managed service. In addition to sustaining operational voice and ground-ground data services, validate the 10 key points of the CRV proof-of-concept;

k) Remaining APAC states to monitor outcomes of the proof of concept andconsider subscription to the CRV service if it is beneficial given their particular circumstance;

l) When CRV pilot is completed and service is accepted, BBIS States should prioritize the transition of AMHS MTA to CRV as well as coordinate with BIS States to join. Conversion of legacy interfaces (X.25, X.25 SNDCF, and IP SNDCF) to IPS should be utilized to support the AMHS transition to CRV.

~~m)~~ States and ASP/AU to participate in the SWIM Task Force and nominate subject matter experts to implement Phases 2 and Phase 3 of the Seamless ATM plan Version 2 adopted by APANPIRG in 2016.~~Three phases are identified in the SWIM Task Force's work plan:~~

    ~~a. Definition phase~~
    ~~b. Implementation phase 1 - expansion of services and preparation of phase 2~~
    ~~c. Implementation phase 2 - generalization~~.

n) Support the transition to FIXM with initial focus on the regional ATFM.

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PBN NavSpecs and Route Spacing (Ref. PBN Manual Doc 9613 Volume II, Attachment B & PANS-OPS Doc 8168 Volume II, Part III, PANS-ATM Doc 4444, and Annex 15)

Appendix I to the Report

Nav Specs	Flight Phase								Supporting Nav. Infrastructure	Route Spacing (NM)	Additional Functionality (Required or Optional)					Operational Requirements				
	En-route Remote	En-route Continental	Arrival	Approach				Departure			RF	FRT	TOAC[2]	Baro VNAV	Nav DB	Communication	Navigation	Surveillance	AIM	Others
				Initial	Intermediate	Final	Missed[1]													
RNAV 10 (RNP 10)	10								Not require ground-based Naviad Dual LRNS (INS, IRS FMS, GNSS)	Lateral 50 between RNAV10, RNP4, or RNP2 / Longitudinal 50 with DCPC, procedureal position report - Distance verification : at least every 24min / 50 with reporting interval 27min / 5min with reporing interval 14min			TBD[2]		O	Voice com through 3rd party, DCPC in some areas. Longitudinal 50 with RCP240 (ADS-C)	RNAV 10 (RNP 10) Approval, lateral deviation less than 7NM (same direction)/6NM (opposite direction)	Longitudinal Procedureal pilot position report (max 24min) 50 with RSP 180 (CPDLC)	WGS-84; QMS for AIS; AIRAC Compliance for publication (42 days, recommended 56 days); ICARD for new waypoint names; Air Navigation Plan Amendment for Regional ATS Routes; Regional Supplementary Procedures (Doc 7030) for application in airspace over the high seas; PBCS	System safety and datalink performance (PBCS) must be monitored, TLS 5X10^{-9} accident per flight hour / Max ADS-C periodic reporting interval - 27min for 50NM - 14min for 5min
RNAV 5		5	5[3]						VOR/DME DME/DME INS or IRS GNSS	Lateral 16.5 - straight unidirectional racks (same direction route-ECAC) 18 - straight bidirectional tracks (opposite direction route- ECAC) 10 - ATC intervention capability (ECAC) 30 - No ATS Surveillance in high traffic density (ECAC)			TBD		O	DCPC- VHF	RNAV 5 OPS Approval (BRNAV)	Procedureal pilot position report Surveillance (RNAV 5)	WGS-84; QMS for AIS; AIRAC Compliance for publication (42 days, recommended 56 days; ICARD for new waypoint names; Air Navigation Plan Amendment for Regional ATS Routes	
RNAV 2		2	2					2	GNSS DME/DME DME/DME/IRU	Lateral 8 to 9 - straight tracks in high traffic density (en-route) (FAA)			TBD		R	DCPC- VHF	RNAV 2 OPS Approval (PRNAV, US RNAV AC 90-100)	surveillance	Same as RNAV 5	
RNAV 1		1	1	1	1		1	1	GNSS DME/DME DME/DME/IRU	Lateral For SIDs/STARs (PANS-ATM) 7 between RNAV1 and RNAV1, RNP1. RNP APCH, or RNP AR APCH			TBD	O	R	DCPC- VHF	RNAV 1 OPS Approval (PRNAV, US RNAV AC 90-100)	surveillance	WGS-84; QMS for AIS; AIRAC Compliance for publication (42 days, recommended 56 days	

Nav Spec	c1	c2	c3	c4	c5	c6	c7	c8	Nav Infrastructure	Separation (Lateral / Longitudinal)						Communication	OPS Approval	Surveillance	Navigation data / publication	Conformance monitoring
RNP 4	4								Not require ground-based Naviad GNSS	Lateral 50 between RNAV10, RNP4 or RNP2 23 between RNP4 or RNP2 (SLOP up to 2NM) - 12 for climbs/descends through aircraft in level 20 between RNP4 or RNP2 (No SLOP or SLOP up to 0.5NM) - 9 for climbs/descends through aircraft in level Longitudinal 50 with reporting interval 32min 30 with reporitn interval 12min 5 min with reporting intercal 14min		O	TBD		R	DCPC or CPDLC. Requires PBCS (RCP240)	RNP 4 OPS Approval	ADS with a lateral deviation contract having 5NM. Requires PBCS (RSP180)	WGS-84; QMS for AIS; AIRAC Compliance for publication (42 days, recommended 56 days; ICARD for new waypoint names; Air Navigation Plan Amendment for Regional ATS Routes; Regional Supplementary Procedures (Doc 7030) for application in airspace over the high seas; PBCS	Conformance monitoring shall be ensured by establishing an ADS-C event contract specifying a lateral deviation change event with a maximum of 5 NM threshold and a waypoint change event Max ADS-C periodic reporting interval - 32min for 50NM - 12min for 30NM - 14min for 5min
RNP 2	2	2							GNSS	Lateral Apply minima in RNP4 if RNP2 is related Between RNP2 or GNSS equipage - 23 for SLOP up to 2NM, climbs/descends through aircraft in level - 20 for No SLOP or SLOP up to 0.5NM, climbs/descends through aircraft in level - 18 for SLOP up to 2 NM with VHF DCPC - 15 for No SLOP or SLOP up to 0.5NM with VHF DCPC - 10 for SLOP up to 2 NM with VHF DCPC, climbs/descends through aircraft in level - 7 for No SLOP or SLOP up to 0.5NM with VHF DCPC, climbs/descends through aircraft in level Longitudinal 30 with reporitn interval 12min 5 min with reporting intercal 14min		O	TBD		R	Requires PBCS (RCP240) for Oceanic/Remote; For other areas, depends on operational considerations (route spacing, traffic density, complexity, contingency procedures)	RNP 2 OPS Approval (Oceanic/Remote/continental)	Requires PBCS (RSP180) for Oceanic/Remote	Same as RNP 4	Conformance monitoring shall be ensured by establishing an ADS-C event contract specifying a lateral deviation change event with a maximum of 5 NM threshold and a waypoint change event Max ADS-C periodic reporting interval - 12min for 30NM - 14min for 5min
RNP 1			1	1	1		1	1	GNSS	Lateral For SIDs/STARs (PANS-ATM) 5 between RNP1 and RNP1, RNP APCH, or RNP AR APCH	O		TBD	O	R	DCPC (RNP 1 SIDs/STARs)	RNP 1 OPS Approval	Not required except reduced route spacing	WGS-84; QMS for AIS; AIRAC Compliance for publication (42 days, recommended 56 days	
A RNP [4]	2	2 or 1	1 - 0.3	1 - 0.3	1 - 0.3	0.3	1 - 0.3	1 - 0.3	GNSS Multi-DME may be provided	Lateral 7 - straight and turning tracks (<90°) in high traffic density (en-route, Terminal, Eurocontrol) 6 to 7 NM with an RNP 0.5 (terminal, Eurocontrol)	R	O	TBD	O	R	DCPC- VHF	A-RNP OPS Approval (Navigation accuracy at least ±1NM, 95% of the fl‌ight time)	surveillance (may not be required to certain navigation application)	WGS-84; QMS for AIS; AIRAC Compliance for publication (42 days, recommended 56 days	
RNP APCH (Part A) [5]			1	1	0.3	1			GNSS (Missed App - RNAV or Conv.)	Lateral For SIDs/STARs (PANS-ATM) 7 between RNAV1 and RNP APCH 5 between RNP1 and RNP APCH	O		TBD	O	R	Not required	RNP APCH OPS Approval	Not required	WGS-84, QMS for AIS, AIRAC, Compliance for publication (42 days, recommended 56 days)	
RNP APCH (Part B) [5]			1	1	Angular	1 or 0.3 (Initial Straight MISAP)			GNSS	Lateral For SIDs/STARs (PANS-ATM) 7 between RNAV1 and RNP APCH 5 between RNP1 and RNP APCH	O		TBD		R	Not required	RNP APCH OPS Approval	Not required	WGS-84, QMS for AIS, AIRAC, Compliance as above.	

RNP AR APCH			1 - 0.1	1 - 0.1	0.3 - 0.1	1 - 0.1		GNSS (DME/DME may be authorized	Lateral For SIDs/STARs (PANS-ATM) 7 between RNAV1 and RNP AR APCH 5 between RNP1 and RNP AR APCH	R[6]		TBD	R[6]	R	Not required	RNP AR APCH OPS Approval
RNP 0.3		0.3	0.3	0.3	0.3		0.3	0.3	GNSS	Lateral (no clear reference) For SIDs/STARs (PANS-ATM) 7 between RNAV1 and RNP0.3 5 between RNP1, RNP APCH and RNP AR APCH	O		TBD	O	R	Not required	RNP 0.3 OPS Approval

Continued columns:

	Not required	WGS-84; QMS for AIS; AIRAC Compliance for publication (42 days, recommended 56 days
RNP AR APCH	Not required	WGS-84; QMS for AIS; AIRAC Compliance for publication (42 days, recommended 56 days
RNP 0.3	Not required	WGS-84; QMS for AIS; AIRAC Compliance for publication (42 days, recommended 56 days

1) RNP requirements do not apply to initial and intermediate missed approach segments.

2) TOAC (Time of Arrival Control), TBD (To Be Determined)

3) RNAV 5 may be used for initial parts of STARs outside 30 NM from the ARP.

4) Advanced RNP core requirements are limited to RNP 1 in all flight phases except final approach (RNP 0.3) and RNP 2 in oceanic/remote and en-route continental. A scaleability option will allow accuracy values between 0.3 and 1.0, in 0.1 NM increments, in all flight phases except oceanic/remote/en-route continental (RNP 1 and RNP 2) and final approach (RNP 0.3).

5) Part A and B refer to the Performance-based Navigation (PBN) Manual (Doc 9613), Volume II, Part C, Chapter 5, Part A — RNP APCH operations down to LNAV and LNAV/VNAV minima and Part B — RNP APCH operations down to LP and LPV minima, respectively.

6) Specific requirement for RF and VNAV

CNS SG/22
Appendix I to the Report