Thirty First Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/31)

Video Teleconference - Bangkok, Thailand, 14 to 16 December 2020

Schedule: 10:00 – 13:15 Bangkok Time [UTC+7hrs]

Agenda Item 3: **Performance Framework for Regional Air Navigation Planning and Implementation**

3.4: **CNS**

REPORT ON THE TWENTY FOURTH MEETING OF CNS SUB-GROUP

(Presented by the Secretariat)

SUMMARY

This paper presents the outcome of the Twenty Fourth Meeting of the CNS Sub-group (CNS SG/24) held as video conference from 30 November to 4 December 2020. The meeting is requested to review the summary report and adopt the draft Decisions and Conclusions formulated by the CNS Sub-group.

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.*

1. INTRODUCTION

1.1 The Twenty Fourth Meeting of the CNS Sub-group was held from 30 November to 4 December 2020 via video conference. The meeting was attended by 176 participants from 26 States/Administrations (Afghanistan, Australia, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Hong Kong China, Macao China, Fiji, French Polynesia, India, Indonesia, Japan, Malaysia, Mongolia, Myanmar, Nepal, New Zealand, Pakistan, Philippines, Republic of Korea, Singapore, Thailand, USA, Viet Nam, and 5 International Organizations namely CANSO, EUROCONTROL, IATA, IFATCA and IFATSEA, plus 26 participants from industry partners. A summary of the meeting outcome for consideration by APANPIRG/31 is provided in **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/2020-CNS-SG24.aspx

2. DISCUSSION

2.1 The meeting considered 26 working papers and 24 information papers, 6 flimsies and 7 Presentations covering its 14 Agenda Items.

2.2 In accordance with APANPIRG Decision 26/65 that Sub Groups of APANPIRG were empowered to adopt Conclusions and Decisions on technical and operational matters. Accordingly, the CNS SG/24 meeting adopted following 8 Conclusions and 5 Decisions:

Reference		Subject
Conclusion CNS SG/24/3 *(ACSICG/7/2 (ATFM/SG/10-3))*	-	Amendment of the AFTN/AMHS-based Interface Control Document (ICD) for ATFM
Conclusion CNS SG/24/4	-	Publishing of the CRV Operations Manual
Decision CNS SG/24/5	-	CRV Landing Page on the ICAO APAC Website
Decision CNS SG/24/*6* *(SRWG/4/1)*	-	Frequency requirements for VHF-COM systems and ILS, VOR, DME and GBAS/VDB facilities
Conclusion CNS SG/24/7 *(SRWG/4/2)*	-	Simulation of VHF COM Frequency requirements for next 10 years
Conclusion CNS SG/24/8 *(SRWG/4/3)*	-	Establishment a list of focal point responsible for the operation of Frequency Finder in States
Decision CNS SG/24/9 *(SRWG/4/4)*	-	Revision of the Term of Reference of the SRWG
Conclusion CNS SG/24/10	-	Flight Inspection Guidance Material (FIGM) for APAC Region
Conclusion CNS SG/24/11	-	Protection of ILS Critical and Sensitive Areas in Three Dimensional
Decision CNS SG/24/12 *(SURICG/5/2)*	-	Dissolution of SEA/BOB ADS-B WG
Conclusion CNS SG/24/14 *(SURICG/5/4(DAPs WG/3/2))*	-	Mode S DAPs IGD 2.0
Conclusion CNS SG/24/15 *(SURICG/5/6)*	-	Revised ADS-B Implementation and Operations Guidance Document (AIGD) Edition13
Decision CNS SG/24/16 *(SURICG/5/1)*	**-**	Establishment of Study Group under SURICG on Sharing of Surveillance Data in SWIM

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

2.4 Based on the outcome of discussions on various agenda items, the meeting developed following 4 Draft Conclusions for consideration by APANPIRG/31 Meeting:

Reference		Subject
Draft Conclusion CNS SG/24/1	-	Target Year of CRV Implementation in APAC Region
Draft Conclusion CNS SG/24/2 *(ACSICG/7/1)*	-	Revised Regional Strategies on AMS and Datalink

Draft Conclusion CNS SG/24/13 - Mode S Forward Fit Equipage in APAC Region
(SURICG/5/3(DAPs WG/3/1))

Draft Conclusion CNS SG/24/17 - Addressing Human Factor Issues of ATSEP

2.5 All Draft Conclusions are included in **Attachment C** to this paper.

2.6 For easy reference, the number of appendices used in this paper carry the same numbers of Appendices to the full report of CNS SG/24 meeting.

2.7 The Revised AMS Strategy for the APAC Region is provided in Appendix C, the Revised Strategy for Implementation of the Air-Ground Data link in APAC is provided in Appendix D, the APAC CRV Operations Manual is provided in Appendix F, Flight Inspection Guidance Material for APAC Region is provided in Appendix K. These appendices are attached to this paper.

2.8 The APANPIRG is invited to note the following appendices to full report of CNS SG/24 meeting:

- Appendix A- ATN/AMHS and AIDC implementation status;
- Appendix B - CRV Implementation Status;
- Appendix H- ICAO APAC AIDC Webinar Presentation;
- Appendix I - SWIM in ASEAN Demonstration Report;
- Appendix M - ADS-B Implementation Status in the APAC Region;
- Appendix R - Factors Adding Stress and Fatigue to ATSEP.

2.9 There are 9 Action Items arising from the CNS SG/24 meeting which are summarized in **Attachment D**.

3. ACTION BY THE MEETING

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

a) note the summary report on the outcome of CNS SG/24 meeting provided in **Attachment A**;

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

c) consider adoption of draft Conclusions endorsed and/or formulated by the CNS Sub-group provided in **Attachment C**; and

d) discuss any relevant matters as appropriate.

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AERONAUTICAL MOBILE SERVICE (AMS) STRATEGY FOR THE ASIA/PAC REGION

The AMS strategy for the Asia/Pac Region is to:

a) Ensure that all communications are provided within the Aeronautical Mobile (R) Service AM(R)S and the Aeronautical Mobile Satellite (R) Service -AMS(R)S, and protect the use of all radio frequency bands allocated for AM(R)S and AMS(R)S;

b) Retain the VHF voice service as the primary medium for air-ground communication;

c) Supplement voice communication with data-link Flight Information Service (DFIS) applications including D-VOLMET, D-ATIS, DCL and other new applications related to the safety and regularity of flight to reduce congestion of the VHF spectrum, reduce workload, and enhance safety;

d) Retain 25 kHz as the minimum channel spacing in the band 118 – 136 MHz by 2025;

e) Use the frequency band 136 – 137 MHz exclusively for the air-ground VHF data-link applications;

f) Use PBCS approved CPDLC to provide DCPC (Direct controller pilot communications) for more efficient communication and enhanced ATM, especially to improve the capability of Trajectory Based Operation and enhance en-route situation awareness;

g) Retain HF voice for communication in areas where VHF coverage is not available;

h) Provide satellite voice (SATVOICE) where appropriate. States providing SATVOICE service should publish relevant details in their AIP;

i) Enhance AM(R)S and AMS(R)S applications within a performance-based communication and surveillance (PBCS) framework;

j) Strengthen the PBCS monitoring and improve its specifications as well as relevant safety assessments on emerging technologies for communication and surveillance supporting ATM operations in accordance with ICAO DOC 9869 and DOC 10037;

k) Encourage applying Satellite Communications (SATCOM) with suitable performance standards on safety data or voice applications in accordance with ICAO Annex 10 and DOC 10037;

l) Conform to the regional implementation priorities of ASBU, plan and implement new ATS communication services to meet the demands of aviation in the ASIA/PAC Region with the involvement of all stakeholders and taking account of costs and benefits. Taking Trajectory Based Operation (TBO) as thread, promote the ASBU operational concept and technology at the regional level.

Note:

Doc 10037: Global Operational Data Link (GOLD) Manual

Doc 9869: Performance-Based Communication and Surveillance (PBCS) Manual

Doc 9750: Global Air Navigation Plan

STRATEGY FOR IMPLEMENTATION OF THE AIR-GROUND DATA LINK IN THE ASIA/PAC REGION

Considering that:

a) The benefit of data communications to improve safety, efficiency and capacity through the reduction of voice communications and process automation to meet the operational requirement and consistent with the Air Traffic Management Operational Concept;

b) Current operation application of data link to support CPDLC, ADS-C, Data link Flight Information Service (DFIS) including D-VOLMET, D-ATIS and DCL, the need to maintain the functional service of these applications;

c) Current technology such as Satellite data link, HF data link, AeroMACS being acceptable for operations and standardized in SARPs and/or industry standards;

d) Ongoing implementation of VHF ACARS, VDL-Mode 2 AoA (ACARS over Aviation VHF Link Control), VDL-Mode 2 ATN and the need to improve data link communication coverage and capacity;

e) The need for PBCS implementation is prescribed in the Performance-Based Communication and Surveillance (PBCS) Manual (Doc 9869) to ensure that data communications operations are carried out in a safe and efficient manner;

f) The Global Operational Data Link (GOLD) Manual (Doc 10037) provides the globally harmonized guidance on data link service, CPDLC and ADS-C implementation, PBCS specifications and post-implementation monitoring and analysis;

g) Trajectory-Based Operations is fundamental for realizing the ICAO Global ATM Operational Concept and the evolution towards TBO is expected to align with the deployment of Aviation System Block Upgrades (ASBU) as described in the *Global Air Navigation Plan*, (ICAO Doc. 9750);

h) Development of standardized LDACS (L-Band Digital Aerospace Communication System);

i) The future growth of data communications to improve operations and the exchange of information including graphical meteorological information;

j) The need to assure global interoperability and harmonization; and

k) The need to assure communication safety and security.

THE GENERAL STRATEGY FOR THE IMPLEMENTATION OF THE AIR-GROUND DATA LINK INFRASTRUCTURE IN THE ASIA/PAC REGION SHOULD BE AS FOLLOWS:

a) Maintain or ensure compatibility of existing data links to support all current ATM and meteorological applications without change to the application or application specific system.

b) New deployment of VHF data link ground systems should be capable of supporting VDL-Mode 2 in addition to supporting ACARS based on ASBU Block Implementation.

c) In the near term there is no intent to implement VDL-Mode 3, VDL-Mode 4.

d) States are encouraged to work co-operatively to assist each other on a multinational basis to implement the air-ground ATN/IPS based on their operational requirements while maintaining service to support ATN/OSI during the transition period. States should consider implementing ATN OSI/IPS Gateway to support aircrafts equipped with either ATN/OSI or ATN/IPS in addition to existing ACARS.

e) HF voice services used in remote continental and oceanic areas should be transitioned to datalink communications.

f) Deploy new applications on aerodrome surface, terminal and en-route of flight which related flight safety and security based on current and new datalink technology in accordance with ICAO Annex10 and Doc 10037 to reduce congestion of the VHF spectrum, reduce workload, and enhance safety.

g) Apply an RCP specification related to the data link systems for relevant airspace complying with Doc 9869, and establish PBCS monitoring programs to assess against the RCP specification.

h) Encourage states to provide the service of VHF ACARS, VDL-Mode 2 AoA, VDL-Mode 2 ATN and the deployment of appropriate Satellite communications (SATCOM) on safety data or voice applications in accordance with ICAO Annex 10 and Doc 10037.

i) Undertake and monitor research and development of communications technology for the future evolution of data link services in line with ICAO Global Air Navigation Plan (GANP).

j) Implement the Security Services and associated policies and requirements specified in the standards, guidelines, and practices of ICAO SARPS, manuals and guidance materials to ensure continued security, safety and continuity of aeronautical communications services.

Note:

Near-Term: now to 10 years

Long-Term: 15+

Doc 10037: Global Operational Data Link (GOLD) Manual

Doc 9869: Performance-Based Communication and Surveillance (PBCS) Manual

Doc 9750: Global Air Navigation Plan

Doc 7030: Regional Supplementary Procedures

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Common Regional Virtual Private Network (CRV) Operations Group (OG) of Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) (APANPIRG CRV OG)

OPERATIONS MANUAL

First Draft v1.3 - November 2020

Record of Amendment

A/L No	Date	Entered By	A/L No	Date	Entered By
1.0	11/09/2019	Vaughan Hickford			
1.1	15/01/2020	Vaughan Hickford			
1.2	14/10/2020	Vaughan Hickford			
1.3	10/11/2020	Vaughan Hickford			

Contents

1 PART I: FOREWORD

1.1 Introduction

a. The Common Regional Virtual Private Network Operations Group (CRV OG) Operations Manual is an informal publication prepared by the CRV Task Force, intended to provide, for easy reference of interested parties, a consolidation of material, particularly of a procedural nature, about the work of the CRV OG and its contributory bodies. It contains the Terms of Reference of the CRV OG established by the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) (Decision 27/34). It also contains the working arrangements and internal instructions developed by the Group for the practical application of its Terms of Reference.

b. The document describes; Terms of Reference; Composition; Position within ICAO; Working Arrangements; Rules of Procedure and Practices governing the Conduct of Business.

c. The framework of Part and Sections headings in addition to the page numbering has been devised to provide flexibility and the facilitation of the revision of additional or new material. Each Part includes an Introduction giving its purpose and status. A Table of Contents is also provided which serves also as a subject index and as a check list for the current pages.

d. All pages bear the date of issuance. Replacement pages will be issued as necessary and any portion of a page that has been revised will be identified by a vertical line in the margin. Additional arterial will be incorporated in the existing Sections or will be the subject of new Sections, as required.

e. Changes to text will be identified by a vertical line in the margin in the following manner;

   i. N for new or revised text;
   ii. E for editorial modification that do not alter the substance or meaning of the text;
   iii. D for deleted text

   iv. For practical reasons, this shall not be applied to title pages or to the routine insertion and deletion of Conclusions and Decisions. The absence of change bars, when data or page numbers have changed, will signify reissue of the section concerned or rearrangement of text (e.g., following an insertion or deletion with no other changes).

f. The Operations Manual will be distributed to Members and Observers of APANPIRG, the ICAO Secretariat, and to other States and international organizations participating in meetings, contributing to, or having interest in the work of the CRV OG and/or its Contributory Bodies.

2 PART II: TERMS OF REFERENCE, COMPOSITION AND POSITION IN ICAO OF THE CRV OG

2.1 Background

The establishment of APANPIRG CRV OG was proposed during the deliberations of the CRV Task Force (TF) as a dedicated group to provide oversight of the CRV operations and the performance of the CRV Service Provider. The APANPIRG CRV OG is formally established by APANPIRG Decision 27/34.

2.2 Terms of Reference

The Common Regional Virtual Private Network (VPN) Operations Group (OG) will provide oversight of the function and performance of the CRV and the performance of the Service Provider. The following are the activities to be performed:

a. Oversee the implementation of the CRV post Contract Award;
b. Manage issues arising from the transition with CRV TF, if any;
c. Co-ordinate and standardize the establishment or upgrade of CRV services as required;
d. Co-ordinate activities with other ICAO CRV OGs, if any, to make sure that decision making and communication with CRV Service Provider is consistent and timely;
e. Oversee the performance of the CRV Service Provider, including customer service;
f. Oversee the performance of the CRV network;
g. Oversee the escalation and solving by the CRV Service Provider of issues associated with the provision of the CRV, including safety and security related issues;
h. Assist with the resolution of issues associated with the provision of the CRV among the CRV Users as required, including safety and security related issues;
i. Assist with the migration of Aeronautical Fixed Services (AFS) onto the CRV, in line with the GANP and seamless ATM plan;
j. Maintain CRV OG documentation associated with the function, performance and management of the CRV, including the CRV OG Operations Manual, a list of CRV users and a record of variations to the common tender package;
k. Accept deliverables from the CRV Service Provider on behalf of the CRV Users as required;
l. Promote the use of CRV; and
m. Perform any other activity as required by CRV operations.

2.3 Reporting

The CRV OG will report to Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) through ACSICG and CNS SG.

2.4 Participation

The CRV OG will include all APAC Member States/Administrations, and any other organization as needed.

2.5 Conduct of the work

It is anticipated that the CRV OG will conduct its work primarily by Web Conferences, teleconferences and other electronic means of communications. Face to Face meetings of CRV OG may be required on an annual basis. The ICAO APAC Regional Office will provide secretariat support for the CRV OG.

2.6 Rapporteur

There will be two Co-Chairpersons of the CRV OG, one primarily responsible for Asia coordination and the other for Pacific coordination.

2.7 Position within ICAO

a) CRV OG shall be the guiding and co-ordinating organ for all activities conducted within ICAO concerning the Common Regional VPN for the Asia and Pacific Regions. However, it shall not assume authority vested in other ICAO bodies, except where such bodies have specifically delegated their authority to the Group. The activities of the Group shall be subject to review by the APANPIRG.

b) The work of groups established and meetings held within the framework of ICAO, concerned with the Asia and Pacific CRV shall be coordinated with the CRV OG to ensure full harmonization with all regional activities regarding the development and operation of the Asia/Pacific system.

3 PART II: WORKING ARRANGEMENTS

3.1 APANPIRG Procedural Handbook

The CRV shall be guided by the APANPIRG Procedural Handbook to ensure that work arrangements are consistent with its parent body

3.2 Administration of the CRV OG

c) The CRV shall be administered as follows:

   i. by two (2) Chairpersons, one elected from the Representatives designated by member States of the Group from ASIA Region and one from the PACIFIC region; and

   ii. by ICAO Regional Director, Asia and Pacific Office designated as Secretary CRV OG by the Secretary General of ICAO. In the execution of duties the Secretary will be supported by the Asia and Pacific Regional Office.

d) The Chairpersons, in close co-ordination with the Secretary, shall arrange for the most efficient working of the Group. The Group shall always work with a minimum of formality and paperwork.

e) Between meetings of the CRV OG, some subjects may be dealt with by correspondence among appointed Representatives of Member States through the Secretary of the CRV OG. However, if States are to be consulted this should be done through the ICAO Regional Director, Asia and Pacific Office.

Service Strategy

- Strategy Management
- Service Portfolio Management
- Financial Management
- Business Relationship Management
- Demand Management

Service Design

- Service Catalogue Management
- Availability Management
- Capacity Management
- IT Service Continuity Management
- Service level Management
- Design Co-ordination
- Information Security Management
- Supplier Management

Service Transition

- Transition Planning and Support
- Change Management
- Service Asset & Configuration Management
- Release and Deployment Management
- Service Validation and Testing Management
- Change Evaluation
- Knowledge Management

Service Operation

- Event Management
- Incident Management
- Request Fulfilment
- Problem Management
- Access Management

Continual Service Improvement

- Service Review
- Process Evaluation
- Definition of CSI Initiatives
- Monitoring CSI Initiatives

4 PART III: SERVICE STRATEGY

Service Strategy

- Strategy Management
- Service Portfolio Management
- Financial Management
- Business Relationship Management
- Demand Management

4.1 Strategy Management

Process Objective: To assess the service provider's offerings, capabilities, competitors as well as current and potential market spaces in order to develop a strategy to serve customers. Once the strategy has been defined, Strategy Management for IT Services is also responsible for ensuring the implementation of the strategy.

a) Reduce telecommunication costs in most cases (to be confirmed by local CBA)
b) Enable integration in the aeronautical infrastructure and enhanced services (GANP, regional objectives)
c) Enhance information security
d) Provide a standardized interface for AFS (instead of multiple protocols, some of which are obsolescent)
e) Rationalize coordination for network management and enhancement
f) Respond to Air Traffic requirements in a timely and standardized manner
g) Coordination with Other Regional Private Networks
h) Promote the use of CRV

4.2 Service Portfolio Management

Process Objective: To manage the service portfolio. Service Portfolio Management ensures that the service provider has the right mix of services to meet required business outcomes at an appropriate level of investment.

- Criteria for services to be added to CRV.
- POC of new services.

4.3 Financial Management

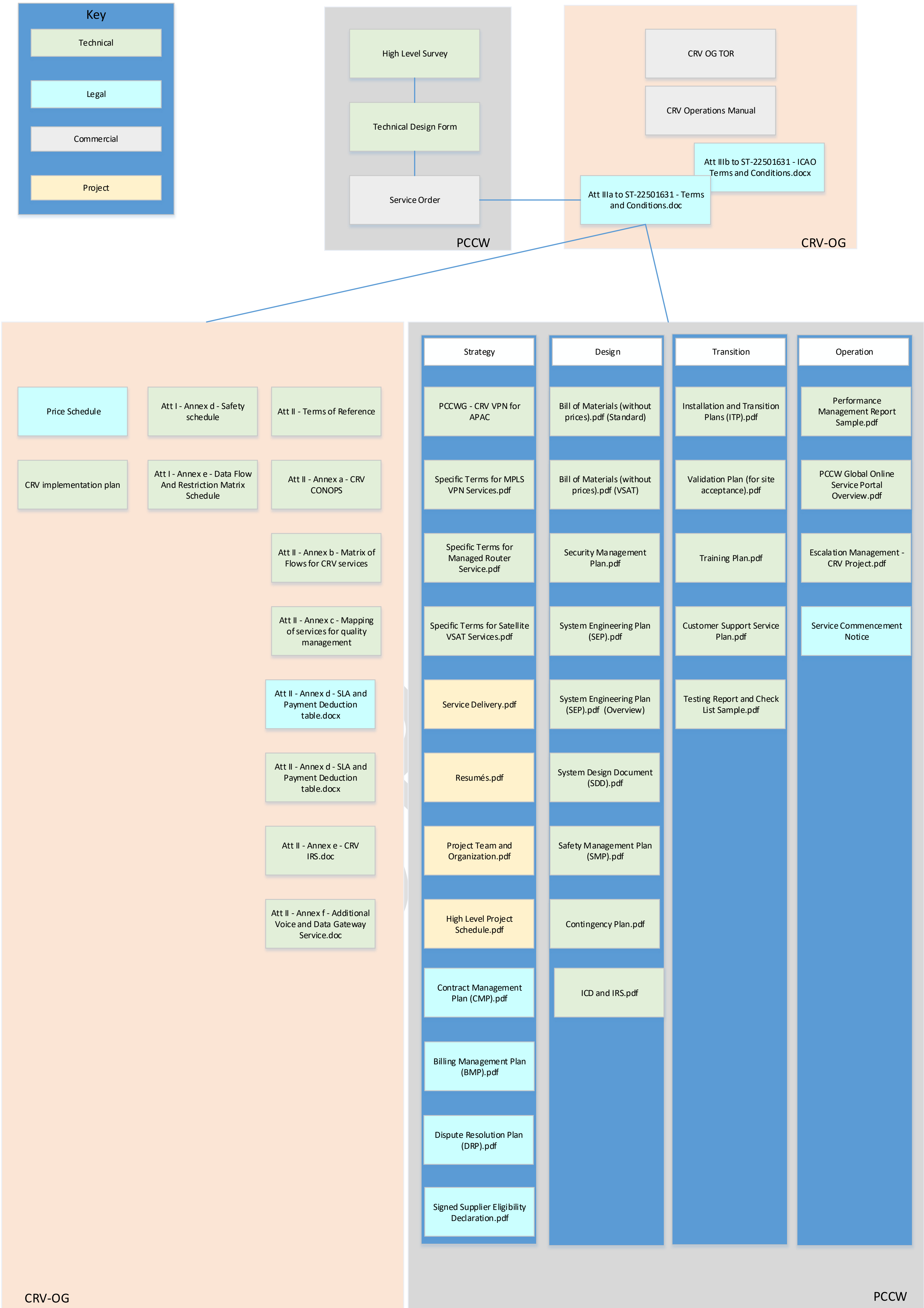
Process Objective: To manage the service provider's budgeting, accounting and charging requirements.

4.4 Business Relationship Management

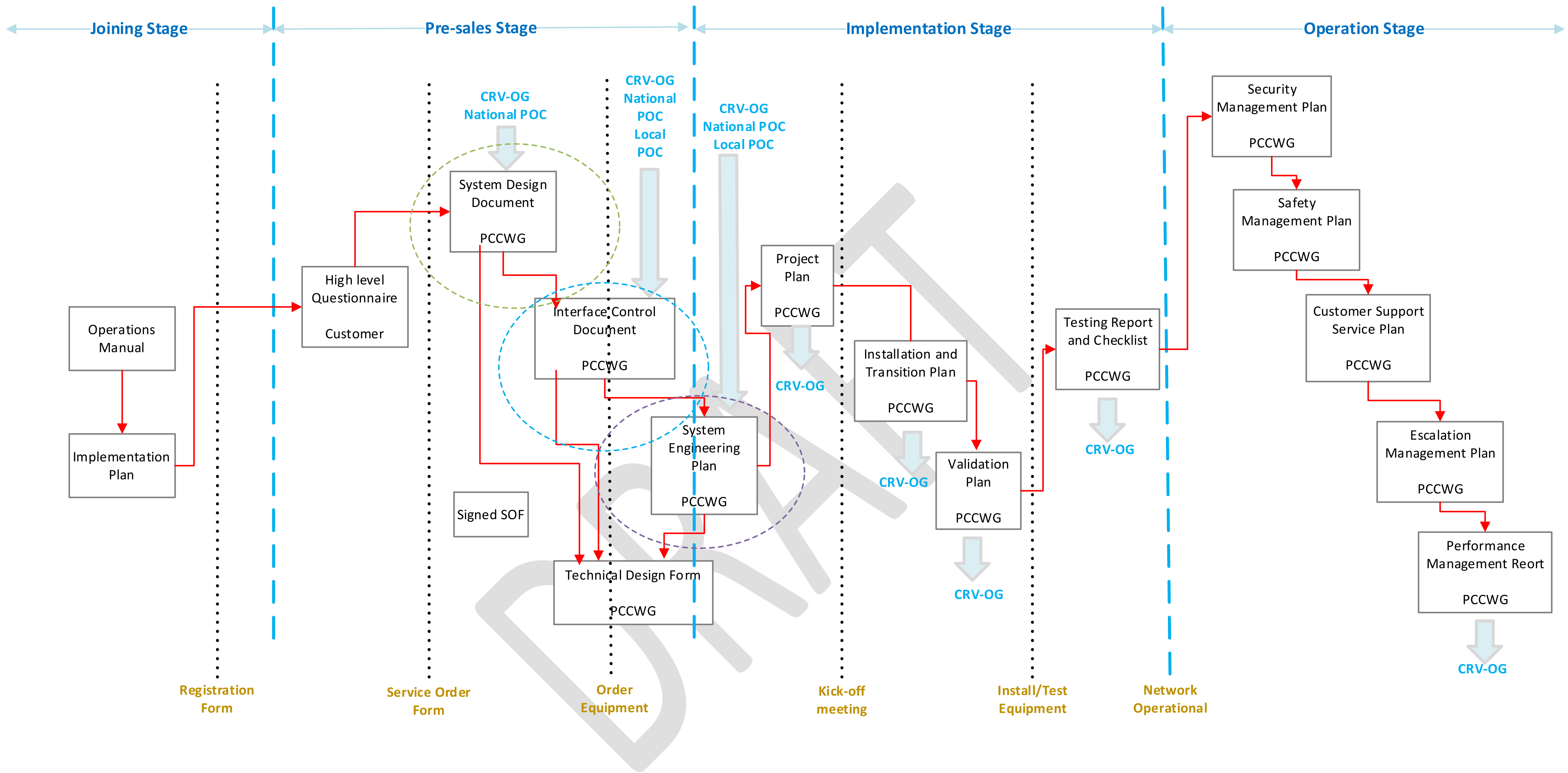
Process Objective: To maintain a positive relationship with customers. Business Relationship Management identifies the needs of existing and potential customers and ensures that appropriate services are developed to meet those needs.

4.4.1 Legal Documentation

The list below shows the precedence of the legal documents that pertains to CRV.



4.4.2 Design and Implementation document flow



4.4.3 Common Package

The Common Package is the common set of documents required to be used to join and operate the CRV Network.

The documents and how they relate to the stages in the Design and Implementation document flow is detailed below.

This is located on the CRV Users Portal here: Common Package.

4.4.4 Joining Stage

a. Operations Manual

This provides the Policies, Processes and Procedures for the Strategy, Design, Transition and Operation of the CRV network.

b. Implementation Plan

The purpose of this Implementation Plan is to provide guidance for all States/ Administrations on the operation requirements for implementing the Common aeRonautical Virtual Private Network (CRV) used in Asia/ Pacific (APAC) Region and the roadmap for implementation.

It contains information on Points of Contacts for each State, Allocated IP addressing for States and Service Providers, proposed implementation dates and suggested tests.

IP Addressing is also listed on the APAC CRV Portal.

c. Registration Form

Provides the information required to connect to CRV as an ANSP.

Example of the Registration Form

4.4.5 Pre-Sales Stage

a. High Level Questionnaire

This provides the high level information to PCCW to be able to provide the Service Order Form (SOF) for signing.

Example of the High Level Questionnaire

b. Service Order Form

Provides the information to PCCW to provide the connection and initiate billing.

Example of the Service Order Form.

c. System Design Document

This is the over-arching Design Document for the CRV Network.

Example of System Design Document

d. Interface Control Document

Example of Interface Control Document

e. Technical Design Form

Example Technical Design Form

f. System Engineering Plan

This is a living document covering the technical aspects of the CRV implementation. Any changes can be updated by the User or PCCW.

Example of a System Engineering Plan

4.4.6 Implementation Stage

a. System Engineering Plan

This is a living document covering the technical aspects of the CRV implementation. Any changes can be updated by the User or PCCW.

Example of a System Engineering Plan

b. Project Plan

Provided to each state post signing of the Contract and is only relevant to that state. It is updated regularly by the PCCW Project manager

Example of a Project Plan

c. Installation and Transition Plan

Example of an Installation and Transition Plan

d. Validation Plan

This is PCCW's testing plan post implementation of the Managed Service

Example of a Validation Plan

e. Testing and Report Checklist

This is the result of PCCW's Testing plan post implementation of the Managed Service and is accompanied by the Service Commencement Notice (SCN)

Testing and Report Checklist

4.4.7 Operation Stage

a. Security Management Plan

Example of the Security Management Plan

b. Safety Management Plan

Example of a Safety Management Plan

c. Customer Support Service Plan

This details the contact details for any Problems or Incidents that the State may encounter.

Example of a Customer Support Service Plan

d. Escalation Management Plan

This details the contact details if the need arises to escalate any Tickets. It also details the escalation criteria

Example of an Escalation Management Plan

e. Performance Management Report

Example of a Performance Management Report

4.5 Demand Management

Process Objective: To understand, anticipate and influence customer demand for services. Demand Management works with Capacity Management to ensure that the service provider has sufficient capacity to meet the required demand.

5 PART IV: SERVICE DESIGN

Service Design

- Service Catalogue Management
- Availability Management
- Capacity Management
- IT Service Continuity Management
- Service level Management
- Design Co-ordination
- Information Security Management
- Supplier Management

5.1 Service Catalog Management

Process Objective: To ensure that a Service Catalogue is produced and maintained, containing accurate information on all operational services and those being prepared to be run operationally. Service Catalogue Management provides vital information for all other Service Management processes: Service details, current status and the services' interdependencies.

5.1.1 Requirements

a. Latency (from the ADDENDUM TO THE SPECIFIC TERMS)

Locations	Average Round Trip Delay
Within the cities specified in Asia (On-net/Off-net)	200ms
Within the cities specified in Oceania (On-net/Off-net)	200ms
Between the cities specified in Middle East and Europe (On-net/Off-net)	200ms
Within the cities specified in Europe (On-net/Off-net)	200ms
Other cities combination not specified above	600ms

b. Availability (from the ADDENDUM TO THE SPECIFIC TERMS)

Service Package	Service Availability
Package A	99.97%
Package B	99.5%
Package B+	99.95%
Package C	99.5%
Package C+	99.7%
Package D	99.5%

c. Jitter (from the ADDENDUM TO THE SPECIFIC TERMS)

The Target Average Jitter Level for voice application and data application is 15ms and 250ms respectively

d. QoS/DSCP markings

Service class name	DSCP Name
Border Gateway Protocol (BGP)	CS6
Voice	EF
Voice Signaling	CS5 (preferred) EF (if CS5 is not possible)
ADS-B	CS4
AFTN, ATN.	AF21
All traffic not otherwise defined.	DF (CS0)

e. Security

Security is the responsibility of each of the ANSPs. Basic security is provided by PCCW utilising Route Filtering and GRE tunnels between ANSP sites.

5.1.2 Criteria to add a new service

a. Considerations

i. Connecting a Service Provider / Service Consumer (SPSC) to the CRV can be initiated by any party that identifies a need for an SPSC to connect to it. The following should be consider by the SPSC and the CRV-Member state.

ii. Service Provider (SP) is defined as a company that provides aeronautical service using the CRV as the means of communication.

iii. Service Consumer (SC) is defined as a company or organisation that consumes aeronautical information using the CRV as the means of communication.

iv. The SPSC should be referred to PCCW to enable an initial discussion with them to assess the feasibility of connecting to the CRV. During this discussion the SPSC should clarify:

v. Interfaces

vi. Data transfer rates

vii. DSCP marking etc.

viii. It is recommended that Service Providers use public ip addressing for the delivery their services.

ix. It is recommended that Service Consumers are provided with a 10.x.x.x ip addressing from the CRV Member State where the PCCW NID is installed.

x. SPSCs will NOT be a member of the CRV Operations Group (OG). The OG may establish a CRV user group that could facilitate discussion on the use of the CRV by SPSCs.

xi. SPSCs will need to adhere to the Common Regional VPN (CRV): System Design Document (SDD). Substantive changes to the SSD MUST be endorsed by the CRV OG.

xii. CRV member states should consider ICAO Doc 9855 AN/459 Guidelines on the Use of the Public Internet for Aeronautical Applications as guidance when they are the Primary sponsor.

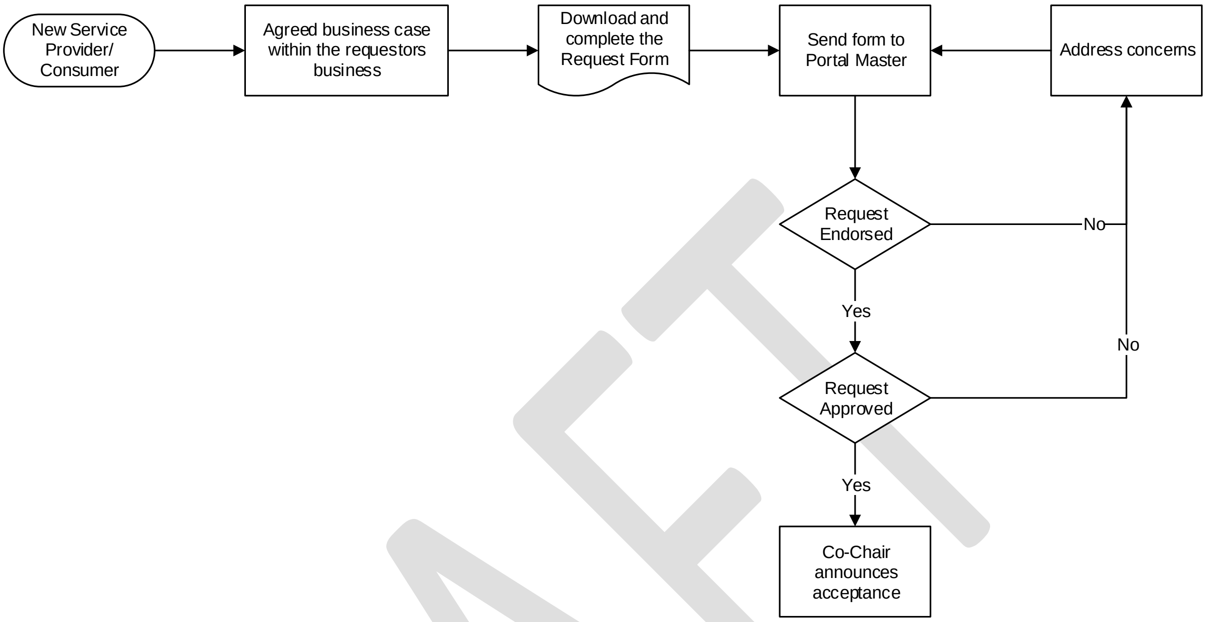
xiii.

xiv. The CRV OG IS NOT responsible for the accreditation/certification/validation of a Service Provider, but must ensure that the all reasonable steps have been taken to ensure that the Service Provider has sufficient systems and process in place to provide their service over the CRV.

xv.

xvi. Service Consumers and CRV members SHOULD ensure that when obtaining a Service from a Service Provider that the service meets their operational service requirements.

b. Process



1. Procedure.

i. The information required in the connection request, should be presented in English and in a clear and logical format. The following process will be used for an SPSC to obtain approval connect to the CRV:

ii. Provide a business justification including Benefits Realization for joining the CRV

iii. For a Service Provider:

a. provide a documentation using Section 2.3 ACCREDITATION OF AN IASP in ICAO Doc 9855 AN/459 as a guide including a cyber-security plan.

iv. For a Service Consumer; at a minimum, provide a CRV connection plan and cyber-security plan on how they will shield the CRV from their organisation.

v. Obtain a Primary CRV member state to sponsor their connection to the CRV.

vi. Obtain business justification from Primary Sponsor to support their request.

vii. Obtain a Secondary CRV member state to sponsor their connection to the CRV based on the information above.

viii. The information provided above, will be provided to the CRV OG via the APAC CRV portal.

ix. CRV OG members will be notified and have 25 business days to review and address any concerns that they may have with the request.

x. After the 25 days, if the majority of reviews by CRV OG members are endorsed, the CRV OG chairs will review the request.

xi. For the request to be approved, both CRV OG C-Chairs need to approve the request.

xii. A Document/Certificate will be provided to the primary sponsor that can used to verify that the SPSC is approved to connect the CRV.

xiii. The on boarding of Service Provider / Service Consumer will be supported by the Airways New Zealand provided APAC CRV SharePoint portal. There will be word forms to facilitate the information and these forms will be migrated to an automated SharePoint Workflow as soon as practical.

Service Provider / Service Consumer will be required to undertake the following:

- Provide a business justification including Benefits Realisation for joining the CRV
- Provide a High Level System Design oh how their Service could potentially connect to the CRV.
  - Service Providers to use Public IP Addressing
  - Service Consumers to use the ICAO allocated IP addresses
  - Interfaces
  - Data transfer rates
  - DSCP marking

5.2 Availability Management

Process Objective: To define, analyse, plan, measure and improve all aspects of the availability of IT services. Availability Management is responsible for ensuring that all IT infrastructure, processes, tools, roles etc. are appropriate for the agreed availability targets.

5.2.1 Monthly Performance Management Reports

Provided by PCCW to each State that has joined CRV covering:

- Router report
- Interface report
- QoS report
- Traffic report

(More SLA data is available from the PCCW Portal)

5.2.2 Monthly Operations Reports

Provided by PCCW to each State that has joined CRV covering:

- Active Service Inventory
- Site Availability (More SLA data is available from the PCCW Portal)
- Ticket Statistic
  - Problem Statistic
  - Incident Statistic
  - Requests
  - Maintenance
- Ticket Details
- AOB

5.2.3 Monthly meetings with PCCW

Conducted via Telephone conference that is hosted by PCCW, with each State that has joined CRV to discuss:

- States Performance Management Report (information from the Portal)
- States Operations Report (Service Report)

5.2.4 Quarterly Operations Reports

Provided by PCCW to the OG covering:

- Implementation progress
- Site Availability (More SLA data is available from the PCCW Portal)
- Ticket Statistic
  - Problem Statistic
  - Incident Statistic
  - Requests
  - Maintenance
- Ticket Details
- AOB

5.2.5 Annual OG meetings

- Implementation progress
- Site Availability (More SLA data is available from the PCCW Portal)
- Ticket Statistic
  - Problem Statistic
  - Incident Statistic
  - Requests
  - Maintenance
- Ticket Details
- Network Utilisation
- AOB

5.2.6 Root cause analysis reports

Provide detail post every Incident to the affected State and the APAC CRV OG. Include these in each of the Monthly, Quarterly and Annual Report.

5.2.7 Notifications of Maintenance

Ensuring that all affected parties of maintenance releases are updated as appropriate.

5.2.8 Diversity Audits

A rolling audit of States/Sites physical and logical connectivity based on the information provided in the Service Commencement Notice.

5.2.9 Testing failover

State LOA/MOU/Technical Letter for carrying out failover testing to ensure service continuity.

5.3 Capacity Management

Process Objective: To ensure that the capacity of IT services and the IT infrastructure is able to deliver the agreed service level targets in a cost effective and timely manner. Capacity Management considers all resources required to deliver the IT service, and plans for short, medium and long term business requirements.

Co-ordinate and standardize the establishment or upgrade of CRV services as required

Oversee the performance of the CRV network;

5.4 IT Service Continuity Management

Process Objective: To manage risks that could seriously impact IT services. ITSCM ensures that the IT service provider can always provide minimum agreed Service Levels, by reducing the risk from disaster events to an acceptable level and planning for the recovery of IT services. ITSCM should be designed to support Business Continuity Management.

a) CRV Contingency Operations

from CRV TF/6 report there is this report:

The meeting discussed again the contingency plan in relation to the safety case. To mitigate the risk of a total or major failure (such as IT disaster that would affect the whole CRV), two layers of process would have to be articulated:

- *the procedures and measures planned and implemented by PCCW; and*
- *consistently, the procedures and measures planned and implemented by the CRV Users, as part of their contingency plan required by ICAO SARPS.*

Furthermore, the meeting agreed that procedures to mitigate the total failure of CRV should be discussed by CRV OG as part of the contingency planning.

5.5 Service Level Management

Process Objective: To negotiate Service Level Agreements with the customers and to design services in accordance with the agreed service level targets. Service Level Management is also responsible for ensuring that all Operational Level Agreements and Underpinning Contracts are appropriate, and to monitor and report on service levels.

5.6 Design Co-ordination

Process Objective: To coordinate all service design activities, processes and resources. Design coordination ensures the consistent and effective design of new or changed IT services, service management information systems, architectures, technology, processes, information and metrics.

Change Requests

Engineering Package

Legal Documents

Dial Plan

5.7 Information Security Management

Process Objective: To ensure the confidentiality, integrity and availability of an organization's information, data and IT services. Information Security Management usually forms part of an organizational approach to security management which has a wider scope than the IT Service Provider.

Security is the responsibility for the implementation of security controls to ensure the integrity of services.

As a minimum the connectivity states is via GE Tunnels.

Other methods of ensuring the security of the connectivity are:

a. Utilising as small an IP Address range as possible.
b. Only advertising relevant IP addresses.
c. Only accepting verified IP Routes when required.
d. Utilising firewalls.
e. Utilising NAT.
f. Utilising Intrusion Protection Software (IPS)

It is recommended that external security advice is sought.

5.8 Supplier Management

Process Objective: To ensure that all contracts with suppliers support the needs of the business, and that all suppliers meet their contractual commitments.

a) Oversee the performance of the CRV Service Provider, including customer service;

b) Oversee the escalation and solving by the CRV Service Provider of issues associated with the provision of the CRV, including safety and security related issues

6 PART V: SERVICE TRANSITION

Service Transition

- Transition Planning and Support
- Change Management
- Service Asset & Configuration Management
- Release and Deployment Management
- Service Validation and Testing Management
- Change Evaluation
- Knowledge Management

6.1 Transition Planning and Support

Process Objective: To plan and coordinate the resources to deploy a major Release within the predicted cost, time and quality estimates.

a) Covered by the Implementation Plan

6.2 Change Management

Process Objective: To control the lifecycle of all Changes. The primary objective of Change Management is to enable beneficial Changes to be made, with minimum disruption to IT services.

All changes are to be conveyed to PCCW via their Change Request Form. And covered by the Change Management Process as found in the Common Package.

6.3 Service Asset and Configuration Management

Process Objective: To maintain information about Configuration Items required to deliver an IT service, including their relationships.

a) Maintain CRV OG documentation associated with the function, performance and management of the CRV, including the CRV OG Operations Manual, a list of CRV users and a record of variations to the common tender package;

   This information is collated in the following ways:

   CRV Operations Manual – APAC Portal
   A list of CRV users – Registrations page on the APAC portal
   Record of Variations is found in the APAC CRV Portal in the Common Package Folder

6.4 Release and Deployment Management

Process Objective: To plan, schedule and control the movement of releases to test and live environments. The primary goal of Release Management is to ensure that the integrity of the live environment is protected and that the correct components are released.

a) Oversee the implementation of the CRV post Contract Award;

b) Manage issues arising from the transition with CRV TF, if any

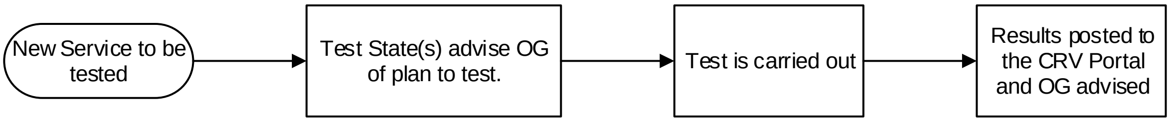
6.5 Service Validation and Testing Management

Process Objective: To ensure that deployed Releases and the resulting services meet customer expectations, and to verify that IT operations is able to support the new service.

a) Accept deliverables from the CRV Service Provider on behalf of the CRV Users as required;

b) Refer to the CRV Implementation Plan

c) New Services



New services being tested by any state,
Notifies OG intention to test as soon as practical.
Advises CRV OG and PCCW 48hrs prior to testing

Testing is to be carried out with a DSCP marking of DF so as to avoid impacting other services.

The results of the tests are to be posted on the CRV portal and the OG advised of the posting.

6.6 Change Evaluation

Process Objective: To assess major Changes, like the introduction of a new service or a substantial change to an existing service, before those Changes are allowed to proceed to the next phase in their lifecycle.

6.7 Knowledge Management

Process Objective: To gather, analyse, store and share knowledge and information within an organization. The primary purpose of Knowledge Management is to improve efficiency by reducing the need to rediscover knowledge.

a) All information relating to the ongoing operation of the network shall be retained in the APAC CRV Portal

   There will be a link to the portal from the ICAO APAC page.

b) To add items to the portal.

c) To Workflow a document.

7 PART VI: SERVICE OPERATION

Service Operation

- Event Management
- Incident Management
- Request Fulfilment
- Problem Management
- Access Management

7.1 Event Management

Process Objective: To make sure CIs and services are constantly monitored, and to filter and categorize Events in order to decide on appropriate actions.

a) Managed by PCCW

7.2 Incident Management

Process Objective: To manage the lifecycle of all Incidents. The primary objective of Incident Management is to return the IT service to users as quickly as possible.

a) Managed by PCCW

After an incident, an incident report (IR) can be provided upon request.

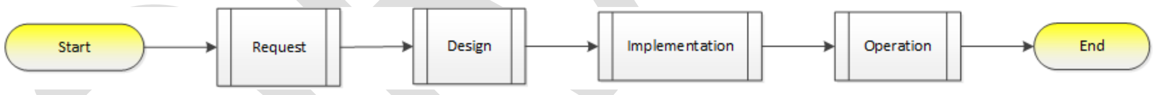
Under normal circumstances, an IR would be ready in 3 working days.

An IR Form template is provided in the Common Package as an example.

7.3 Request Fulfilment

Process Objective: To fulfil Service Requests, which in most cases are minor (standard) Changes (e.g. requests to change a password) or requests for information.

- Process

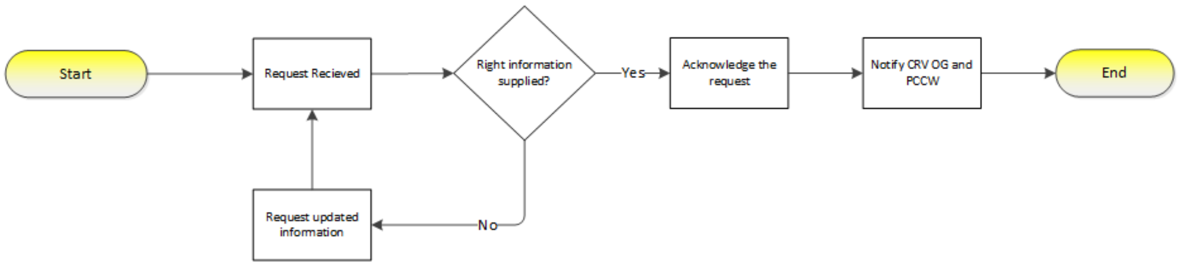


- Procedure
  - Request

    There are four types of requests:

    1. Request to join CRV as a user.
    2. Request to change
    3. Request to add a new service
    4. Request to terminate the CRV connection

    ▪ Process



        - Procedure

          1. Details on how to join CRV are posted on the ICAO APAC and ICAO MID pages.
          2. An initial request is sent to the APAC CRV Portal Administrator requesting to join, leave or add a new connection to CRV.
          3. Upon receipt of the request to join, leave or add new connection to CRV, a registration form is provided.
          4. Upon receipt of the registration form to join or leave, check the content is complete:
             a. ANSP Making the Request
             b. Technical Point of Contact
             c. State(s) connecting to.
             d. Proposed services between ANSPs
             e. Proposed go live/removal date
          5. If complete, acknowledge the request with a link to the Common Package, the Operations Group Manual and the Implementation Plan and the CRV Portal.
          6. If not complete, request updated information.
          7. Notify the CRV OG and PCCW.
          8. Update the Registrations List.

    - Design
        - Go to Design Co-ordination
    - Implementation
        - Go to Change Management
    - Operation
        - Go to Service Operation

7.4 Problem Management

Process Objective: To manage the lifecycle of all Problems. The primary objectives of Problem Management are to prevent Incidents from happening, and to minimize the impact of incidents that cannot be prevented. Proactive Problem Management analyses Incident Records, and uses data collected by other IT Service Management processes to identify trends or significant Problems.

a) PCCW Initiated – Follow the Customer Support Service Plan

b) Authority Initiated

   a. Troubleshoot local connectivity

   b. Polling the NID. On the ANSP NID provided by PCCW, a local loop back will be configured using a specified IP address from the allocated range of IP addressing. This will be called the troubleshooting IP address.

   c. Troubleshoot with peers

   d. Fault with PCCW following the Customer Support Service Plan

7.5 Access Management

Process Objective: To grant authorized users the right to use a service, while preventing access to non-authorized users. The Access Management processes essentially execute policies defined in Information Security Management. Access Management is sometimes also referred to as Rights Management or Identity Management.

a) Physical Access Control

   i. The Cabinet for Core Routers are locked

   ii. The network main PoP sites are under 7x24 CCTV monitoring and recording

b) Remote Network Access Control

   i. The remote access of Cores and CE routers are controlled by access-list ACL that is only allow authorized terminal of management systems.

   ii. The TACACS is deployed to allow the authorized persons of PCCWG to access Core Routers or CE routers as AAA clients.

c) Portal Access

   Review member’s access annually.

PART VII: CONTINUAL SERVICE IMPROVEMENT

Continual Service Improvement

- Service Review
- Process Evaluation
- Definition of CSI Initiatives
- Monitoring CSI Initiatives

7.6 Service Review

Process Objective: To review business services and infrastructure services on a regular basis. The aim of this process is to improve service quality where necessary, and to identify more economical ways of providing a service where possible.

Volunteers for each section

Small groups around these sections.

Report back up to the master document owner

Approval by Chairs

Approval by APANPIRG

Master owner of the document updates and publishes every two months?

Quarterly conference call to start with to update the document.

7.7 Process Evaluation

Process Objective: To evaluate processes on a regular basis. This includes identifying areas where the targeted process metrics are not reached, and holding regular bench markings, audits, maturity assessments and reviews.

7.8 Definition of CSI Initiatives

Process Objective: To define specific initiatives aimed at improving services and processes, based on the results of service reviews and process evaluations. The resulting initiatives are either internal initiatives pursued by the service provider on his own behalf, or initiatives which require the customer's cooperation.

7.9 Monitoring CSI Initiatives

Process Objective: To verify if improvement initiatives are proceeding according to plan, and to introduce corrective measures where necessary.

8 PART VIII

DEFINITIONS

8.1 Definitions

A Service is defined as any service provided over the CRV supporting Meteorological Service for International Air Navigation or Air Traffic Control Services.

Service Provider / Service Consumer (SPSC)

Incident - An Incident is defined as an unplanned interruption or reduction in quality of an IT service (a Service Interruption).

Eg. A link has been flapping in the network causing reroutes.

Problem - A cause of one or more Incidents. The cause is not usually known at the time a Problem Record is created.

Eg. Link flaps have been caused by unplanned work by a third party.

Asia and Pacific Office

ASIA PACIFIC FLIGHT INSPECTION GUIDANCE MATERIAL

First Edition

(ii)

AMENDMENTS

Amendments are announced in the supplements to the *Publications Catalogue*; the Catalogue and its supplements are available on the ICAO website at www.icao.int. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS, CORRIGENDA AND ADDENDA

AMENDMENTS		
No.	Date	Entered by

CORRIGENDA / ADDENDA		
No.	Date	Entered by

PREFACE

This publication was prepared in response to a recommendation from the "Seminar on Flight Inspection and Procedure Validation (FIPV)" held in the ICAO Asia and Pacific (APAC) Regional Office, Bangkok, Thailand from 24 to 27 September 2019 with content contribution from volunteer States / Administrations and industry partners. It is decided to complement existing Standards and Recommended Practices (SARPs) to provide guidance on flight inspection and to serve as a reference upon which States / Administrations can develop their own specific practices and procedures.

The guidance material is developed with the experiences and knowledge among APAC States / Administrations and industry partners and includes recommendations of key activities and milestones in planning, execution, and delivery of a flight inspection. Useful materials, including sample flight inspection reports are also included for reference. This guidance material can hopefully facilitate and be useful to States / Administrations, especially for those without a national Flight Inspection Service Provider (FISP) and with difficulties when conducting flight inspection.

This guidance material is not intended to and shall not replace the relevant flight inspection requirements stipulated in Annex 10 and Doc 8071. In the event of any inconsistency or conflict between this document and Annex 10 and Doc 8071, Annex 10 and Doc 8071 shall take precedence.

The support from ICAO APAC Office and contributions from the following volunteer State/Administration and industry partner (in alphabetical order) in preparing the guidance material are acknowledged and highly appreciated: -

- AeroPearl, Australia
- Airways, New Zealand
- Civil Aviation Authority of Singapore
- FCS Flight Calibration Services GmbH, Germany
- Flight Inspection Center, Civil Aviation Administration of China, China
- Hong Kong Civil Aviation Department, China

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GLOSSARY

SYMBOLS AND UNITS

DDM	Difference in the depth of modulation
Ft	Feet
Kg	Kilogram
Km/h	Kilometers per hour
Kw	Kilowatt
M	Meter
NM	Nautical mile
QNH	Atmospheric pressure adjusted to mean sea level

ABBREVIATIONS

ADS-B	Automatic Dependent Surveillance – Broadcast
AI	Artificial Intelligence
AIP	Aeronautical Information Publication
ANSP	Air Navigation Service Provider
AOC	Air Operator's Certificate
APAC	Asia and Pacific
ATC	Air Traffic Control
ATM	Air Traffic Management
ATS	Air Traffic Service
CCC	Crew Coordination Concept
CNS	Communication, Navigation and Surveillance
COVID-19	Coronavirus Disease 2019
CRM	Crew Resource Management
DME	Distance Measuring Equipment
DVOR	Doppler VHF Omni-Directional Range
EASA	European Union Aviation Safety Agency
EFB	Electronic Flight Bag
FAA	Federal Aviation Administration
FIPV	Flight Inspection and Procedure Validation
FISP	Flight Inspection Service Provider
FTL	Flight Time Limitation
GBAS	Ground Based Augmentation System
GLS	GNSS Landing System
GNSS	Global Navigation Satellite System
GP	Glidepath
ICAO	The International Civil Aviation Organization
ICASC	The International Committee for Airspace Standards and Calibration
IFR	Instrument Flight Rules
ILS	Instrument Landing System
LOC	Localizer
LSALT	Lowest Safe Altitude
MSA	Minimum Sector Altitude
MVA	Minimum Radar Vector Altitude
NAVAID	Navigation Aid
NDB	Non Directional Beacon
NOTAM	Notice to Airmen
PANS-Ops	Air Navigation Services – Aircraft Operations
PAPI	Precision Approach Path Indicator
PSR	Primary Surveillance Radar
RNAV	Area Navigation
RNP	Required Navigation Performance
RPAS	Remotely Piloted Aircraft Systems
SARPs	Standards And Recommended Practices
SMS	Safety Management System
SOPs	Standard Operating Procedures
SORA	Specific Operations Risk Assessment
SSR	Secondary Surveillance Radar

TAR	Test Accuracy Ratios
TERPs	Terminal Instrument Procedures
TRM	Team Resource Management
TSO	Technical Standard Orders
UAV	Unmanned Aerial Vehicle
VASI	Visual Approach Slope Indicator
VHF	Very High Frequency
VMC	Visual Meteorological Conditions

Chapter 1

INTRODUCTION

This material was developed in response to the recommendation from the Seminar on Flight Inspection and Procedure Validation (FIPV) held in the ICAO APAC Regional Office, Bangkok, Thailand from 24 to 27 September 2019, considering the typical need of States / Administrations without a national FIS provider and some recommended measures necessary for conducting flight inspection at night.

1.1 OBJECTIVE

1.1.1 In accordance with the ICAO Annex 10 Volume I and Document 8071 requirements, flight inspection has to be conducted periodically to ensure accuracy, reliability and integrity of the signals-in-space from the air navigation facilities, and that the radio navigation systems meet the SARPs in Annex 10.

1.1.2 While flight inspection could also be conducted for surveillance facilities and/or other purposes such as flight procedure validation, VHF coverage checking, etc., this guidance material focuses on flight inspection for air navigation and surveillance facilities and is a sharing and representation of common practices existing in a number of States with considerable experiences in flight inspection.

1.1.3 This guidance material introduces and describes different stages in flight inspection for air navigation facilities, including planning, conducting and accepting the report that all tolerances are met. It is not intended to recommend specific FISP(s) or equipment to be used, but rather to provide general details and guidelines in the arrangement of flight inspection for States' own consideration.

1.2 SCOPE

1.2.1 This guidance material describes general reference in conducting flight inspection, including resources planning, roles and responsibilities of involving parties and identification of stakeholders. It also provides guideline in communication with stakeholders and criteria on planning and scheduling flight inspection.

1.2.2 This document introduces example flight inspection procedures for Instrument Landing System (ILS) including visual aids, Doppler Very High Frequency Omni-Directional Range (DVOR), Distance Measuring Equipment (DME), Primary Surveillance Radar and Secondary Surveillance Radar (PSR / SSR) and discusses about the arrangement for flight inspection at night and also emergency flight inspections.

1.2.3 Reference is also given on the example flight inspection system performance specifications and associated Test Accuracy Ratios (TAR) and the workflow on reporting of flight inspection results. Sample flight inspection records and reports are also shared in this document for States to make reference with.

Chapter 2

PLANNING FOR FLIGHT INSPECTION

2.1 GENERAL

2.1.1 General Setup and Resources Planning

2.1.1.1 General setup – there are 2 typical scenarios of flight inspection arrangements:

(a) State has its own flight inspection unit; or

(b) Engagement of external FISP.

2.1.1.2 State's own flight inspection unit will be:

(a) Able to activate within a short period of time during emergency (high flexibility);

(b) Particularly useful when State has large number of facilities / aerodromes to be flight inspected; and

(c) Likely regulated by State.

2.1.1.3 Engagement of external FISP will be:

(a) More cost effective when State has small number of facilities to be flight inspected;

(b) More feasible when the State may not have the necessary expertise;

(c) More flexible to change FISP to meet the required service performance; and

(d) Little or no control when an emergency flight inspection is required.

2.1.1.4 General planning before flight inspection typically includes the following:

(a) Determine types of flight inspection required (commissioning or routine) and periodicity for routine ones;

(b) Identify facilities to be flight inspected;

(c) Determine type of aircraft used for flight inspection, for example using jet aircraft for high level (i.e. FL350 and above) radar coverage check;

(d) Check with apron operations on where the inspection aircraft can park and identify any traffic/timing restrictions for its taking off and landing;

(e) Plan the time of flight inspection, after consulting operations;

(f) Develop draft flight inspection schedule and flight inspection profiles as well as proposed date for brief and debrief;

(g) Notify parties involved/affected by draft flight inspection schedule and flight inspection profiles. Parties involved/affected could be ATC, runway maintenance team, military, ground handlers, Navaids & Surveillance facilities managers, Navaids & Surveillance maintenance staff, airfield lighting / Precision Approach Path Indicator (PAPI) maintenance team;

(h) Conduct flight inspection briefing with involved / affected parties;

(i) Issue Notices to Airmen (NOTAMs) for any change / cancellation of runway maintenance works; and

(j) Develop list of contact details of parties involved in the flight inspection.

2.1.2 Roles and Responsibilities of the Flight Inspection Service Provider (FISP) Including Crew Resources Management

FISP is the main party to provide safe and reliable flight inspection services. Selection of an appropriate FISP is a key successful factor for flight inspection.

2.1.2.1 Roles

(a) Assist Air Navigation Service Provider (ANSP) in planning, scheduling and conducting the flight inspection;

(b) Be familiar with the airspace / airport to conduct safe and efficient flight inspection with minimum impact to normal traffic; and

(c) Provide routine, commissioning or ad-hoc (special or urgent) flight inspection services.

2.1.2.2 Responsibilities

(a) Assist ANSP to ensure no equipment (e.g. navigation aids) would expire the validity period as recommended by ICAO or State's regulatory requirement, or any validity period as confirmed by the ANSP, with proper planning and scheduling of flight inspection tasks;

(b) Survey or assist to survey the reference point(s) for Global Navigation Satellite System (GNSS) for precision flight inspection on ILS;

(c) Obtain all the necessary permits to fly over areas for its flight inspection;

(d) Closely coordinate with ATC and ground technical personnel to prepare and conduct flight inspection including the provision of flight profiles for ATC assessment;

(e) Implement Safety Management System (SMS) as appropriate to deliver safe flight inspection services;

(f) Keep good archived records of flight inspection results of the equipment / system being inspected and provide advice if there was any anomaly trend or result observed;

(g) Feedback to the ANSP on overall flight inspection arrangement, discuss and assist to resolve problems encountered; and

(h) Desirable to have Crew Resource Management (CRM) to clearly define the roles and responsibilities of each crew member and to establish close collaboration among the crew members.

2.1.2.3 Crew Resource Management (CRM) System

Crew Resource Management (CRM) and Crew Coordination Concept (CCC) define how crews are to work together and the roles and responsibilities of each crew member. It clearly describes the communications involved in executing tasks and should be reinforced by Standard Operating Procedures (SOPs) and checklists. The CRM system, however, does not only define the cooperation among cockpit members, but also should encompass procedures and communication between cockpit and cabin, and it should define the interface between the flight crew and the rest of the organisation, like tasking / scheduling, management, maintenance, etc. This holistic approach in CRM is of great importance to create a working environment that takes into account all requirements to accomplish the organization's mission profile safely and reliably. It effectively translates into a Team Resource Management (TRM).

2.1.3 Roles and Responsibilities of the Flight Inspector

A flight inspector is the person who performs checking on equipment / system status. He / she must be proficient and have a good understanding on the characteristics of various equipment / systems to be flight inspected as well as familiarise himself / herself with relevant procedures to perform flight inspection on that equipment / system.

2.1.3.1 Roles

(a) Contribute in early planning of the flight inspection;

(b) Coordinator between ANSP and the flight inspection service provider;

(c) Perform equipment checking in flight inspection and alert ANSP in real time of any out-of-tolerance conditions or anomaly observed during the flight inspection;

(d) Assist ANSP to identify and analyse any anomaly / adverse trends observed; and

(e) Prepare flight inspection records and reports.

2.1.3.2 Responsibilities

(a) Provide advice to ANSP in planning the flight inspection tasks;

(b) Assist in preparing flight inspection procedures for checking a specific equipment / system;

(c) Coordinate with the rest of flight inspection team (e.g. pilots) for ad-hoc and flexible arrangement of flight inspection procedures (e.g. re-check on a specific run);

(d) Observe the measured results of flight inspection and checks against the relevant tolerance limits;

(e) Keep records of the measurement results and notifies ANSP for any trend/anomaly observed;

(f) Assist ANSP from the flight inspection perspective for the rectification on any anomaly observed; and

(g) Coordinate any real time changes to the flight inspection schedule due to unforeseen circumstances such as inclement weather, aircraft or aircrew problem.

2.1.4 Roles and Responsibilities of ANSP

The ANSP is ultimately responsible for management of the flight inspection. It is therefore vital that ANSP takes an active role throughout the flight inspection.

2.1.4.1 Roles

(a) Types of ANSP Personnel

(i) Ground technical personnel maintaining navigational and landing aids, surveillance radars, airfield lighting and PAPIs, etc.; and

(ii) Air Traffic Controllers – En-route, Approach and Tower.

2.1.4.2 Responsibilities

(a) Ensure that all systems and facilities to be flight inspected are operational and in a condition suitable for flight inspection on the scheduled dates;

(b) Ensure all systems and facilities are regularly flight inspected, complying with the State's regulatory requirement on the periodicity of flight inspection;

(c) Provide an annual draft schedule of systems and facilities to be flight inspected to the flight inspection service provider to facilitate early planning;

(d) Assist in obtaining security clearance for flight inspection crew to access aircraft;

(e) Provide necessary geographical information of systems & facilities under flight inspection, for example latitude and longitude co-ordinates of all navigation facilities;

(f) Provide authorization for flight inspection aircraft to fly below established minimum altitudes, together with all other necessary air traffic authorizations to accomplish the flight inspection;

(g) Provide qualified staff to be present during flight inspection;

(h) Coordinate flight inspection briefing and debriefing;

(i) Review flight inspection profiles with ATC and arrange discussion with FISP for any clarification, if required;

(j) Ensure FISP obtain necessary permits to fly over areas for the planned flight inspection;

(k) Issue necessary NOTAMs for flight inspection;

(l) Review flight inspection reports;

(m) Publish addition or / and amendments to AIP regarding systems / facilities after flight inspection;

(n) Make arrangement for flight inspection crew to call ATC before the start of each sortie for co-ordination purposes;

(o) ATC to facilitate flight inspection and accord it some priority, whenever possible; and

(p) ATC to be conversant with flight inspection profiles.

2.2 FLIGHT INSPECTION COORDINATION AND PREPARATION

2.2.1 Identification of Stakeholders

The smooth conduct of flight inspection requires concerted efforts from all key stakeholders. Subject to the organization structure in the States, an example list of stakeholders related to flight inspection is provided below for reference:

2.2.1.1 Flight Inspection Service Provider (FISP)

(a) FISP plays a vital role in flight inspection and is expected to be conversant with the relevant ICAO and local standards and requirements for fight inspection of various CNS equipment. FISP is also expected to be familiar with the flight profiles to be conducted and local airport / airspace environment in order to perform flight inspection in an efficient and effective manner. FISP should also be familiar with details of permits / approvals required for flying in airspace to ensure a successful and effective flight inspection.

(b) The flight inspection team deployed by the FISP normally consists of three types of staff, namely pilots, flight inspectors and aircraft engineers.

(i) Pilots – mainly communicate with air traffic controllers to perform flight inspection profiles

(ii) Flight Inspector – mainly coordinate with ground maintenance personnel or systems supplier engineer to take, report and calibrate measurement reading to ensure the equipment under inspection performs within the relevant tolerance limits.

(iii) Aircraft Engineer – support staff to deal with daily maintenance and problems encountered on the flight inspection aircraft, which would normally have been deployed at a far distance from the FISP's main base.

2.2.1.2 ANSP - Air Traffic Controller

(a) States may consider, as far as practicable, to assign dedicated air traffic controller(s) in handling the flight inspection aircraft, in which the flight path might cross multiple sectors and affect normal traffic patterns. Experienced air traffic controllers could efficiently reduce the lead time to conduct flight inspection, while keeping the impact to normal traffic to a minimum.

(b) Subject to different airport and airspace, temporary holding of ground and / or air traffic might be required to allow the flight inspection aircraft to conduct dedicated profiles unaffected.

(c) Air traffic controller handling flight inspection aircraft has to work closely with the flight inspection pilot and keep a very close eye on the aircraft position to keep it clear from normal traffic.

2.2.1.3 Aerodrome Operator

(a) Local aerodrome operator plays an important role in providing necessary logistics support to the flight inspection team, for example in the facilitation of access to airport restricted area, facilitate the conduct of flight profiles on ground or assist in handling the shipment of spare parts to address technical faults encountered by the flight inspection aircraft.

2.2.1.4 ANSP - Ground Maintenance Personnel

(a) The ground maintenance personnel are responsible for equipment maintenance and adjustment during the flight inspection. They have to work closely with the flight inspector to ensure the measured reading is within tolerance limit and ensure the equipment is safe for operational use. Prior to the flight inspection, the ground maintenance personnel shall also ensure the equipment is operational and in a condition suitable for flight inspection.

2.2.1.5 Other Supporting Personnel

(a) To facilitate daily flight inspection mission, there might be logistics support required for the flight and ground crews of the flight inspection team to travel between airport and their accommodation place. Immigration, Customs and Exercise clearance support might also be required to facilitate smooth operation of flight inspection activities.

2.2.1.6 Military, if applicable

(a) The military shall be informed of the civilian flight inspection schedule to ensure military flights and civilian flight inspection aircraft routes are de-conflicted. The civilian flight inspection aircraft should take note of the military no fly zones.

2.2.2 Communication with Stakeholders

2.2.2.1 A thorough understanding of the details of flight inspection arrangements is crucial to the successful completion of a flight inspection. All stakeholders should know their roles and duties to render the best support to the flight inspection activities.

2.2.2.2 To facilitate clear communication among stakeholders, ANSP could consider preparing a comprehensive but concise daily programme for sharing among all stakeholders. The daily programme would typically include information on equipment / facility to be inspected, estimated start and end time, parties involved and their roles, useful contacts, etc. (see sample at Attachment A to this chapter).

2.2.2.3 In addition, the ANSP could also consider preparing a detailed flight inspection check sheet for each equipment / facility to document the planned flight inspection profiles to be conducted (preferably with diagrams for easy visualisation) and estimated duration for each run. This check sheet could greatly facilitate air traffic controllers and airport stakeholders to assess any potential impact to airport / airspace operations and to aid communication during the flight inspection (see sample at Attachment B to this chapter). Appropriate NOTAM should also be issued to ensure airlines and pilots are kept informed of the flight inspection schedule and time.

2.2.2.4 Before the commencement of each round of flight inspection, an in-briefing involving all key stakeholders is recommended to ensure all are familiar with their roles and responsibilities in supporting the daily flight inspection as well as any issues requiring special attention. This also allows all stakeholders to exchange comments about the daily arrangement, for instance the flight profiles sequence, and helps to spot early issues that would potentially hinder normal ATC operations and flight inspection.

2.2.2.5 Contingency plan, including backup flight inspection date(s) due to unexpected ad-hoc event such as inclement weather or technical fault, could also be discussed with key stakeholders during the in-briefing.

2.2.2.6 During the flight inspection, it is essential that the ground maintenance personnel maintains direct communication with the on-board flight inspector so that any required adjustment of ground facilities or any recheck can be done expeditiously.

2.2.2.7 During the flight inspection period, daily de-briefing among flight inspection crews, ANSP, ATC and ground maintenance personnel would allow quick feedback on any issues encountered during the flight inspection so as to make timely fine-tuning when necessary for the subsequent flight inspection. This allows individual stakeholder to make adjustment / enhancement arrangement promptly such as issuance / cancellation of NOTAM, co-ordination / cancellation of runway closures, etc.

2.2.2.8 After the completion of each round of flight inspection, a de-briefing involving all stakeholders would help all to strive for continuous improvements on overall flight inspection arrangement, with parties sharing their views and suggestions as well as to share results and resulting actions of the flight inspection.

2.2.3 Consideration in the Planning and Scheduling of Flight Inspection

Flight inspection, depending on the exact flight profiles to be conducted, often causes some degrees of disruption to normal airport and airspace operations, especially at busy international airports during peak traffic hours. When planning and scheduling flight inspections, a number of key factors have to be considered so as to minimise potential interruptions to normal operations, for example:-

2.2.3.1 Traffic Volume

(a) During day time when normal traffic is usually at its peak, the coordination of flight inspection by air traffic controllers will be complex and with great challenges which often results in undesirable disruption to normal air traffic. Hence, for busy airports, there is a trend to advance the flight inspection time to dawn or even earlier so as to avoid the busy day time traffic.

(b) Some flight inspection profiles may require day-light conditions to perform. When scheduling the flight inspection, one possible way to take advantage of less busy early hours would be to perform those flight profiles that do not require day-light condition first, followed by those requiring day-light conditions. As the time of flight inspection is dependent on time of peak traffic volume, close co-ordination and early inputs from ATC and slot planner from the airport operator in the planning would be beneficial.

2.2.3.2 Holiday and Peak Travel Season

(a) Long holidays and travel peak seasons would significantly increase the air traffic volume. In some ANSPs, there may also be a period of time in which equipment configuration or change is not allowed as this supports the heavy traffic in long holiday and peak season. Therefore, when planning and scheduling flight inspection programs, such long holiday and travelling peak seasons should be avoided as far as practicable.

2.2.3.3 Seasonal Weather Condition

(a) In some States, there might be seasonal strong winds, typhoons or severe weather conditions in some parts of the year. Heavy rainfall, lightning and other severe weather conditions may impact or delay flight inspection activities. As such, the fight inspection program should be scheduled to avoid bad weather seasons as far as practicable.

2.2.3.4 Major Military Flying Exercises

(a) Planning of flight inspection should avoid disruption with a period of major military flying exercises. This is because during the latter, many forbidden flying areas / zones may be activated and such activations could affect the normal flight inspection.

2.2.3.5 Types of Flight Inspections

(a) Depending on type of flight inspections, some of them, such as some ILS commissioning checks, procedure validation, etc., may have to be carried out in the daytime with suitable visual conditions.

2.2.3.6 Contingency Arrangement

(a) Back-up/contingency dates should be planned to cater for any unplanned cancellation or effect on flight inspection activities.

(b) The back-up/contingency flight inspection date(s) could be inserted as buffer date(s) in between the planned flight inspection activities, or after all the planned flight inspection activities as an extended arrangement.

2.3 FLIGHT INSPECTION AT NIGHT

Flight inspection operations at night are becoming more popular and may inevitably be required at large and high traffic density airports so as to minimize potential impact to the normal air traffic flow. The possibility of reduced traffic flow densities at night may allow the necessary inspection profiles to be flown with minimal disruption to ATC. However, the potential risks for the FISP crews for performing such tasks at night need to be properly managed.

To reduce the risk in flight inspection at night, FISP crews should be familiar with the airspace and airport environment including the height of terrain and structures along and close to the flight inspection path. Air traffic controllers have to pay special attention to the altitude and flight path of the flight inspection aircraft to avoid any deviation from the planned safe flight path.

Night operations should be considered as any flight inspection being performed 30 minutes after sunset until 30 minutes before sunrise.

2.3.1 Flight Inspection Aircraft Type

2.3.1.1 The aircraft should be a multi-engine type capable of safe flight within the intended operational envelope with one engine inoperative, fully equipped and instrumented for night and instrument flight operations.

2.3.2 Crew Resource Management (CRM)

2.3.2.1 Flight inspection operations at night present additional risks that must be identified, assessed with necessary mitigations and documented. Night flying operations should only be conducted by experienced pilots that are current and proficient at night flying and who understand well the risks associated with night-time flight inspection.

2.3.2.2 A dual pilot operation should be considered for a normal night flight inspection operation to mitigate against the higher risks involved for night operations.

2.3.3 Night Duty Periods

2.3.3.1 FISPs operate under their own Air Operator's Certificate (AOC) and Flight Time Limitation (FTL) which would normally include duty periods for their specific night operations. Consideration should be given to the preceding duty period prior to any planned night duty to ensure the crew, including the flight inspector, have enough rest periods before and after the night duties.

2.3.3.2 Limitations should be provided for night duties worked in immediate succession, for example two consecutive nights, with a maximum duty period of 11 hours each.

2.3.3.3 Upon the conduction of a single night duty, or two consecutive night duties, there should be a minimum interval of rest time for the FISP crews before the commencement of the next duty time.

2.3.4 Operational Requirements

2.3.4.1 Where a requirement exists for flight inspection of ILS or other NAVAID installations at night, the following operational requirements should be met.

2.3.4.2 Aircraft Related - In addition to the normal equipment required for a night operation, the following equipment should be functioning normally:

(a) Both aircraft altimeters;

(b) Radar altitude indicators;

(c) Auto-Pilot;

(d) All flight instrument displays;

(e) Up-to-date database for flight inspection equipment map display (If applicable);

(f) Electronic Flight Bag (EFB), if applicable; and

(g) Approach plate holders with adequate lighting.

2.3.4.3 ANSP Related – The following is recommended to be provided by the ANSP prior to any night flight inspection operation:

(a) ATC are able to provide an Instrument Flight Rules (IFR) service;

(b) ANSP should provide a full radar service within the area of operation;

(c) Runway edge, centreline, approach lighting and PAPI's shall be serviceable and operating normally;

(d) Any obstacle lighting shall be operational within the designated area of operation;

(e) The weather conditions for the night inspection must be Visual Meteorological Conditions (VMC) below the 25/10 NM Minimum Sector Altitude (MSA) or Minimum Radar Vector Altitude (MVA) / Radar Lower Safe Altitude (LSALT); and

(f) ATC to provide any aerodrome QNH changes expeditiously.

2.3.4.4 Pilot Related - Prior to the commencement of any night inspection operation, a skyline plot of the obstructions in the approach path must be obtained from the aerodrome operating authority. The pilot should compare the intended inspection runs and adjustments made to the minimum operating altitude as necessary.

2.3.4.5 Where flight crews have not conducted a daylight operation into an aerodrome, then prior to conducting a night inspection task, the crew should first fly the approach in daylight conditions to assess the obstacle clearance within the approach area.

2.3.4.6 Areas surrounding the inspection runs shall be predominantly level, clear of terrain and obstacles.

2.3.4.7 For operations in certain States it may be compulsory for the crew to provide an alternate Aerodrome for recovery, these requirements must be determined prior to commencement of night operations. In addition, holding and alternate requirements always need to be borne in mind.

2.3.4.8 To raise the flight crew situational awareness and to reduce fatigue, the autopilot should be used whenever possible.

2.3.4.9 Flights should be conducted under the IFR.

2.3.4.10 Flight Inspection Profiles - Flight inspection at night should be conducted using the following minimum altitudes:

(a) Level runs, Orbits and Part Orbits should not be conducted below the sector 25NM/10NM MSA or radar LSALT.

(b) Not below SECTOR 25/10 NM MSA or radar LSALT until established on a flight inspection approach run, when established within full-scale deflection of the localiser descent may occur.

2.3.4.11 Localiser (LOC) offset approaches that involve flights more than half scale (5 Dots) indications should be flown during daylight.

2.3.4.12 Where a LOC part orbit altitude needs to be increased for a night operation, a range change may be required to ensure that the localiser coverage area correlates with the published GlidePath (GP) angle.

2.3.4.13 Cat III ILS approaches that include a fly through at 50ft along the runway to ILS Point ‘E’ should only be flown at night providing the following are met:

(a) Runway centreline lights are serviceable; and

(b) Pilots have conducted the relevant simulator training for such an operation.

An alternate method would be for the aircraft to perform a run along the runway centreline prior or post the inspection.

2.3.4.14 GP approach profiles that involve flight with more than half scale “FLY UP” indications should be flown during daylight e.g. GP lower edge (5 dots Fly Up) runs.

2.3.4.15 GP level runs need to encompass coverage and clearance at a minimum angle of 0.45Θ, however, increasing the height to be at MSA for this measurement will inevitably mean an increase in the start range to achieve this, with the possibility that the GP coverage tolerance may not be met beyond 10NM. As an alternate solution, the GP level run profile could be flown with the addition of the night profile run during daylight and the measurements used as a reference transfer standard between the two profiles.

2.4 EMERGENCY FLIGHT INSPECTION ARRANGEMENT

2.4.1 Types of Flight Inspection

2.4.1.1 The various types and priorities of flight inspection are published within ICAO DOC 8071, Chapter 1 (Para.1.5). The following paragraphs discuss the requirements surrounding special inspections.

2.4.2 Priorities of Flight Inspection

2.4.2.1 If there are multiple flight inspection requests, the use of inspection priorities will determine the tasks to be supported first and make the most effective use of the resources in FISP. The following is an order of priorities that should be considered:

Priority	Type	Description
1	Accident/Incident	Accident or incident investigation requiring immediate response.
2	Restoration	Restore a commissioned facility after an unscheduled outage.
3	Periodic	A regularly scheduled inspection of a commissioned facility.

4	Commissioning	A comprehensive inspection of a newly installed facility.
5	Site Evaluation	An inspection to determine the environmental effects on the performance of a planned navigational aid.

Table 2-1. Flight Inspection Priority

2.4.3 Post-Accident Investigation

2.4.3.1 A flight inspection may be requested following an accident or incident by the investigating authority to verify the NAVAID system performance is satisfactory and able to continue to support the published instrument approach procedures and ANSP operations.

2.4.3.2 For a FISP, this type of inspection should be accorded highest priority and an appropriate response time should be contractually agreed between the ANSP and the service provider.

2.4.3.3 Pre-Flight Requirements – The flight inspector will be required to obtain the following information:

(a) Equipment configuration at the time of the accident i.e. transmitter in operation;

(b) Instrument approach procedures used; and

(c) Any additional information required to support the investigation.

2.4.3.4 The flight inspector will need to coordinate the system configuration with the maintenance personnel and perform as a minimum, an inspection of the facility which may include the instrument procedure used if applicable. It is important to note that no equipment adjustments should be made during this inspection and if required, should be performed in a separate special inspection to facilitate investigation.

2.4.3.5 In the event of an accident or incident, ANSP should do all that is reasonably practicable to ascertain that a NAVAID is operating correctly. For this reason, ANSP should have equipment suitable for making field measurements available.

2.4.4 Post-Incident Investigation

2.4.4.1 Where a runway excursion by an aircraft has occurred and damage has been sustained to a NAVAID, the maintenance authority will determine the repairs required to the facility and whether a ground or flight inspection is required to return the facility back into service. However, the following considerations should be given when determining the need for a flight inspection:

(a) Antenna array replacements that will affect the radiated pattern;

(b) Cable replacements that affect transmission line lengths;

(c) Replacement or re-positioning of an ILS near field monitor if the system does not contain integral course monitoring;

(d) Major repair work to the LOC antenna distribution unit or when the center line phasor has been adjusted;

(e) Adjustment or corrective maintenance on phasing or width controls that results in figures outside the monitor site acceptance figures;

(f) Any work performed on the GP antenna distribution unit;

(g) Adjusts to GP integral monitor probes, cables or monitor combiner unit; or

(h) Damage to ILS critical areas ground in the beam forming areas that need re-grading.

2.4.4.2 In the event of an accident or incident, ANSP should do all that is reasonably practicable to ascertain that the facility is operating correctly. For this reason, all aerodromes should have equipment suitable for making field measurements available.

2.4.5 Flight Inspection Service Providers (FISP)

2.4.5.1 Information regarding FISP may be obtained from the appropriate ICAO Regional Office or online from the International Committee for Airspace Standards and Calibration (ICASC) at http://www.icasc.co [1]

2.4.6 Navigational Aid Performance Reports

2.4.6.1 The reporting of aviation safety occurrences is vital to the prevention of aircraft accidents and contributes to the understanding of where safety risks lie within the aviation system. This information provides an understanding of the safety related issues thus allowing these to be addressed and relevant measures adopted. Safety occurrence reporting by aviation professionals contributes to the prevention of accidents and fundamentally promotes the safety of aviation activities within the organisations that employs them or uses their services.

2.4.6.2 Persons involved in aviation activities should be encouraged to report any safety issue they encountered. State regulations should differentiate between the cases which would require mandatory reporting and those that may be reported after judging it relevant.

2.4.6.3 The obligation of these reporting occurrences would be included within the normal operation of an organisation's SMS. ANSP or airline operator should, through a mandatory reporting system, inform the relevant authority of a particular occurrence and with defined categories that represent a significant risk to aviation safety.

2.4.6.4 Safety management systems are reliant on the collection and analysis of safety related information. Therefore, anything that is perceived by the individuals as having the potential to impact safety should be reported within reasonable time, for example, 72 hours to raise awareness of the occurrence.

2.4.6.5 Organisations SMS may define the format of the occurrence reports to be used by relevant aviation professional. It should include areas to report NAVAID performance or RNAV procedure where relevant. In general, reporting forms need to be user friendly and will not discourage potential reporters to report the occurrences. The aim should be to facilitate the collection of occurrence information as much as practicable from the front-line individuals and allow the appropriate authorities to understand and address the issues from the information provided.

2.4.6.6 The following reporting information requirements should be considered as a minimum, but not limited to, in the determination of NAVAID's performance from both an ATC and Pilots perspective.

(a) Date/Time UTC

(b) Aircraft Call Sign

(c) Airline Operator

(d) Pilot Name

(e) SSR Code

(f) Aircraft Type

(g) Aircraft Flight Phase (Climb, Descent, Level, Approach), IFR/VFR, Radar Vectored, Navigational Aid in use (ILS/VOR/DME/NDB/RNAV)

(h) Description of Occurrence

2.4.6.7 ANSP's and Airline Operators are likely to have their own organisations occurrence report forms to cover the mandated reporting requirements within their SMS. These may not contain the aforementioned information relevant for a pilot reporting an unreliable NAVAID performance. Therefore, additional information may be required for investigation purposes depending on the seriousness of the occurrence. Consultation with the ground technicians will greatly assist an immediate investigation on a system status and possible actions required.

2.4.6.8 For precision approach landing aid systems such as an ILS/DME or GNSS Landing System (GLS), once an occurrence report related to the system is received from a pilot, an ANSP would have to follow up by investigation and discussion with ground technicians and may require the issue of a NOTAM on that facility once it is identified to be faulty and requires maintenance. The ANSP has to ensure a continued safe operation or provide alternative services and procedures resulting from the occurrence.

[1] ICAO DOC 8071 Fifth Edition, 2018

2.5 CONSIDERATIONS ON FLIGHT INSPECTION PERIODICITY DURING PANDEMIC

2.5.1 There might be occasion that the flight inspection could be affected by external factor with global impact, such as the COVID-19 pandemic. With such a huge global impact, cross-country deployment of flight inspection aircraft might become difficult, especially for those States who do not have their own FISP. As such, States should assess and consider the flight inspection periodicity on radio navigation aids to secure continuous service or keep minimum impact to service.

2.5.2 ICAO has published a reference note on the considerations of radio navigation aids flight inspection periodicity during COVID-19 (at Attachment C to this chapter).

Attachment A

Example Flight Inspection Programme

Example Routine Flight Inspection Program

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Remarks
In-briefing at (time)						In-briefing with flight inspection team
	XX VOR OFF (time)	XX VOR F/I (start time)				XX VOR – periodic F/I after annual maintenance
			XX ILS maintenance (off time)	XX Tx 1 F/I (start time) XX Tx 2 F/I (start time)		XX ILS - periodic F/I after annual maintenance
					De-briefing	De-briefing with flight inspection team

<u>Notes for ATC and/or Aerodrome Operator:</u>

- Expected period and end time for VOR and ILS flight inspection
- Runway closure and maintenance requirements

Attachment B

Example Flight Inspection Profiles

VOR/DME Routine Inspection

EXAMPLE VOR/DME INSPECTION PROCEDURES LIST					Profile Version
Facility ID			[Facility ID]	Routine Inspection	
Target Completion Time (LT)	Run No.	Flight Procedure	Procedure Description	Facility Transmitter Number	Items To Be Inspected
xxxx-xxxx		Radial xxx°	xxNM-xxNM, QNH xxxxFT	VOR/DME No.1	e.g. Reference Radial/Alignment Check
		Radial xxx°	xxNM-xxNM, QNH xxxxFT	VOR/DME No.2	e.g. Reference Radial/Alignment Check
		Radial xxx°	xxNM-xxNM, QNH xxxxFT	VOR/DME No.1 Only	e.g. VOR Monitor Alarm Check
		Radial xxx°	xxNM-xxNM, QNH xxxxFT		
		Radial xxx°	xxNM-xxNM, QNH xxxxFT	VOR/DME No.1	e.g. VOR Monitor Alarm Normal
		Orbiting (C.C.W. / C.W.)	Radius: xxNM, QNH xxxxFT	VOR/DME No.1	Mean Alignment Error, Bends, Roughness, DME Range Error
		Orbiting (C.C.W. / C.W.)	Radius: xxNM, QNH xxxxFT	VOR/DME No.2	Mean Alignment Error, Bends, Roughness, DME Range Error

Routine Inspection (ILS Tx1)

EXAMPLE ILS INSPECTION PROCEDURES LIST					Profile Version
Runway		ILS Name	ID	ILS Identification	Routine Inspection
Target Completion Time (LT)	Run No.	Flight Procedure	Procedure Description	Facility Transmitter Number	Items To Be Inspected
xxxx-xxxx		e.g. Threshold Parking	Runway	LOC No.1&2	e.g. Monitor Alarm Check
xxxx-xxxx		e.g. Level Run	xxNM-xxNM QNH xxxxFT	GP No.1	e.g. Width (including alarm), Symmetry SBP, etc.
xxxx-xxxx		e.g. Level Arc	xxNM, +xx°/-xx °, QNH xxxxFT	LOC No.1	e.g. Width (including alarm), Symmetry, Clearance, etc.
xxxx-xxxx		e.g. Approach with low pass	Initial From xxNM and QNH xxxxFT	DME No.1; LOC/GP No.1	e.g. DME and Runway Lighting, Path Angle, Datum, Mod Sum, Structure, etc.

Routine Inspection (ILS Tx2)

EXAMPLE ILS INSPECTION PROCEDURES LIST					Profile Version
Runway		ILS Name	ID	ILS Identification	Routine Inspection
Target Completion Time (LT)	Run No.	Flight Procedure	Procedure Description	Facility Transmitter Number	Items To Be Inspected
xxxx-xxxx		e.g. Level Run	xxNM-xxNM QNH xxxxFT	GP No.2	e.g. Width (including alarm), Symmetry SBP, etc.
xxxx-xxxx		e.g. Level Arc	xxNM, +xx°/-xx °, QNH xxxxFT	LOC No.2	e.g. Width (including alarm), Symmetry, Clearance, etc.
xxxx-xxxx		e.g. Approach with low pass	Initial From xxNM and QNH xxxxFT	DME No.2; LOC/GP No.2	e.g. DME and Runway Lighting, Path Angle, Datum, Mod Sum, Structure, etc.

Remarks:

- Any protection to ILS sensitive area should be applied

Attachment C

Flight Inspection Periodicity Considerations for Radio Navigation Aids during the COVID-19 Pandemic and Related Recovery Phase

1. Introduction

1.1. The present note discusses issues related to flight inspection that could arise during the COVID-19 pandemic and during the recovery phase, with particular regard to periodicity. The main purpose of the document is to ensure that flight inspection will be able to maintain safe operation of navigation aids during the pandemic and will not be on the critical path to aviation recovery after the pandemic.

1.2. To this end the document stresses the need to maintain regular ground and flight checks of navaids to ensure that they are available during recovery (delaying implementation of new facilities if necessary). It provides information on flight inspection experiences and best practice currently adopted in several ICAO States, including recommendations on how to deal with periodicity intervals when delays are experienced.

2. ICAO Requirements on Flight Inspection Periodicity

2.1. The fundamental ICAO provision addressing flight inspection in general is the Standard in Annex 10, Volume I, Chapter 2, 2.2.1 (reproduced in Appendix).

2.2. Guidance on flight inspection, including periodicity, is given in the ICAO *Manual on Testing of Radio Navigation Aids* (Doc 8071). The general aspects of periodicity requirements are addressed in section 1.15 of the document (reproduced in Appendix), whereas *suggested* **[1]** periodicities for specific navigation aids are given in the chapters corresponding to each aid. States may have determined their periodicity requirements based on local circumstances and as such the recovery should consider these periodicities.

3. Relationship between Ground Testing and Flight Inspection

3.1. This document focuses on flight inspection periodicity. However, Doc 8071 also specifies a number of ground tests with an associated periodicity. Normal practice is to ensure that a navigation facility passes all of its ground tests prior to conducting a flight inspection. Local maintenance staff normally accomplish this. This document assumes that such ground testing can be carried out as required and in accordance with the local COVID-related health precautions. Some of the measures discussed herein can also be applied to ground maintenance staff. The document focuses on flight inspection due to its often international dimension (cross-border operations).

4. Flight Inspection Practices during the Pandemic

4.1. The ICAO Secretariat and EUROCONTROL have conducted an informal survey of flight inspection practices during the pandemic in twenty-seven States.

4.2. The survey results show that the majority of States surveyed are maintaining a regular or near-regular flight inspection schedule during the pandemic. This is consistent with the general recognition of ATC as an essential public service and the related need for reliable system performance of radio navigation aids. However, it should also be noted that the majority of the responses came from States that operate their own flight inspection aircraft. So the survey may not fully reflect the situation in States where issues may exist due to delays or suspended flight inspection operations, especially if they rely on cross-border flights by flight inspection providers (see below).

5. Special Measures

5.1. In order to sustain the flight inspection schedule notwithstanding the pandemic-related difficulties, the majority of the States surveyed have adopted special health safety procedures and operational measures, as discussed below.

6. Health Safety Procedures

6.1. Some or all of the following health safety procedures have been put in place:

(a) daily sanitization of aircraft**[2]** and equipment;

(b) daily supply of personal protection devices to crew, with detailed instructions on usage;

(c) flight inspection crew segregation from ground support personnel (ground maintenance, dispatch, refuel etc);

(d) flight inspection crew segregation from engineering personnel responsible for the navaids under test (telephone coordination only);

(e) segregation between the flight inspection crews themselves (fixed crew staffing); and

(f) implementation of alternate on/off crew rotation rosters taking into account potential incubation period.

7. Operational Measures

7.1. While flight inspection operations have been to some extent facilitated by the low air traffic levels currently prevailing, overall significant operational restrictions are being experienced, calling for special measures to mitigate them.

7.2. A common approach adopted for flight inspection operations during pandemic is to keep individual missions within a single day, returning to base at the end of the day and thus avoiding overnight stays at the destination.

7.3. The impact of the associated reduction in efficiency could be mitigated by prioritizing regular flight inspection missions over new implementation projects (new facilities and procedures).

7.4. Furthermore, among regular missions, those addressing facilities that are approaching the flight inspection due date, particularly in the case of ILS Category III facilities, should be prioritized.

7.5. In some cases however, reductions in aerodrome operating hours may limit the number of working hours available in a day. In such cases and in other cases when overnight stays are necessary (e.g. to avoid exceeding flight duty time limitations), particular care should be given to assessing the chosen accommodation to ensure compliance with pandemic sanitation provisions and minimize the need for external contacts.

8. Specific Issues with Cross Border Flights

8.1. In some cases, in which flight inspection services are supported by cross border flights (international flight service operations), a number of specific issues have been encountered:

(a) requirements for special authorization to access aerodromes that would otherwise be closed to all traffic;

(b) requirements for special authorization for crew access to country;

(c) requirements for quarantine on crew arrival to destination and return to base;

(d) difficulties in ensuring avoidance of contact between crew and ground personnel at destination (eg due to custom/immigration controls); and

(e) suspension of ground maintenance activities.

8.2. These issues were largely unexpected, due to the situation being effectively unprecedented, and were not taken into account in the original inspection schedules. They have required ad-hoc adjustments, negotiated bilaterally on a case-by-case basis by the entities involved. This has typically led to scheduling delays. However, notwithstanding the delays, cross border flights have remained largely feasible, if less efficient, thanks to the commitment of all the parties to the flight inspection requirements.

8.3. In the process, the need for international recognition in pandemic situations of the special status and needs of flight inspection as a key element of the safety-critical air navigation infrastructure has been highlighted. Future work by ICAO will address the development of guidance to States on facilitating cross-border flight inspection operations in pandemic situations, including development of an advisory health safety protocol to minimize interaction between crew and ground personnel.

9. Dealing with Potential Periodicity Issues during and after the Pandemic

9.1. The informal survey results suggest that in principle flight inspection should be feasible even in COVID-19 times, possibly with some restrictions requiring prioritization/rearranging of schedule as discussed above.

9.2. As a result, periodicity of flight inspection should not be affected substantially, and it should be possible to limit any potential deviations from the nominal intervals to within the time window of extension mentioned in Doc 8071, 1.15.15. While Doc 8071 makes no recommendations on the length of such time windows, the extension window needs to be a reasonable fraction of the nominal interval. For example, some States use a maximum delay of 1 month for nominal inspection periodicities of 6 months.

9.3. In cases in which nominal periodicity cannot be maintained and the appropriate extension time window is exceeded (e.g. because of initial set-up issues with cross-border operations, as discussed above), Doc 8071, 1.15.15 offers a choice of actions that may be considered:

(a) allowing for further extension time, after engineering evaluation and/or ground maintenance reinforcement;

(b) downgrading of ILS (Category III down to Category I or II); and

(c) temporarily removing the navigation aid from service.

9.4. In choosing among those actions, the responsible entities should take into account the exceptionality of the current situation, in which aviation has suffered an unprecedented setback and is facing what can be expected to be a very difficult recovery phase. In this context, the navigation infrastructure must remain operational both to support the reduced level of traffic during containment measures (including flights meeting critical pandemic-related needs, such as delivery of medical supplies) and to facilitate the resumption of regular flight operations. Therefore, in cases where timely flight inspection cannot be ensured, the preferred method for maintaining safe signals in space is to either take advantage of the (short) periodicity extension window, or, if a longer extension is required, to grant an extension of periodicity intervals in line with the principles described in Doc 8071. Furthermore, in cases where flight inspection operations were suspended and periodicity intervals extended, careful planning should ensure that navigation aid availability of service can be ensured to support the recovery.

9.5. At the same time, no compromise on operational safety due to non-standard performance of navigation aids should be accepted. Instead, potential extensions of nominal inspection intervals should be considered only in the presence of appropriate mitigations maintaining nominal safety levels. To this end, the provisions of Doc 8071, 1.15 should be taken into account.

9.6. Doc 8071, 1.15.2 recognizes that the suggested periodicities are given as general guidance and may be modified based on the manufacturer's recommendation or operational experience. Subsequent sections (1.15.4 – 1.15.6) discuss the factors influencing the inspection intervals, including reliability and stability of operation of the equipment, extent of ground monitoring, degree of correlation between ground and flight measurements, changes in the operating environment, manufacturer recommendations, and quality of maintenance. In many cases, modern ground facilities using current technology provide highly stable and reliable signals. A point of particular practical interest in the current context is given in 1.15.6 with the observation that equipment reliability may be adversely affected by too frequently scheduled major maintenance activities, which should therefore be limited to essential needs if extended periodicity is desired.

9.7. Further sections of Doc 8071, (1.15.7 – 1.15.8 and 1.15.10- 1.15.14) discuss the type of technical analysis that would need to be performed to extend nominal ground and flight inspection periodicities in a normal situation. While performing such detailed analysis may be unpractical in a pandemic situation, it should be noted that the most important item to ensure safe facility performance is the verification of the proper functioning of executive monitor shutdown capabilities. Special attention should also be given to site safeguarding, especially if aircraft or other large equipment is being parked near a navigation aid.

9.8. While the guidance in Doc 8071 does not explicitly address the current situation, it does indicate that, in situations in which maintaining nominal flight inspection periodicity is effectively impossible, case-by-case extensions can legitimately be considered on an exceptional basis when the relevant enabling factors are present.

In other words, in the unprecedented situation now being faced by aviation, a reliable system running in a stable configuration with a history of nominal performance, undergoing regular ground checks consistent with manufacturer recommendations which indicate normal functioning, and in the absence of anomaly reports, should normally qualify for an extension of the periodicity interval.

9.9. Special considerations apply to the specific case of Category III ILS. Because of the particularly demanding requirements, rigorous testing is essential. For that reason, during the current pandemic several States are prioritizing flight inspection of Category III ILS. Should it nevertheless occur that flight inspection intervals for a Category III ILS are significantly exceeded, as mentioned above a potential option would be downgrading of the facility from Category III to Category II or Category I.

Note:

[1] It should be noted that "suggested" is the term used in Doc 8071, as opposed to "required". See for instance Doc 8071, 1.5.2: "This document contains suggested schedules for each radio navigation aid, which should be considered (and modified, if necessary), based on the conditions relevant to each State and each site."

[2] See for example EASA "Safety Directive under Article 76(6)(b) of Regulation (EU) No 2018/1139 - SD No.: 2020-01"

Chapter 3

Conducting Flight Inspection

3.1 TYPICAL FLIGHT INSPECTION PROCEDURES

3.1.1 Flight Inspection Procedures Manual

3.1.1.1 Each FISP should provide evidence of operating to a Flight Inspection Procedure Manual. This manual provides assurance to the customer that the necessary compliance checks are being carried out as intended by Doc 8071 and can help with demonstrating compliance. These may vary State to State depending on the regulatory oversight. Some investigation into other areas of aviation within your State can aid with what could be acceptable criteria such as:

(a) Procedure Development (Procedures for Air Navigation Services – Aircraft Operations (PANS-Ops) or Terminal Instrument Procedures (TERPs)); and

(b) Aircraft Recognized Approval Documentation (FAA/EASA, etc.).

3.1.1.2 Doc 8071 provides guidance on typical check methods intended for both Ground and Air for each facility type. The operator should ensure that each listed item is applicable to the inspection type (Commissioning or Categorization, Site, Periodic). The operator or owner of the facility should verify the FISP is adequate to satisfy the required parameter check. For comparison, flight test procedures have been also included in Doc 8071 for guidance.

3.1.1.3 Some flight profiles have been included in this document to assist with comparisons. In some situations, flight validation of the procedure is considered a separate inspection, and therefore it is important to check if the intended procedure covers flying the approach procedure. This may be of benefit in satisfying the procedure revalidation criteria.

3.1.1.4 Clear procedures should be provided to cover any navigational, surveillance or communication equipment that is subject to flight inspections. Inspections should be undertaken with equipment that has calibration traceability and where the FISP can provide clear evidence of the suitability for individual parameter assessment. A Test Accuracy Ratio (TAR) of minimum three or better for each parameter measured can provide a good picture of uncertainties and if the system is fit for purpose.

3.1.1.5 As a provider of service such as DVOR, ILS or other navigational equipment, it is important that the ANSP can demonstrate the facilities are operating to the respective ICAO standard. For this reason, the closer the inspecting receivers represents the level of avionics needed in large aircraft, the less risk of finding inconsistencies between airline approaches and ground check measurements. Hence it is sometimes advantageous if the equipment has international accreditation such as TSO conformance and other relevant aircraft software development standards. This is more important for systems that are directly used for the purpose of Air Navigation verification. The degree of compliance is less for items used as a surveillance tool.

3.1.2 Instrument Landing System (ILS)

3.1.2.1 Key requirements:

(a) Antenna should be calibrated for field strength through the frequency range and different orientations. This should also include frequency response and polar patterns. This data should be available for verification.

(b) The antenna should have TSO compliance for IFR and comply with the local airworthy certification. Location and installation of the antenna should be in accordance with the following:

(i) Recordings should show minimum propeller modulation.

(ii) Aircraft should be fitted with airworthy ILS/DME/Markers equipment approved for IFR flight.

(iii) Kit should be capable of recording the required parameters against the reference system, typically at a rate greater than 5 samples per second.

(iv) The antenna should also have the appropriate TSO rating as required by IFR flight.

(v) The kit should be capable of recording the parameters as outlined in Doc 8071 within the accuracy specified.

3.1.2.2 Typical Flight Profiles for ILS flight checks:

(a) Alignment runs normally commencing as required by the published procedure or 10NM for periodic Inspections.

(b) 6-10NM arc profiles, forty degrees either side of the runway centre-line.

3.1.2.3 Typical parameters to be recorded as applicable for the items being checked:

(a) Receiver course deviation for all systems include Localizer/Glidepath/markers/DME

(b) Aircraft position fixing system deviation

(c) The difference (a) minus (b)

(d) Receiver input signal level

(e) Modulation levels

(f) Frequency spectrum (optional)

3.1.2.4 Careful consideration should be made with regard to the procedures used and the purpose of the check.

3.1.2.5 Depending on the methods employed to ensure monitor integrity, instead of inspecting both the transmitting and monitoring systems of the ILS in every check, some locations may choose to flight inspect the transmitting system once in every two inspections.

3.1.2.6 FISP should be able to provide a table of parameters to assist with comparisons against Doc 8071.

3.1.2.7 An example checklist of commissioning and periodic flight inspection items for ILS is tabulated below for reference.

Check Item	Commission	Periodic
Identification	X	X
Modulation Balance	X	R
Modulation Depth	X	X
Polarisation	X	R
Front Course Alignment	X	X
Course Structure	X	X
Course Sector Width and Symmetry	X	R
Off-course DDM Clearance	X	-
Coverage or Usable Distance	X	-
Monitor Alarm – Front Course Alignment (Position Alarm)	X	X
Monitor Alarm - Course Sector Width (Width Alarms)	X	X
Monitor Alarm - Off-Course DDM Clearance	X (1)	X
Monitor Alarm – Coverage	X	-
Dual Equipment	X	X (3)
Flyability	X	X
Associated Navigation Aids (Navaids)	X	X (2)

LEGEND: R = To action on request
X = To action

- = Not required
(1) = Capture/Clearance Wide Alarm applies only for a dual frequency localizer
(2) = Includes runway visual aids
(3) = Alignment, Modulation Depth and Identification Only

3.1.3 Doppler Very High Frequency Omni-Directional Range (DVOR)

3.1.3.1 Key requirements:

(a) Antenna should be calibrated for field strength, and data should be available for verification. The antenna should have TSO compliance for IFR and comply with the local airworthy certification.

(b) Recordings should show minimum propeller modulation.

(c) Aircraft should be fitted with airworthy DVOR equipment approved for IFR flight.

(d) Kit should be capable of recording the required parameters against the reference system, typically at a rate greater than 5 samples per second.

(e) The antenna should also have the appropriate TSO rating as required by IFR flight.

(f) The kit should be capable of recording the parameters as outlined in Doc 8071, within the accuracy specified.

3.1.3.2 Typical parameters to be recorded as applicable for the items being checked:

(a) Receiver course deviation

(b) Aircraft position fixing system deviation

(c) The difference (a) minus (b)

(d) Receiver input signal level

(e) Modulation levels

(f) Modulation index

3.1.3.3 An example checklist of commissioning and periodic flight inspection items for DVOR is tabulated below for reference.

Check	Commission	Periodic
Identification	X	X
Voice	X	X
9960 Hz/30 Hz Levels	X	X
Vertical Polarisation	X	-
Orbit	X	X
En route Radials	X	R
Terminal Radials and Procedures	X	X (2)
Radial Plan	X	-
Intersections and Changeover Points	X	-
Off-track Coverage	X	-
VOR/DME Sector Altitude Coverage	X	R
High Angle Coverage	X	R
Receiver Checkpoint	X	X
VOR Monitor Checks	X	X
Dual Equipment	X	X
Transmitter Differential	X	-
Standby Power	X	-
Associated Navigation Aids (Navaids)	X	X (1)

LEGEND: R = To action on request
X = To action

-	=	Not required
(1)	=	An appearance inspection of the VASI/PAPI is to be included if not otherwise subject to a routine inspection
(2)	=	Final approach radial(s) only, profile as published

3.1.3.4 Some typical Flight Profiles for DVOR flight inspections:

(a) Arcs at published minimum safe altitude.

(b) Published approach radials at advisory altitudes.

3.1.4 Distance Measuring Equipment (DME)

3.1.4.1 Key requirements:

(a) Antenna should be calibrated for field strength and data should be available for verification. This should consider cables and connectors.

3.1.4.2 A summary of flight test requirements is listed in ICAO Doc 8071. These form a comparison against the FISP's procedure manual. If there are missing parameters, further clarification should be made where in some cases, with acceptable technical and statistical validation, these parameters could be moved to a ground inspection. This is more common on DME facilities. However, this may not be acceptable by your State's regulatory authority and may need to be endorsed by them.

3.1.4.3 Often the DME equipment would be included as part of the ILS or DVOR flight inspections where it is considered an associated facility.

3.1.4.4 Typically, published DME arcs with the appropriate altitude restrictions would be flown, and in accordance with any associated procedures.

3.1.4.5 Doc 8071 provides a list of parameters for reference. It is important to consider both ground check requirements and flight inspection requirements for DME.

3.1.4.6 An example checklist of commissioning and periodic flight inspection items for DME is tabulated below for reference.

Check	**Commission**	**Periodic**
Identification	X	X
DME System Distance Accuracy	X	X
Coverage - Terminal Procedures	X	X
Coverage – En-route Radials	X	-
Coverage - Off-track	X (1)	-
Coverage - Steps, Intersections and Changeover Points	X	-
Sector Coverage	X (1)	-
Dual Equipment	X	X (2)
Standby Power	X	-
Associated Navigation Aids (Navaids)	X	X

LEGEND:	X	=	To action
	-	=	Not required
	(1)	=	As specified by Navigation Services
	(2)	=	Identification only for second transponder

3.1.5 Primary Surveillance Radar and Secondary Surveillance Radar (PSR/SSR)

3.1.5.1 The requirements are very dependent on the engineering assessment requirements and expected coverage volume.

3.1.5.2 Some typical considerations are:

(a) Altitude;

(b) Range;

(c) Delay to alert; and

(d) Minimum radar coverage elevation.

3.2 OTHER TYPES OF FLIGHT INSPECTION

3.2.1 Procedure Validation

3.2.1.1 This is detailed in ICAO Doc 9906, Quality Assurance Manual for Flight Procedure Design. Volume 5 – Validation of Instrument Flight Procedures. The ANSP, FISP and Procedure Design Company need to work closely to ensure this aspect is covered off adequately.

3.2.2 VHF equipment, ADS-B, GBAS

3.2.2.1 Flight inspection is typically carried out under request from an appropriately trained Communications/ADS-B or GBAS engineer. The specifics such as location, type of check and flight profiles are determined by a collaborative approach between all involved disciplines. In some cases, flight inspection is used to assist in the validation of models for determining coverage.

3.2.3 Performance-based Navigation – RNAV and RNP

3.2.3.1 At a minimum, the aircraft should have the capability to undertake the desired procedure validation. RNP procedures' validation requirements would normally be specified within the Procedure Design Company specifications. The Aeronautical Design and Development organization should analyze the results to determine containment within the specified criteria. Technical assessment perspective is as follows;

(a) Validation of obstacle survey data is recommended during the flight validation process.

(b) Verification of survey data can be performed by setting ground stations at certain survey points. The ground survey team can check and compare the DGPS signal to the TSO avionic aircraft receiver position.

(c) The survey data may be affected by waypoint, track and bearing error.

(d) The effect of terrain shielding should be taken into consideration.

(e) Verification is often done slightly lower than the published profile to remove altimeter error as often it is advantageous to verify in the worst-case position.

3.3 TYPICAL FLIGHT INSPECTION SYSTEM PERFORMANCE SPECIFICATIONS AND ASSOCIATED TEST ACCURACY RATIOS (TAR)

3.3.1 Test Accuracy Ratios

3.3.1.1 As the results obtained by the flight inspection system could potentially be used to defend a service provider in the event of an incident or accident, the State should clearly specify the standards adopted in the maintenance and calibration of the systems used for flight inspection purposes. To effectively perform calibration of a system, the calibration equipment should be typically five (minimum three) times more accurate than the system equipment. Some considerations should be as follows:

(a) Temperature stability and compensation.

(b) Electromagnetic interference.

(c) Polar Pattern considerations.

(d) Absolute measurements.

(e) Relative measurements.

(f) Aircraft receiver and calibration equipment duplication.

3.3.1.2 The calibration equipment should also undergo regular periodic checking as part of verification against traceable international standards that support the TAR required.

3.3.1.3 A dedicated calibration facility operated by the ANSP or ISO/IEC 17025 approved facility is the preferred means by which to achieve this to ensure a good consistency of standards.

3.3.2 Duplication

3.3.2.1 System duplication is important throughout the calibration process of both the flight inspection equipment and calibration laboratory used to calibrate the systems. Duplication of equipment can very quickly identify system drift and prevent unknowingly using a bad receiver to adjust an air critical system incorrectly.

Chapter 4

Reporting of Flight Inspection Results

4.1 TYPICAL FLIGHT INSPECTION REPORTS

4.1.1 After each daily flight inspection, the flight inspector should prepare the flight inspection report. The formal flight inspection report signed by the responsible captain and flight inspector should be provided after the flight inspection. The contents of flight inspection report typically include the following items:

(a) Location

(b) Identification

(c) Flight inspection date(s)

(d) Facility inspected

(e) Type of inspection

(f) Inspected items

(g) Results

(h) NOTAM

(i) Facility status

(j) Remarks

(k) Aircraft registration number

4.1.2 A sample flight inspection report is provided in Attachment A to this Chapter for reference.

4.2 TYPICAL FLIGHT INSPECTION RECORDS

4.2.1 Flight inspection records and flight inspection data sheet should be provided by flight inspector. The contents of flight inspection record typically comprise of the following items:-

(a) Airport name

(b) Aircraft registration number

(c) Date of inspection

(d) Inspector's name

(e) Flight hours

(f) Facility type and identification

(g) Run numbers

(h) Transmitter number

(i) Flight inspection results of each run

4.2.2 A sample Flight Inspection Report is provided in Attachment B to this Chapter for reference.

Attachment A
Sample Flight Inspection Reports

Sample Flight Inspection Report for ILS/DME

1.LOCATION:	2.RUNWAY NO:
3.DATE(S) OF INSPECTION:	4.IDENTIFICATION:

5.TYPE OF INSPECTION		SITE EVALUATION		PERIODIC		SPECIAL
		COMMISSIONING		SURVEILLANCE		INCOMPLETE
6.FACILITY INSPECTED		LOCALIZER		GLIDE SLOPE		DME
		LIGHTING SYSTEM		7. AIRCRAFT NO**:**		

8.CATELOGY:	9.FREQUENCY:
10.COMMISSIONED COURSE WIDTH:	11.COMMISSIONED PATH ANGLE:

12.LOCALIZER				
FLIGHT INSPECTION ITEMS	TX1		TX2	
	INITIAL	FINAL	INITIAL	FINAL
IDENTIFICATION				
MODULATION				
ALIGNMENT				
COURSE STRUCTURE—Z1/RNG				
COURSE STRUCTURE—Z2/RNG				
COURSE STRUCTURE—Z3/RNG				
COURSE STRUCTURE—Z4/RNG				
COURSE STRUCTURE—Z5/RNG				
VERTICAL POLARIZATION/RNG				
WIDTH/SYMMETRY				
MEAN WIDTH(HALF)/SYMMETRY				
CLEARANCE 90/DEG				
CLEARANCE 150/DEG				
MOD.BALANCE(COS/CLR)				
Z5 ROLL OUT RESULT:				

USABLE DISTANCE				
MONITOR				
WIDTH ALARM(NARROW)/SYM				
WIDTH ALARM(WIDE)/SYM				
CLEARANCE 90 (WIDE ALARM)				
CLEARANCE 150(WIDE ALARM)				
ALIGNMENT ALARM(+)				
ALIGNMENT ALARM(-)				
13.GLIDE SLOPE				
FLIGHT INSPECTION ITEMS	TX1		TX2	
	INITIAL	FINAL	INITIAL	FINAL
ANGLE /REFERENCE DATUM HEIGHT				
MODULATION				

PILOT IN CHARGE:	FLIGHT INSPECTOR:	AIRCRAFT NUMBER:

Sample Flight Inspection Report for Runway Approach Lights and PAPI

<table>
<tr><td colspan="5">1.LOCATION:</td><td colspan="2">2.RUNWAY NO:</td></tr>
<tr><td colspan="7">3.DATE/DATES OF INSPECTION:</td></tr>
<tr><td rowspan="2">4.TYPE OF INSPECTION</td><td></td><td>SITE EVALUATION</td><td></td><td>PERIODIC</td><td></td><td>SPECIAL</td></tr>
<tr><td></td><td>COMMISSIONING</td><td></td><td>SURVEILLANCE</td><td></td><td>INCOMPLETE</td></tr>
<tr><td>5.FACILITY INSPECTED</td><td></td><td>PAPI</td><td></td><td>RUNWAY LIGHTS</td><td></td><td>APPROACH LIGHTS</td></tr>
</table>

<table>
<tr><td rowspan="3">6.COMMISSIONED PAPI ANGLES</td><td></td><td>NO.1</td><td>NO.2</td><td>NO.3</td><td>NO.4</td><td>PATH ANGLE</td></tr>
<tr><td>LEFT</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>RIGHT</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="7">7.PAPI INSPECTION RESULTS</td></tr>
<tr><td rowspan="3">ACTUAL PAPI ANGLES</td><td></td><td>NO.1</td><td>NO.2</td><td>NO.3</td><td>NO.4</td><td>PATH ANGLE</td></tr>
<tr><td>LEFT</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>RIGHT</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

ITEMS CHECKED	SAT	UNSAT	ITEMS CHECKED	SAT	UNSAT
COVERAGE ANGLE			VISIBLE DISTANCE		
INTENSITY LEVEL			INTENSITY COINCIDENCE		
NO. OF INOPERATIVE LIGHTS			COINCIDENCE WITH ILS		

8.APPROACH LIGHTS RESULTS INSPECTION RESULTS

ITEMS CHECKED	SAT	UNSAT	ITEMS CHECKED	SAT	UNSAT
LAMP ALINMENT			VISIBLE DISTANCE		
INTENSITY LEVEL			INTENSITY COINCIDENCE		
NO. OF INOPERATIVE LIGHTS			LIGHTS CATEGORY		

9.RUNWAY LIGHTS INSPECTION RESULTS

ITEMS CHECKED	SAT	UNSAT	ITEMS CHECKED	SAT	UNSAT
LAMP ALINMENT			VISIBLE DISTANCE		
INTENSITY LEVEL			NO. OF INOPERATIVE LIGHTS		
RUNWAY END LIGHTS			LANDING ZONE LIGHTS		

<table>
<tr><td>10.FACILITY STATUS</td><td>PAPI</td><td>RUNWAY LIGHTS</td><td>APPROACH LIGHTS</td><td rowspan="4">11.NOTAM’s:</td></tr>
<tr><td>UNRESTRICTED</td><td></td><td></td><td></td></tr>
<tr><td>RESTRICTED</td><td></td><td></td><td></td></tr>
<tr><td>UNUSABLE</td><td></td><td></td><td></td></tr>
<tr><td colspan="5">12.REMARKS:</td></tr>
</table>

PILOT IN CHARGE’S SIGNATURE:	FLIGHT INSPECTOR’S SIGNATURE:	AIRCRAFT NO:

Sample Flight Inspection Report for DVOR/DME

1.LOCATION:	2.IDENTIFICATION:

3.FLIGHT INSPECTION DATE(S):	4.FACILITY INSPECTED		VOR		DME

5.TYPE OF INSPECTION		SITE EVALUATION		PERIODIC		SPECIAL
		COMMISSIONING		SURVEILLANCE		INCOMPLETE

6.ORBIT RESULTS

NO.	TX NO.	FLIGHT LEVEL(MSL)	ORBIT RADIUS(NM)	MEAN BEARING ERROR	MEAN RANGE ERROR
1	**1**				
2	**2**				

7.RADIAL RESULTS

RADIAL USE								
AZIMUTH								
TX NO.								
MSL ALTITUDE								
DISTANCE FROM								
DISTANCE TO								
ALIGNMENT ERROR								
MAX BEND/RANGE								
ROUGHNESS/RANGE								
POLARIZATION								
TRANSMITTER DIFF								
MOD30HZ AM								
MOD30HZ FM								
MOD9960HZ								
MINIMUM SS								

DME RANGE ERROR								
INTERFERENCE								

8.MONITORS						
TX NO.	REFERENCE RADIAL	MSL	RANGE	ALIGNMENT	ALARM+	ALARM-

9.ORBIT BEARING ERROR (TX NO.1)

9.ORBIT BEARING ERROR (TX NO.2)

10.GROUND RECEIVER CHECK POINT			
GROUND CHECK POINT	TX NO.	BEARING READING	RANGE READING

11.GENERAL	TX1		TX2	
	SAT	UNSAT	SAT	UNSAT
STANDBY POWER				
VOICE				
VOR IDENTIFICATION				
DME IDENTIFICATION				

DME ACCURACY				
DME COVERAGE				

12.FACILITY STATUS			13.NOTAM's:
STATUS	VOR	DME	
UNRESTRICTED			
RESTRICTED			
UNUSABLE			

14.REMARKS:		
PILOT IN CHARGE'S SIGNATURE:	FLIGHT INSPECTOR'S SIGNATURE:	AIRCRAFT NO:

Attachment B
Sample Flight Inspection Records

Sample Flight Inspection Record

Flight Inspection Record / Log Sheet					
Airport Name:		Aircraft Registration Number:		Date of Inspection:	
Flight Hours:		Total Number of Run:		Inspector Name:	
Facility Type:		Identification:		Frequency:	
Temperature:		Air Pressure:			
Run Number	**Transmitter**	**Profile**	**Result Summary**		**Finding**

Appendix 1

1. USEFUL REFERENCE

- ICASC - Document on Standards and Recommended Practises for Flight Inspection & Flight Validation Organisations
  http://www.icasc.co/sites/faa/uploads/documents/Library/ICASC/ICASC_SARPs_FI_FV_v14_11102018_final101.pdf

- ICASC Recommended Flight Inspection & Flight Validation Contract Annex
  http://www.icasc.co/sites/faa/uploads/documents/Library/ICASC/ICASC_FIS_Contract__Annex_v0_2_26_05_2016_final101.pdf

- Reference note from ICAO on the considerations of radio navigation aids flight inspection periodicity during COVID-19
  https://www.icao.int/safety/COVID-19OPS/Pages/ANS.aspx

Appendix 2

1. Use of Emerging Technology to Supplement Flight Inspection

1.1. Flight navigation systems are essential in the world where global air traffic growths continuously. These systems enable Air Navigation Service Providers (ANSPs) to ensure that aircraft can reach their destination in due time safely, despite the continuous increase in air traffic density. Indeed, Air Traffic Management (ATM) companies strongly rely on advanced, unfailing and efficient navigation aid equipment in order to accomplish their mission in the best conditions.

1.2. Among the numerous requirements from the International Civil Aviation Organization (ICAO), flight navigation systems must be regularly calibrated, inspected and maintained to ensure that all essential navigation aids for pilots are always working properly. This means that these systems must be tuned and maintained to radiate the correct signals in the airspace, at any time. To achieve this, a combination of ground and air inspections is necessary, like the localizer measurements for CAT III ILS (Instrument Landing System).

1.3. ILS is an essential navigation aid to help pilots land their aircraft in low visibility conditions during IFR (Instrument Flight Rules) flights. In order to maintain the ICAO ILS certification, dynamic measurements need to be performed by the airport operators / ANSPs, their subcontracted flight inspection organizations or government agencies. These companies are always looking to improve and streamline inspection processes to mitigate impacts on airport operations. The regular ILS signal inspection is made in flight, using a manned aircraft. It requires prior coordination and preparation with various stakeholders, together with ground measurements in order to optimize the manned flight inspection.

1.4. Both of the above flight and ground operations have their limitations: the manned aircraft is costly, noisy and environmental unfriendly with large fuel consumption by flight inspection aircraft, while the ground one is limited in terms of reachable distance and height for the measurement antenna. The ground ILS inspections are indeed restrained to the runway threshold, since they are performed using masts that generally don’t go higher than around 25 meters, from the ground. This is where the initiative for developing drones or Unmanned Aerial Vehicle (UAV) inspection solution. With improved lifting power, efficiency and reliability, the drone / UAV could perform inspections in the ILS far field as well as ILS elevation profiles and mini approaches with inspection to analyze the ILS signals (course alignment, slope angle, alarms, displacement sensitivity, etc.) and to supplement the ground and manned flight measurements in a more comprehensive mean.

1.5. With the technology of UAV being widely and rapidly developing, more and more flight inspection institutes came into the research on how to utilize UAVs for flight inspection and many practices have been made. The UAVs are normally classified in two groups, the drones, which are smaller, normally with multiple rotors; and Remotely Piloted Aircraft System (RPAS), which are heavier and with fixed wings. Some institutes concentrate on the development of RPAS flight inspection, which is quite similar to the performance of normal flight inspection aircrafts, but cheaper on cost.

1.6. It should be noted that the technology of UAV/RPAS is still emerging. Major issues that still need to be addressed including the integration of UAV/RPAS with other manned civil aviation traffic in unsegregated airspace, while maintaining a similar high level of integrity and reliability that have been developed and matured over the past decades. These integrity requirements, especially those apply to the operations beyond line of sight, would be even more significant when operating in Terminal Airspace, with a mixture of UAV/RPAS operations and regular traffic in densely used airspace. Major challenges in mastering UAV/RPAS autonomous operations (traffic sensing and avoidance), improving system integrity and reliability, as well as establishing a suitable certification framework and process, still need to be addressed. Nowadays, UAV/RPAS are already well positioned to assist Ground and Flight Inspection under a clearly defined and restrained operational environment.

2. Flight Inspection with Drones

2.1. Application of drone inspection allows improvements on ILS inspection operations by dramatically reducing the manned aircraft flight inspection frequency and thus decreasing the overall operational cost for airport operators. Highlights of advantages that could be brought by applying drone in ILS flight inspections are listed below:

(a) Supplement to ILS ground measurements

(b) Excellent repeatability

(c) Cost & time saving

(d) Flexible inspection time

(e) Reducing operational disturbances

(f) Reducing CO_2 and noise emissions

2.2. This major step in ILS maintenance domain for preventive and corrective maintenance is only a beginning. Thanks to the technology advancement, research institutes are going further in developing the next generation ATM systems. In addition to ILS flight inspections, new horizon also arise for drone / UAV inspection on other systems like VOR, DF, PAPI, radars, etc.

2.3. With user-friendly interface, preparing the drone operation could take less than 1 minute. The operator just has to select the airport and the runway from database and then choose the type of the required inspection. Once this is done, all the required data (missions, waypoints, distances, altitudes, etc.) is generated automatically. There is no need to read the procedures to figure out which measurements that are to be made and where to be made. The operation could be created in platform with simple access from the tablet to view and download the details. This database of airports, runways and navigation aids can be expanded and updated with an easy-to-use web interface.

2.4. Once the corresponding operation has been downloaded to the inspection program / application, the operator could launch the mission and monitor the automated procedures. The operator is guided throughout the mission. Each mission takes only a few minutes of flight and could be repeated as many times as needed. Measurements are available and could be viewed in real-time.

2.5. Reports are viewable on-site through the program / application. There is no need to download the measured data to compile the reports. Reports contain all the relevant measurements and parameters same as any report generated from generic flight inspection aircraft, in the form of tables and images. Reports, along with all the measurements, images or videos, are uploaded into a platform for centralized recording, future reference or additional processing.

3. Worldwide Development of Drones to Assist Flight Inspection / Testing

3.1. As in 2019, flight inspection organizations or institutes in Belgium, China, Germany, Italy, Russia, Spain have used drones to assist and provide supplementary tests in flight inspection works. The drones are normally be used to assist testing of navigation equipment signals, since they are not competent for all flight inspection missions with limited performance in speed, service ceiling, endurance, crosswind resistance, payload, etc.

3.2. Belgium

(a) The development of the UAV / drone solution for ILS inspection was started in 2015 and in operation since January 2018 in Belgium and has extended the usage to Geneva (GVA – LSGG) and Zurich (ZRH – LSZH) airports.

3.3. Germany

(a) In early November 2018, a drone specially developed for carrying out ILS measurements was employed at Hannover International Airport in Germany during the commissioning of a new ILS. This entailed generating DDM (Difference of Depth of Modulation) measurement curves above and below the 3° approach path of the new 09R ILS at 1 km distance from the threshold. The measurement flights were monitored not only in the control tower of the Hannover airport, but also at the DFS headquarters in Langen via a drone tracking system. The flights were very successful and form an important impulse for the rapid operational introduction of measurement drones for ground measurements of the numerous Instrument Landing Systems installed at German airports.

4. Flight Inspection with RPAS

4.1. Balancing the factors of performance, cost, operation, maintenance, management, safety, the fixed-wing RPAS with 8-11 meters wing span is better for flight inspection due to its stability in flying, with following example performance for reference.

4.2. Typical performance of RPAS for flight inspection

(a) Wingspan: 8-11 meters

(b) Cruising speed: 100-180 km/h

(c) Max speed: 200-240km/h

(d) Ceiling: 6000m or higher

(e) Runway length for take-off and landing: 300m or longer

(f) Payload for inspection equipment: 50kg or more

(g) Electrical power supply: 2kw or more

(h) Endurance: 5 hours or more after inspection system installed

(i) Communication: C2 or 5G or Data link with bandwidth more than 2M

(j) Flight control: fully pre-programmable

4.3. Typical RPAS flight inspection system configuration

(a) RPAS aircraft

(b) Airborne inspection system including all the receivers, transceivers, camera, position-fixing, communication equipment and antennas, etc.

(c) Vehicle-borne system including control console, communication equipment, differential station, etc.

(d) Container and transportation truck

(e) Control car

(f) Auxiliary equipment and mobile

4.4. Operation considerations of RPAS flight inspection

(a) Fully pre-programmed flight for all inspection profiles including take-off and landing

(b) Signal collection in the air and processing on the ground

(c) Internet Big Data system and Artificial Intelligence (AI) analysis

(d) On-site co-operation with NAVAID maintenance and ATC

(e) Ground transportation from airport to airport

(f) Crew members:1 or 2 inspectors, 3 or 4 maintenances/operators

4.5. Safety management of RPAS flight inspection

(a) Organizations or institutes operating RPAS flight inspection should establish a safety management system (SMS) to ensure flight safety of RPAS. A good experience is to evaluate with the tool named SORA (Specific Operations Risk Assessment).

5. Profiles and Items for RPAS Flight Inspection

5.1. ILS

(a) All the ILS inspection profiles could be flown by RPAS.

(b) All the inspection items including LOC alignment, GP angles, modulations, structures, clearance, width, coverage and all the alarms could be checked by RPAS.

(c) Alignment alarm of LOC should be checked closer to the antenna on the runway or using the approach since it would be difficult to get a stable result on the ground of runway threshold.

5.2. VOR/DME and NDB

(a) RPAS could implement almost all the profiles required for VOR/DME and NDB flight inspection. The only insufficiency is the high flight level en-route signal check limited by RPAS performance.

5.3. PAPI

(a) Many institutes and organizations have attempted to check PAPI with camera-equipped drones. RPAS could do this work better since it could simulate a real approach and get more realistic results. However, camera stability and the ability to zoom during high speed approach would be a challenge to RPAS flight inspection researchers.

5.4. Flyability

(a) The lack of human sensing and judgment in actual cockpit and without assistance from on-board flight instruments, it is difficult to rate the fly-ability for a specific procedure / equipment by RPAS flight inspection. . It is suggested that fly-ability should be assessed by manned aircrafts.

5.5. Flight inspection recordings and plotting

(a) Flight inspection recordings and plotting, together with the inspection reports could be done on ground and transferred to a central data repository, which could then be analyzed by customers and facilitate set-up of a Big Data system for future management and reference.

Summary Report of CNS SG/24 meeting

Agenda Item 1: Adoption of agenda

1.1 The tentative agenda proposed in **WP/01** was adopted by the meeting. The meeting was chaired by Mr. Richard Wu, the Chair the CNS Sub-group.

Agenda Item 2: Review outcomes of APANPIRG/RASG Chairpersons review, APANPIRG/30 meeting, 40th Session of ICAO Assembly, ATM Sub-group and other major meetings relevant to CNS Sub-group

Outcomes of A40 and APANPIRG/30 on CNS (WP/02)

2.1 The meeting was informed that there was no outstanding issue on CNS in Assembly 40 (24 September - 4 October 2019).

2.2 The meeting carried out a review of the actions taken by APANPIRG/30 on the four Conclusions formulated by the CNS SG/23. The meeting also noted the follow-up actions taken on the 9 Conclusions and 4 Decision adopted by CNS SG/23 meeting.

Outcome of APANPIRG/RASG Chairpersons Review (IP/11)

2.3 The meeting noted the progress made on the follow-up actions taken on the outcomes of APANPIRG/30 and RASG-APAC/9 meeting. The meeting also briefly reviewed the key outcomes/achievements of APANPIRG/30.

ATM/SG/8 and RASMAG/25 Outcomes (WP/03)

2.4 The CNS/SG/24 was briefed on the outcomes from the ATM/SG/8, xx-xx November 2020 and the RASMAG/25, 27 – 30 October 2020.

ADS-B

2.5 Singapore had presented its plan to establish ADS-B out exclusive airspace within the Singapore FIR in phases by January 2022. The ATM/SG/8 had also noted that a number of other States contemplating the use of ADS-B within international airspace, including SB ADS-B, so it would be better to have several States jointly submit a PfA. The Chair encouraged a Small Working Group of interested States to work on the PfA. ICAO APAC ATM Officer in charge would notify this initiative to the upcoming CNS/SG/24 meeting.

CNS Systems Resilience and GNSS Interference (IP/10)

2.6 The Council, at the ninth meeting of its 220th Session on 22 June 2020, agreed with the proposal to bring to the attention of States the actions agreed by the 40th Session of the Assembly with regard to CNS systems resilience and mitigation of harmful interference to GNSS.

2.7 A State Letter with Ref.: AN 7/5-20/89 and **Subject**: *Strengthening of communications, navigation, and surveillance (CNS) systems resilience and mitigation of interference to global navigation satellite system (GNSS)* was circulated to States on 28 August 2020, and proposed required action by States on the aforementioned issues.

2.8 The meeting noted the criticality of the issue and the importance of action by States to address it by making use of the ICAO guidance provided in Doc 9849, *Global Navigation Satellite System (GNSS) Manual*. **ACTION ITEM 24-1**

Agenda Item 3: Aeronautical Fixed Service (AFS)

3.1 Under this agenda, the meeting reviewed meeting reports of a number of contributory bodies on the AFS matters.

Outcomes of ACSICG/7 including the outcomes of CRV OG/7(WP/04)

3.2 The Secretariat presented the outcomes of the Seventh Meeting of the Aeronautical Communication Services Implementation Coordination Group (ACSICG/7) which was held from 21 to 23 July 2020 using VTC. The ACSICG/7 meeting reviewed the outcomes of the 7th meeting of CRV Operations Group (CRV OG/7) and took follow-up actions.

3.3 The meeting noted the updated ATN/AMHS and AIDC implementation status in the APAC Region provided in **Appendix A** to this Report.

Election of a co-chair of the ACSICG

3.4 Mr. Chonlawit Banphawatthanarak, Chief, Policy and Strategy Management Bureau of AEROTHAI was unanimously elected as co-chair of the ACSICG of APANPIRG.

Action taken on the Report of CRV OG/7 Meeting

3.5 The Seventh Meeting of the Common aeRonautical Virtual Private Network Operations Group of APANPIRG (CRV OG/7) was held in ICAO Asia and Pacific Office from 20 to 22 January 2020.

3.6 The ACSICG/7 meeting recognized the challenges and difficulties faced by States/Administrations under current pandemic situation and recommended to postpone the target year of regional implementation of CRV from 2020 to end of 2021. PCCW Global Limited (PCCWG), as the contractor for the provision of CRV infrastructure and services, also agreed to extended target year for regional CRV implementation from 2020 to 2021 without changing terms and conditions of their technical/price offers.

3.7 Through **Flimsy/04** prepared by the Secretariat, the meeting recapped the Action Item DGCA/54/20 in 2017 putting up 2020 as the target date for CRV implementation for all ANSP to optimize cost benefit. The meeting then recalled the Beijing Declaration adopted by the first Asia/Pacific Ministerial Conference on Civil Aviation (APACMC) in 2018 that States/Administrations were requested to take necessary follow up actions in achieving implementation of Common Ground/Ground Telecommunication Network in APAC Region by 2022. With aforementioned, the meeting formulated a draft conclusion as following: **Draft Conclusion CNS SG/24/1 - Target Year of CRV Implementation in APAC Region**.

3.8 According to the latest updates in November 2020 from PCCWG, **eleven** States/Administrations have joined CRV and implemented operations: Australia, Bhutan, China, Hong Kong China, Fiji, Japan, New Zealand, Philippines, Republic of Korea, Singapore and USA. Additional **nine** States/Administration have plan to join CRV: France-New Caledonia and Polynesia, India, Indonesia, Malaysia, Nepal, PNG, Russia, Thailand. The Updated CRV Implementation Status Table is provided in **Appendix B** to this report.

CRV for AMHS Centres of the Russian Federation Interacting of COM Centres in the APAC Region

3.9 Russian Federation provided updates on their plan and progress of joining CRV at number of centres (Moscow, Khabarovsk, Irkutsk) in Russia to interact with COM centres (Fukuok, Beijing and Ulaanbaatar) in the APAC Region as well as COM centres in USA (Salk Lake City and Anchorage). In following up the outcome of COM Coordination Meeting in May 2019, Russian

Federation is considering options to join CRV at those designated entry/exit points in Russia with entry/exit points in the APAC Region.

3.10 The meeting noted that CRV OG supported for Russian Federation to join CRV. In following up the outcome of the meeting, the ICAO Secretariat sent a letter with reference of: T 8/2.10-AP-CNS0020/20 dated 20 February 2020 to Russian Federation.

MPLS/IP Based Inter-Regional Connection

3.11 The meeting agreed to a proposal to develop a high-level concept on the interconnection of the CRV with other regional network such as REDDIG/MEVA/PENS. A number of States that connecting to the CRV are also planning to connect to other regional networks for cost reduction and improve efficiency. Noting these requirements, the CRV OG and PCCWG will enhance and trigger early discussions with these regional networks at future opportunity to consider how the CRV can potentially be interconnected with other regional networks.

CRV and AFS Safety and Protection planning

3.12 In following up the outcome of CNS SG/23 meeting, the AFS Safety and Protection joint working group meeting scheduled for 21 to 23 April 2020 in Nevada, USA has been postponed without a firmed date. The meeting considered necessary and timely to address safety and security concerns as more and more AFS and other new applications being transferred to and exchanged over CRV. This meeting was also planning to discuss inter-network connection as indicated in the paragraph above.

Proposal to use CRV for Space based ADS-B

3.13 PNG and ICCAIA jointly made a presentation on use of CRV for delivery of surveillance data from spaced-based ADS-B. One prime purpose for using CRV is to reduce the need for point to point circuits and would result in lower data communications costs for ANSPs. PNG Air Services Limited (PNGASL) has contracted for the supply of space-based ADS-B data from Aireon LLC and is intending to contract for a CRV connection in early 2020. Indonesia expressed support to PNG's proposal to use CRV for distribution of space-based ADS-B data.

3.14 The meeting noted that in following the agreed procedure, co-chair of CRV OG from Australia conducted survey with members of CRV OG regarding the service provider Aireon LLC's joining CRV. The co-chair from Fiji was requested to provide the result of the consultancy on the CRV portal.

SWIM Demonstration on CRV

3.15 The meeting noted that SWIM Demonstration on CRV to be hosted by Hong Kong China scheduled for March 2020 has been postponed due to pandemic. Hong Kong China was requested to keep the Secretariat informed of the new date of the Demonstration once available.

CAAP-FAA AMHS/AIDC Planned Routing Changes

3.16 Considering the upcoming AMHS service between Civil Aviation Authority of the Philippines (CAAP) and USA Federal Aviation Administration (FAA) will become operational in 1Q2021, the Philippines and USA proposed to make following routing changes:

- USA will route all "RP" traffic directly to the Philippines with existing route via Japan as alternate.
- The Philippines will route all "C", "K", "M", "P", "S" and "T" traffic directly to the US as primary and to Hong Kong China as an alternate.

3.17 USA and the Philippines will coordinate with AMC for these routing changes. The ICAO Regional AFTN/AMHS Routing Directory may also be updated to reflect the new traffic routes. The meeting noted that the AMHS connection between FAA and CAAP would carry AIDC traffic after successful implementation of AMHS.

Report on the readiness status of AMHS to support IWXXM service by November 2020

3.18 The following ANSPs should be able to support IWXXM using their respective AMHS with FTBP capability: Australia; Bangladesh; Bhutan; Cambodia; China; Hong Kong, China; Macao, China; Fiji; India; Indonesia; Japan; Republic of Korea; Myanmar; Nepal; New Zealand; Pakistan; Philippines; Singapore; Sri Lanka; Thailand; and USA.

3.19 The meeting recommended that States with designated BBIS: Australia, China, Hong Kong, China, Fiji, India, Japan, Singapore, Thailand and USA should increase their respective connection bandwidth to greater than 64kbps if feasible and applicable.

APAC regional Strategies on AMS and Air-Ground Data Link

3.20 As assigned by the CNS SG in 2019, China took the lead and worked together with Australia, Japan and USA to review the regional AMS strategy adopted by APANPIRG in 2013 and the Datalink strategy adopted by APANPIRG in 2005. The draft on the revised strategies were distributed among members and discussed through a teleconference on 1 July 2020. As a result, the ad hoc group agreed to submit the proposed changes to the ACSICG/7 for consideration.

3.21 The meeting reviewed the draft on the revised strategies attached to WP presented by China, Australia, Japan and USA. The meeting further discussed some additional changes proposed by Singapore. As a result of discussion, the meeting endorsed the revised regional strategies and formulated a Draft Conclusion **ACSICG/7/1 - the Revised Regional Strategies on AMS and Datalink** for consideration by CNS SG.

3.22 The meeting expressed appreciation to China, Australia, Japan and USA for the development of the revised strategies and to Singapore for the comments on further improvement, and agreed to a proposal to forward the draft strategies agreed by the meeting to the FANS Interoperability Team Asia (FIT-Asia/10) for comments and endorsement at its next meeting scheduled for early August 2020 before its final adoption by CNS SG in December 2020.

3.23 With aforementioned, the meeting further reviewed the revised regional strategies and formulated the following Draft Conclusion for consideration by APANPIRG: **Draft Conclusion CNS SG/24/2(ACSICG/7/1) - the Revised Regional Strategies on AMS and Datalink.**

Amendment to AFTN/AMHS-based ATFM Interface Control Document (ICD)

3.24 The Tenth Meeting of the Asia/Pacific ATFM Steering Group (ATFM/SG/10, Video Teleconference, 4 to 8 May 2020) proposed amendment to the AFTN/AMHS-based ATFM ICD which was endorsed by ACSICG and adopted by CNS SG/23 meeting in 2019.

3.25 Subsequent to the ATFM/SG/10 meeting, the Secretariat conducted a further editorial review of the ICD, in consultation with the ATFM/SG/10 Chair and the AMNAC Technical Sub-group. The document was further amended to correct some errors and minor omissions.

3.26 In view of the foregoing, the meeting adopted the following Conclusion: **Conclusion CNS SG/24/3(ACSICG/7-2 (ATFM/SG/10-3)) - Amendment of the AFTN/AMHS-based Interface Control Document (ICD) for ATFM.**

Draft CRV Operations Manual (WP/24)

3.27 New Zealand presented update on the CRV Operations Manual after the ACSICG/7, as the outcome of the ACTION ITEM of the meeting. Since then several ad hoc meetings have been held. The main focus has been on the Request Fulfillment Process and procedures as this provides the information and directions required to join, leave or make changes the CRV network. This has also led to the need to have a CRV landing page on the ICAO APAC and MID regional websites. This landing page will provide an overview of CRV and who to contact. An initial request will be send to the APAC CRV Portal Administrator requesting to join, leave or add a new connection to CRV. Upon receipt of the request, a registration form is provided and check the content is completed. Once published, the CRV OG will manage changes to the Operations Manual and other CRV related documentation through the Document Administration Process and Procedure which is detailed in the Operations Manual.

3.28 With the abovementioned, the meeting adopted the following Conclusion: **Conclusion CNS SG/24/4 - Publishing of the CRV Operations Manual**.

3.29 The meeting also endorsed the following Decision: **Decision CNS SG/24/5 - CRV landing page on the ICAO APAC website**.

3.30 The meeting also noted the issues related to CRV operational support at a regional level, as more and more ANSPs, service providers and service consumers have been joining CRV, various services are being implemented over CRV. States/Administrations are encouraged to share their new ideas on this issue in future meetings. **ACTION ITEM 24-2**

Review of AMHS Readiness Status for Supporting IWXXM (WP/05)

3.31 The APANPIRG/28 in September 2017 through Conclusion APANPIRG/28/16: *Upgrade AMHS to support IWXXM traffic* urged all APAC States/Administrations to upgrade AMHS systems (AMHS server and User Agent) by November 2020 to either Extended AMHS or Basic ATS Message Handling Service plus File Transfer Body Parts sub-set of extended AMHS for Binary data exchange (FTBP) functional groups as defined in **Doc 9880 Part IIB section 3.4.1**.

3.32 Consequently, a number of States/Administrations shared the AMHS readiness and experience for supporting IWXXM Traffic at the ACSICG/7 from 21 to 23 July 2020. The APAC State Letter Ref.: T 8/3.5 & T 8/2.11– AP160/20 (CNS) was sent to States/Administration in August 2020 as a reminder to upgrade the AMHS with FTBP and deploy AMHS connect to achieve synchronized AMHS distribution mechanism to support MET information exchange using IWXXM in the APAC Region. The report of AMHS readiness from States/Administrations and was further updated by CNS SG was provided in **Appendix G** to this Report.

Updates on APAC Implementation of IWXXM Exchange over AMHS (IP/21)

3.33 The Secretariat presented the updates on the implementation of IWXXM exchange over AMHS in APAC Region based on the outcome of MET SG/24 meeting, and invites the meeting to request the States to urgently advise the ICAO of their implementation details.

3.34 The meeting noted that a majority of APAC States/Administrations had not yet reported full implementation of IWXXM format, in accordance with the standards in ICAO Annex 3, applicable from 5 November 2020. IWXXM exchange requires AMHS (with FTBP) and the use of unique AMHS addresses. The Regional OPMET Centres (ROCs) will be responsible for distribution of IWXXM formatted OPMET data in APAC. An online register of the status of IWXXM exchange capabilities in APAC Region will facilitate IWXXM exchange between capable ROCs.

3.35 The meeting requested the MET SG and CNS SG to enhance mutual coordination and sharing outcomes of related survey and seminar/workshop, and encouraged States/Administrations to expedite responding to the ICAO's survey as soon as possible before APANPIRG/31, and the contributory body of MET SG (Meteorological Information Exchange Working Group (MET/IE WG)) should work collaboratively with ACSICG for a way forward in APAC region. **ACTION ITEM 24-3**

Presentation of PCCW Network Based IWXXM Translation and Exchange Services (IP/23)

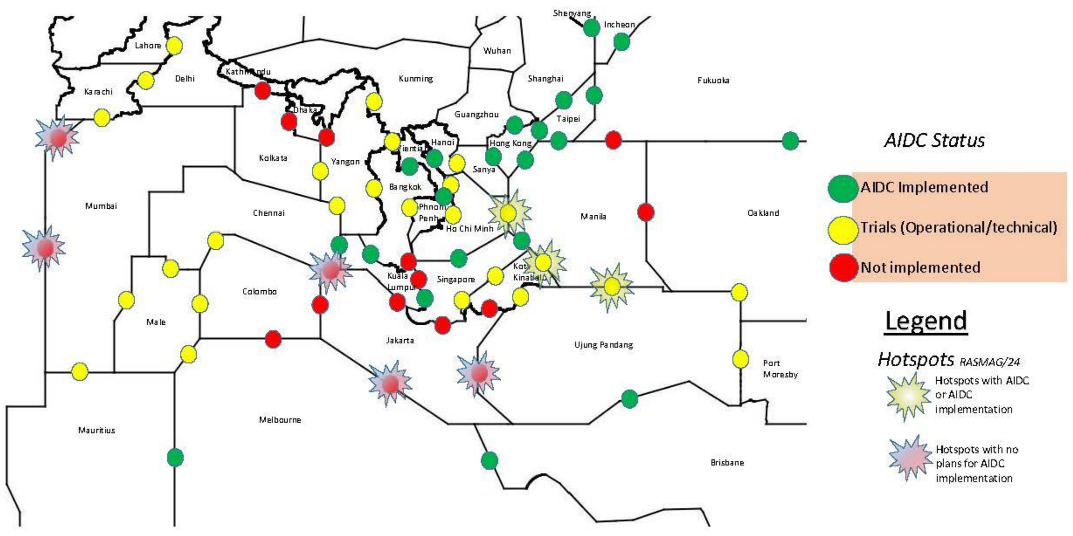
3.36 Fiji and PCCWG described PCCW IWXXM Translation and Exchange Services. They proposed that it could serve as an alternative solution for member States to fulfil the exchange of IWXXM messages.

Report of the Sixth Meeting of the Asia Pacific AIDC Task Force (WP/06)

3.37 The Sixth meeting of the ATS Inter-facility Data Communication Task Force (APA TF/6) noted that AIDC implementation in South China Sea sub-region had been satisfactory while further efforts by States in the Bay of Bengal sub-region are required. The summary of the new AIDC connections implemented since the APA TF/5 meeting is listed below:

- Automatic handling over based on OLDI ICD between Shenyang ACC and Khabarovsk ACC implemented in October 2019 over a dedicated line;
- AIDC operational implementation between Kuala Lumpur ACC and Chennai OCC came into effect on 1 April 2020;
- Operational AIDC between Singapore ACC and Kuala Lumpur ATCC with limited messages set was implemented on 1 November 2019;
- Operational AIDC between Bangkok ACC and Kuala Lumpur ATCC with limited messages set was implemented on 14 March 2020;
- Operational AIDC between Bangkok ACC and Vientiane ACC with 5 messages set was implemented on 14 July 2020;
- AIDC service between Manila ACC and Hong Kong ACC implemented on 23 May 2019;
- AIDC service between Manila ACC and Singapore ACC implemented on 1 November 2019; and
- AIDC service between Manila ACC and Taipei ACC implemented on 5 December 2019.

3.38 The meeting encouraged States/Administrations concerned to continue work bilaterally to expedite implementation of those planned AIDC connections as priorities identified by APANPIRG. The graphical map for quick and easy understanding of the regional AIDC implementation status is shown below.



APA AIDC Implementation Chart ver 2 (Jul 2020)

Collected AIDC Implementation Issues

3.39 The latest AIDC issues were presented to APA TF/6 meeting by Indonesia with support from India and Singapore. The meeting considered that the issue table would continue to serve as a reference for other States. A summary of the 89 issues identified is shown in the Table below:

Fault Categories	APA TF/6 (2020)		
	Issues Reported	Closed	Open
a. Communication Link	9	3	6
b. ATM System	50	20	30
c. AIDC Message	17	15	2
d. Airspace Design/Procedures	8	4	4
e. Other	5	2	3
Total	**89**	44	45

3.40 The meeting encouraged States/Administrations to provide the identified issues with recommended solutions to Indonesia for consolidation into the issues form.

AIDC Webinar

3.41 Due to the significant achievements made by APA TF under such a difficult time, the key contributors of the task force were invited to make a webinar on AIDC to APAC region, titled *AIDC Implementation Benefits and Lessons Learnt*. The webinar was successfully conducted on 9 October 2020. The presentation is provided as **Appendix H** to this report.

3.42 The meeting appreciated the great contribution of the APA TF since its establishment including the guidance material and promotion on implementation. The meeting also agreed that the understanding on AIDC implementation may differ from the regional perspective and State's perspective, based on regional planning document or bilateral agreement between ATSUs. APA TF holds the view that the number of messages to be implemented in AIDC operation would be considered as far as practical. Regarding the AIDC/OLDI implementation between India and Oman, the meeting was informed that ATM automation system of Mumbai is capable to support AIDC and OLDI, inter-regional coordination between India and Oman may require escalation through ICAO APAC and MID Office.

Fourth Meeting of System Wide Information Management Task Force (WP/07)

3.43 The meeting reviewed the report of SWIM TF/4 meeting held from 3 to 6 November 2020 via VTC.

Election of Co-Chair of the Task Force

3.44 Dr. Amornrat Jirattigalachote, Strategic Planning Manager (Engineering), Policy and Strategy Management Bureau of AEROTHAI, was elected as co-chair of the APAC SWIM Task Force.

Review SWIM Task Force Programme and outstanding action items

3.45 The meeting reviewed the development of SWIM TF's work plan and the updating of Action List with highlight on the restructure of the task assignment and numbering. The meeting noted the information, considered the amendment as necessary, and therefore adopt the revised task structure through **Decision SWIM TF/4/1** - *Revised SWIM TF Task Group*.

An Approach for APAC Regional SWIM Implementation

3.46 Japan presented the research and practical results of previous Task 1.8 and the optional approaches of regional SWIM construction and implementations within transition period. The research work of this Task was carried out in coordination with the tasks of ASEAN SWIM Demonstration and SWIM Service and Application Validation. To overcome the limitations of CRV and avoid the unsupportable point-to-point connections between all stakeholders, the cooperation between CRV and SWIM service providers is required. As result of discussion, the meeting agreed to adopt an CRV-based interoperable architecture in which the CRV communication and SWIM communication are divided into different layers to assure the performance of CRV for conventional AFTN/AMHS applications and improve the flexibility required for regional SWIM implementation. It is required SWIM service providers to establish common agreements and creating a collaborative environment at the regional level to ensure information exchange between different systems.

3.47 The meeting further discussed the technical capabilities of SWIM TI required to achieve interoperability during the transition period, such as: 1) The SWIM TI will have two interfaces that enable the exchange of information with both CRV-based legacy systems and SWIM-enabled systems; 2) SWIM-enabled systems need to receive/send different AFTN/AMHS message types (MET, AIS, and ATS) from/to CRV-based legacy systems according to information domain requirements; 3) The SWIM TI is able to decouple CRV-based legacy and SWIM-enabled applications from external systems that implement different communication protocols.

SWIM Technical Overview Centered around CRV

3.48 PCCWG, the CRV provider selected through ICAO TCB process, presented a system architecture of SWIM service. It is a managed SWIM solution which can be deployed with the preference of each member States and is proposed to run on CRV network as value-added service.

3.49 PCCW SWIM infrastructure could be one of the global/commercial EMS nodes to deliver SWIM services or qualified third party services. The deployment options include on-premise deployment, network based as well as hybrid model. This enables flexibility to meet individual State requirement.

Extension Development of FIXM to Support National ATFM Operations and ATFM/A-CDM Integration in China

3.50 In order to implement data sharing among ATFM stakeholders, and facilitate a seamless and agile exchange of ATFM data, the development of FIXM has been started by ATMB of

CAAC in 2019, based on FIXM APAC FLOW Extension version 1.0. Additional data attributes required to be exchanged among stakeholders involving in ATFM operations and to support the integration between ATFM and A-CDM were identified in FIXM ATMB ATFM Extension version 0.1.

SWIM Discovery Service (SDS): Introduction

3.51 United States (USA) and Republic of Korea (ROK) introduced the concept of a SWIM Discovery Service (SDS). The ability to search for and locate (discover) services offered by a growing number of independently developed and autonomously managed SWIM domains is highly important and is a precursor for achieving global information exchange. The Federal Aviation Administration (FAA) and Korea Airports Corporation (KAC) are collaborating in an effort to define and test an approach for enabling federated service discovery across geographical and organizational boundaries. The paper described SDS interaction patterns and discussed the contents of the Implementation Specification, including SDS behavior model, information model, resource model, interface requirements, and security requirements. The meeting noted that the SDS approach is consistent with the federated registry architecture adopted at SWIM TF/3, and encouraged participants to collaborate on SDS development.

Security and Trust in the Context of SWIM Service Discovery

3.52 USA and ROK provided a discussion of Security and Trust in the Context of SWIM Service Discovery. The joint FAA and KAC effort to establish a SDS development and testing environment has identified the need to address issues of security and trust that might occur when multiple independently operated discovery services exchange information. The paper illustrated some of these issues using an example scenario (an end user wants to "find all operational flight services") that requires intercommunication among three different discovery services. It went on to explain that FAA and KAC are investigating using a federated identity management solution approach to secure the communication and showed how this approach could answer questions raised in the scenario. The paper also provided an overview of the latest relevant security technologies, and it discussed the proposed APAC Mutual Trust Infrastructure being developed as part of the Security Management subtask (Task 5) and its relationship to issues of trust between discovery services. The meeting recommended that issues identified in the paper be addressed by the TF Governance task and TF Security Management task, and encouraged participants to collaborate further on this subject.

SWIM Service Category Taxonomy

3.53 USA presented a SWIM Service Category Taxonomy designed for the purpose of organizing SWIM services into classes or categories to make the services easier to find or manage. The paper defined taxonomies as hierarchical classification schemes and described this particular scheme as a 3-level hierarchy with a top level "SWIM Service" classified into two categories, "Information Service" (services that provide information products) and "Core Service" (services that provide support capabilities). Each category has subcategories; e.g., "Weather Service" is a subcategory of Information Service, and "Security Service" is a subcategory of Core Service. The virtue of this taxonomy is that it can be extended horizontally by adding more categories to any level of the hierarchy, or vertically by further dividing a particular category into more specialized subcategories; in this way it is able to meet future business needs. Rendering the taxonomy into machine language (see https://semantics.aero/service-category) also allows it to support applications for service discovery or governance processing. The paper concluded by suggesting that the taxonomy be adopted as a standard approach for classifying SWIM services.

Implementation Status of SWIM Discovery Service (SDS)

3.54 USA and ROK provided information on the Implementation Status of the joint FAA/KAC SDS effort. In October 2019, (FAA) SWIM and KAC began a collaborative effort to establish a virtual environment for conducting transparent and replicable development of discovery services for future deployment by APAC SWIM initiatives. The paper presented a list of FAA/KAC work items together with the current status of each item. Completed items include: a service registry for ROK SWIM, a SDS Specification v.1.0.0 (https://discovery.swim.aero/sds/1.0.0/), a Service

Description Model for JSON (SDM-J) (https://discovery.swim.aero/sdm-j/1.0.0/), and several SDS operations implemented. Remaining items include carrying out bi-directional testing of SDS operations and formally reporting the result of the joint effort to SWIM APAC TF/4.

FF-ICE/R1 Service Validation and Implementation

3.55 This WP was presented via a joint demonstration led by Japan, China and Republic of Korea. To implement FF-ICE/R1 operation, not only SWIM Technical Infrastructure for sharing information between different systems but also information services for supporting operation between different ATM applications are required. The FF-ICE services are expected to be highly automated and are expected to be performed through computer-to-computer links within a SWIM environment. This demonstration validated the implementation of FF-ICE services and the process of related messages for FF-ICE/R1 operation through two scenarios by considering the FF-ICE/R1 capable ASPs and AUs (eASP and eAU). The demonstration shows that the SWIM-based FF-ICE operation is capable to provide related information in greater detail and allow the eAU and the eASP to share their expectations in an unambiguous manner via the exchange of trajectory information. Moreover, according to the scenario discussion and the test system development, some technical observations and recommendations are presented for improving regional SWIM and FF-ICE/R1 implementation.

SWIM in APAC Region: Where are we now and where are we going?

3.56 Japan recalled the main regional activities since the establishment of SWIM Task Force in 2017. Considering the important role and function of SWIM in Global Air Navigation Plan (Doc 9750) and the Global ATM Operation Concept (GATMOC), as well as the significant impact of COVID-19 on the aviation industry, it is essential to highlight more efficiency and a strengthened and shared strategy for implementing SWIM in the region with stakeholders.

3.57 The meeting agreed to develop an action item for next Task Leads meeting to revise the TOR and further consolidate the list of action items, with consideration on the impact of COVID-19, new provisions from GANP edition 6, APAC Seamless ANS Plan, and enhancement of the interaction with various contributory bodies under APANPIRG. ACTION ITEM 4-5. The meeting also proposed to consider to prepare another SWIM workshop for this region during the next Task Leads meeting.

Regional Coordination

3.58 IATA presented to the meeting about the SWIM related activities (and their interdependencies) in planning or development within other Working Groups (WGs) and Task Forces (TFs) at regional level since SWIM TF/3, for a broader coordination of SWIM activities in APAC (not solely MET) and improved awareness of the work of the SWIM Task Force.

3.59 The access to ICAO APAC SWIM reference and education material resided in ICAO Secure Portal, SWIM briefing videos and IATA SWIM training classroom course were also introduced:

i. SWIM awareness / educational videos are available from both ICAO at https://youtu.be/wXI9ep98Z8E and IATA at https://youtu.be/QplD6sP--gg
ii. two-day IATA SWIM Training classroom course and two-hour online SWIM introductory course, both of which participates can register for at https://www.iata.org/en/training/.

Breakout Session Summaries

3.60 During the planning period of SWIM TF/4, the chair, Task Leads and secretariat team conducted a number of online discussions, therefore agreed to set up a breakout session for SWIM TF/4 to facilitate the Task Leads and contributors to meet and update their assignment respectively with efficiency and effectiveness. Three online breakout meeting rooms were provided to accommodate tasks' discussion. The outcome of breakout session was reported by to the plenary by various Task Leads.

Update on APAC SWIM Implementation Materials

3.61 The outbreak of COVID-19 pandemic projected unprecedented impact on aviation industry and also changed the original plan and available resource of this task. Considering the significant change of task force programme after SWIM TF/3, and the progress of DOC 10039 Vol II, the meeting agreed to suspend ACTION ITEM SWIMTF/3/2 for some time and reactivate it upon further updates during the future Task Lead meetings or SWIM TF/5, and the meeting encouraged the participants and concerned parties to provide and share SWIM related video, training material and other useful information to SWIM TF and secretariat for future compilation.

Generation and Life Cycle Management of GUFI and Related Issues

3.62 China implemented the wide-area surveillance network function verification system which was fed with various data sources including AFS message system, satellite/ground-based ADS-B system, surveillance radar system, ACARS, etc. The system provides multi-category data services for airlines, airports, ATC units, administration, GADSS-related organizations and other data users. GUFI (Globally Unique Flight Identifier) is used in flight data management in the system, which is usually generated in the flight planning stage by the simulated ATM role and participate in the subsequent data exchange, and it is managed in the entire life cycle of a flight, so as to realize the persistent storage of FIXM format flight data in the system.

3.63 The paper briefed the GUFI’s textual representation, encoding rules, and the accessing of various flight-related data, part of which is generated in real time, while others is generated after the flight. At each flight data access point, a GUFI management component is set up. Some identified issues to be addressed were also discussed in the paper, such as the method to exchange data between systems in different countries/regions, difficulty to uniformly generate GUFI on a global scale, and GUFI use to exchange flight data in the transition environment.

The Status of SWIM R&D in the Republic of Korea

3.64 The Republic of Korea has been conducting SWIM R&D following the ICAO Global Air Navigation Plan (GANP) and Korea's National ATM Reformation and Enhancement Plan (NARAE) since 2016. Korea Airports Corporation (KAC) is in charge of SWIM R&D and its purpose is to implement SWIM testbed and lay the foundation for the transition to a SWIM environment.

Report on SWIM in Australia

3.65 Australia summarised the activities and plans for the design and implementation of SWIM services in Australia. SWIM architecture and planning activities have been carried out by Airservices Australia (ASA) and the Australian Bureau of the Meteorology (BOM) over the past 18 months. A number of proposals for the APAC SWIM community were formulated.

New IWXXM design to better support SWIM

3.66 Hong Kong China, being one of the members of the Task Team on Aviation Data (TT-AvData) of World Meteorological Organization (WMO), presented the latest update on the development of a new IWXXM design being studied by WMO TT-AvData for future versions of IWXXM. The new IWXXM design would introduce "Weather Object" to better facilitate retrieval and consolidation of individual meteorological element through SWIM information services.

The Status of Shared Information Quality Management in China

3.67 The paper presented the exploration and practice of Civil Aviation Administration of China (CAAC) for establishing information quality management system based on SWIM concept. As the number of participants and information shared for operation coordination are increasing rapidly, it is necessary to clarify the accountabilities, standardize the procedures and enhance the platform functions for information quality management.

SWIM in ASEAN Demonstration Report (WP/23)

3.68 Singapore and Thailand presented the SWIM in ASEAN Demonstration Report. SWIM in ASEAN Demonstration was successfully conducted on the 12 and 15 of November 2019, in Bangkok, Thailand and Singapore, respectively to demonstrate the principles of SWIM, show the potential operational benefits of SWIM and to demonstrate a model of SWIM implementation for ASEAN and Asia/Pacific Region. It got a wide participation of aviation stakeholders including CAAs, ANSPs, airport operators, airlines, and international organizations such as ICAO APAC, IATA.

3.69 The Report covered details of the demonstration development, including operational scenario development, SWIM infrastructure, information services, and SWIM-enabled applications design, development, and test, and observations and lessons learnt. Various operational scenarios were conducted. Global Enterprise Messaging Services (GEMS) was selected as the architecture to support the demonstration. To ensure that messages would be routed correctly and in the most efficient manner possible, AMQP version 1.0 was chosen to be the standard protocol for the Demonstration. It was concluded that the existing standardized information exchange models, namely AIXM, FIXM, and IWXXM could be utilized for the exchange of aeronautical information, flight information, and weather information, respectively. The specific version of information exchange models, i.e. AIXM version 5.1, FIXM version 4.1, and IWXXM version 2.0, were selected. It was found that to address the specific needs, extensions to the core of the existing information exchange models are viable and effective solution. Additionally, mediation is a key to bring diverse stakeholders on board and to enable the early leveraging of seamless information sharing. Clearly defined operational use cases and processes are crucial to and prerequisite for SWIM development and implementation. SWIM ASEAN Demonstration Report is provided in **Appendix I** to this report.

3.70 The meeting congratulated Thailand and Singapore in leading this SWIM Demonstration, and highly recognized its contribution to the regional SWIM implementation. The meeting also encouraged SWIM TF to make better benefits from the cross cutting coordination with other contributory bodies of APANPIRG, in particular with CRV and ATFM, to further enhance the connection with infrastructure and the users. **ACTION ITEM 24-4.**

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 information from the SRWG/4 Report related to the aeronautical mobile communication and spectrum utilization.

Fourth Meeting of the Spectrum Review Working Group (SRWG/4) (WP/08)

4.2 The Fourth Meeting of the Spectrum Review Working Group (SRWG/4) was assisted by Mr. Robert Witzen in voluntary way from Montreal, who’s a former ICAO Officer, expert in frequency management and main developer of Frequency Finder software tool.

4.3 Due to resignation of Mr. Paul Dowsett of Airservices Australia from the Chair role after the third meeting. Mr. Chainan Chaisompong, Air Traffic Engineering Manager from Aeronautical Radio of Thailand Ltd. (AEROTHAI) was elected as the new Chair of the SRWG.

Review of Regional Process

4.4 A secretariat paper addressed the need to explore the spectrum capacity to implement future requirements for VHF-COM systems as well as for NAV systems are in the light of determining the need to reduce in particular the channel spacing in the VHF band 108 – 117.975 MHz for ILS Localizer and VOR to 50 kHz. The paper proposed to develop a frequency assignment plan that would include all requirements for VHF-COM and for NAV systems, including GBAS/VDB, for the period up to around 2030. Therefore, the meeting endorsed the following Decision: **Decision CNS**

SG/24/6(SRWG/4/1) - Frequency requirements for VHF-COM systems and ILS, VOR, DME and GBAS/VDB facilities.

Introduction of Signal Monitoring for ILSs Using Same Frequency But Different Identifiers at Both Ends of the Same Runway

4.5 China introduced the signal monitoring for ILSs which using same frequency but different identifiers at both ends of the same runway in China. In order to solve the problem of ILSs frequency strain in airports dense area, it is a common practice to assign the same frequency but different identifiers at both ends of the same runway. Such practice was implemented at Shanghai Pudong international airport and Beijing Daxing international airport. Since human factor or failure of interlock could lead navigation indication error and aircraft flight path loss, a monitoring method is necessary for protection of ILSs signal quality.

Review of Global COM List for the APAC Region

4.6 With the successful implementation of Frequency Finder, there was no more Frequency List No. 3 published by the ICAO Asia and Pacific Regional Office after the 29th Edition in January 2016, the up-to-date database in Frequency Finder (equivalent to Frequency List No. 3 in APAC region) is visible to all Frequency Finder users.

4.7 The maintenance and promulgation of Frequency List Nos. 1 and 2 are still being conducted by the Regional Office in a timely and periodic manner. It proposes to request States to update specific characteristics for NAV facilities in the Frequency List No. 2 as well as to secure that the information in the Frequency Lists is up-to-date.

4.8 After review of the regional Frequency List No. 3, through further discussion in the meeting, a decision was made as following Conclusion: **Conclusion CNS SG/24/7(SRWG/4/2) – Simulation of VHF COM Frequency requirements for next 10 years**.

4.9 Considering the important role of Frequency Finder played in the updating and maintenance of global database, relevant issues including user credential, software robustness, cyber security, etc. were addressed by the meeting. In order to fully benefit from the use of Frequency Finder for spectrum coordination, while effectively managing the relevant risks, the meeting urged ICAO to continue the robustness of the tool, endorsed the following Conclusion aimed at improving the administrative process. **Conclusion CNS SG/24/8(SRWG/4/3) – Establishment a list of focal point responsible for the operation of Frequency Finder in States**.

4.10 The meeting encouraged States/Administrations to share experience in using VHF COM function of Frequency Finder in various regional CNS events. The meeting also urged States to provide the Regional Office with information of all facilities that are in operation to improve the currency of Frequency lists.

Review of TOR and Action List

4.11 The secretariat presented the development and achievements made in APAC Region since SRWG/3, and the meeting reviewed the main outcomes from the previous meetings, with the experiences shared by States, discussed the possible future direction and tasks against the TOR and the Action List.

4.12 The most important function of this expert working group was to study the issue of the requirement of 8.33 kHz channel spacing, and it could be considered as completed by 2016 after SRWG/3. However, with the expected changes in air traffic, it has been agreed to conduct another round of simulation on VHF COM frequency assignment in APAC Region based on operational needs submitted by States, it has also been identified in spectrum capacity to accommodate GBAS/VDB and other emerging issues in optimizing the efficient and safe use of radio spectrum. The meeting discussed the aforementioned information and experiences from States, and agreed the following Decision: **Decision CNS SG/24/9 (SRWG/4/4) – Revision of the Term of Reference of the SRWG.**

4.13 The keynote for this revision is to conduct simulation on VHF COM frequency assignment and expand its scope of work to cover Navigation systems with highlight on GBAS implementation.

1090 MHz Spectrum and 24-bit Aircraft Address Issues with UAS

4.14 It is noted that on 8 November 2019, ICAO issued a State Letter on the Subject: 1090 MHz spectrum issues and proper management of 24-bit aircraft addresses associated with unmanned aircraft operating exclusively at very low level, Ref.: SP 44/2 - 19/77. ICAO member States are urged to note the ongoing ICAO initiatives to ensure the continued safe and reliable operation of aeronautical surveillance systems, and encouraging State to make use of the guidance material enclosed in the letter.

Report on the results of the International Telecommunication Union (ITU) World Radiocommunication Conference (2019) (WRC-19) (IP/08)

4.15 Radio frequency spectrum is a critical component of infrastructure that serves all aeronautical CNS/ATM services and is protected as a safety-of-life function under the Radio Regulations. The ITU WRC serves as the preeminent event for negotiating long-term frequency spectrum rights. This paper summarizes the discussions and results from ITU WRC-19 (held 28 October to 22 November 2019 in Sharm el Sheikh, Egypt). In general, the conference results conformed to the ICAO Position. It is now essential to form an expeditious start of the ICAO preparatory activities for the next conference in 2023, as a very large effort will be required on the part of the Organization and its Member States to ensure that the ICAO Position is supported by the conference.

Draft ICAO Position for ITU WRC-23 (IP/09)

4.16 This paper reviewed the agenda for the ITU World Radiocommunication Conference 2023 (WRC-23), discussed points of aeronautical interest and provides the ICAO Position for these agenda items.

4.17 The goal of the ICAO Position is to ensure aeronautical access to appropriately protected spectrum for radiocommunication and radionavigation systems that support current and future safety-of-flight applications. In particular, it describes the safety considerations necessary to ensure adequate protection against harmful interference.Support of the ICAO Position by ITU Member States is required to ensure that the position is supported at the WRC-23 and that aviation requirements are met. **ACTION ITEM 24-5.**

4.18 The meeting briefly reviewed the draft ICAO Position for ITU WRC-23 and also reviewed the ICAO process to prepare Position and join the WRC preparations provided in **Flimsy/02**.

Space-based VHF Communications in 117.975-137 MHz Frequency Band (WP/26)

4.19 Singapore presented updates on the preliminary technical study findings of study of space-based VHF concept and the progress of space-based VHF discussions at ICAO and ITU meetings.

4.20 By space-based VHF, aircraft operating in remote continental regions and oceanic areas could communicate with ATC via VHF relayed through satellite(s). The paper provided illustration of the space-based VHF communication concept. Amendments to the ITU Radio Regulations (“RR”) are necessary as the space-based VHF will require the ITU to harmonise and allocate the VHF frequency spectrum for AMS(R)S between satellite and aircraft. The space-based VHF frequency allocation (under AI 10 of WRC-19) was formally accepted as an agenda item for WRC-23 Agenda Item 1.7. Works on space-based VHF spectrum and technology studies have started in ITU Working Party 5B (WP 5B), ITU Asia Pacific Telecommunity (APT) Preparatory Group (APG), ICAO Communications Panel, and ICAO FSMP. Objectives and characteristics for the space-based VHF system under study along with Aircraft VHF receiver characteristics was discussed.

4.21 CAAS and its industry partners will continue with the technical feasibility studies on the design of the satellite constellation, coverage optimisation and other technical parameters. France and Singapore commenced the frequency compatibility studies work and submitted an Input Document at the November 2020 ITU Working Party 5B (WP 5B) meeting to update on Agenda Item 1.7. In parallel, CAAS is also working closely with interested States and ICAO FSMP to develop methods to satisfy this agenda item, in the current WRC cycle leading up to WRC-23. FSMP is also drafting ICAO Positions for WRC-23, in addition to coordinating the frequency compatibility studies work required for WRC-23. The current draft ICAO Position for WRC-23 Agenda Item 1.7 was described. The ICAO DCIWG meeting in Oct 2020, approved the setup of a new project team sub-group to review existing ICAO Annex 10 SARPs, and recommend if amendments are required and relevant guidance materials to enable satellite-based VHF operations for AMS(R)S.

4.22 Chairman asked whether space-based VHF topic was discussed at ACSICG prior to this meeting. Singapore and ICAO Secretariat replied that similar papers were presented at SRWG and ACSICG, but WP26 contained more updates from the frequency compatibility studies that commenced in mid-2020 (after the SRWG and ACSICG meetings). Through **Flimsy/03**, Singapore further informed the meeting about the proposal on a draft conclusion to encourage States/Administrations in APAC Region to participate in the ICAO DCIWG space-based VHF sub-group to review ICAO Annex 10 SARPs for adoption of space-based VHF operations. The meeting considered further work needs to be done and agreed to recommend States/Administrations who are interested and capable to join the relevant study, and as present ICAO Position for WRC-23 already included space-based VHF agenda. The Secretariat was requested to coordinate with SRWG chair and ACSICG chair to clarify how to track and monitor this initiative, and form an ad hoc group, if necessary, to take the concerns from States on a regional level so as to make the study meaningful, and the outcome of this deliberation will be reported back to CNS SG/25 for consideration. **ACTION ITEM 24-6**

Agenda Item 5: Navigation

Seventh Meeting of Performance Based Navigation Implementation Coordination Group (PBNICG/7) (WP/09)

PBN Implementation Update

5.1 The Secretariat presented global PBN implementation status at international airports. and informed that regarding key requirement of ICAO Assembly Resolution A37-11, which is the implementation of approach procedures with vertical guidance (APV) for all instrument runway ends by 2016, implementation of APV procedures were behind global achievement. However, implementation of PBN SID/STAR were above the global implementation status (see **Table 1**).

Table 1. ICAO Assembly Resolution A37-11 Implementation Status

Dec 2019	PBN Approach	APV		PBN SID	PBN STAR
		LNAV/VNAV	LPV		
Global (%)	74.8	56.5	34.1	47.8	43.9
Asia/Pacific (%)	62.6	43.5	0	70	67.8

Regional Transition Plan for RNP Chart Identification

5.2 The Secretariat informed the meeting that Asia/Pacific Regional Transition Plan for RNP APCH Chart Identification from RNAV to RNP as accepted by states in PBNICG/6 and endorsed by ATMSG/7 and CNS SG/23 was adopted by the APANPIRG/30. Proposed contingency measure for the Regional Transition Plan for RNP APCH Chart identification as discussed in APANPIRG/30 was also presented.

States' PBN Implementation Progress

5.3 China provided updated information on PBN implementation. China informed the meeting that 500 out of 532 instrument runway ends of 246 airports have PBN approach procedures. The meeting was also informed that China implemented 753 PBN routes. By now, Beijing/Capital, Beijing/Daxing, Shanghai/Pudong, Shanghai/Hongqiao and other major airports have implemented RNP APCH procedures. China has also implemented 33 RNP AR procedures including 11 at International airports and 22 at Domestic airports.

5.4 India provided information on ATS routes, SIDs/STARs and RNP APCH implementation in accordance with its PBN implementation plan. India has implemented RNP APCH procedures for 52 Runway ends so far. Out of these 23 RNP APCH are for international airports and 29 RNP APCH for domestic airports. As per the regional transition plan for chart identification from RNAV to RNP, India has completed and changed all the chart identification and all new charts are having Chart title RNP.

5.5 India also informed the meeting on the progress & update on the development of SBAS (GAGAN) LPV procedures and that it is exploring the possibility of implementing LPV procedures. The secretariat asked about the clarification about GAGAN Mandate, to which India stated that it is for new aircraft to be registered in India after the cut-off date. The secretariat requested India to share the mandate on GAGAN and India agreed to share the same with meeting. The secretariat also requested India to share safety assessment of LPV procedure in the next GBAS/SBAS, to which India agreed.

5.6 The Republic of Korea (ROK) presented its PBN implementation status in approach, SID/STAR and ATS routes. The meeting was informed that the entire RNAV5 routes operated within the Incheon FIR were converted to the RNAV2. The meeting was informed that of 18 airports (civil / joint civil and military) in ROK, LVAV / VNAV approach procedures have been established at 29 out of 56 runway ends, while LNAV procedure has been established at 34 runway ends. The ROK has completed converting naming of 32 charts from RNAV (GNSS) RWY XX to RNP RWY XX as of 15 August 2019.

5.7 Maldives has published 22 RNP APCH procedures, 16 LNAV and 6 LANV/VNAV. Eight more procedures will be published for the newly developed domestic airports. The meeting was informed that the process to change the identification of PBN instrument flight procedure approach charts from RNAV to RNP was completed in May 2019.Maldives has published 10 domestic routes based on the RNP 1 navigation specification, to connect the airports in the South. The secretariat raised the rationale for selecting RNP 1, which is designed for terminal airspace, Nav Specs for these routes and Maldives should consider replacing RNP 1, with RNAV 2 or RNP 2 routes. Maldives stated that due to lateral spacing requirement, they have implemented this.

5.8 Myanmar provided information on the PBN implementation progress in Terminal, Approach and En-route in accordance with their PBN implementation plan. However, the implementation process has been delayed due to some constraints involving military airspaces. Vietnam enquired about frequency of validation flight of Baro-VNAV procedures, Myanmar responded that it is done before publication of the procedure. The secretariat clarified that the validation process as defined in ICAO Doc 9906 should be followed.

5.9 Nepal provided information on the latest progress of PBN implementation in Terminal, Approach and En-route in accordance with their PBN implementation plan. The meeting was informed that Feasibility study for RNP APCH (SBAS) will be done and regional cooperation will be sought for the planned implementation if such procedures are desirable. RNP AR Departures will be designed and implemented at TIA Kathmandu. The meeting was informed that the process to change the identification of PBN instrument flight procedure approach charts from RNAV to RNP was completed in March 2020.

5.10 Pakistan enquired about RNP AR departure criteria, to which Nepal responded that its being designed using criteria used by industry and some States. The secretariat clarified that presently there is no published criteria of RNP AR departure in ICAO documents.

5.11 Thailand provided PBN implementation status in approach, SIDs and STARs, and ATS route implementation. In addition, the meeting was informed the progress of RNP AR APCH procedure, the plan for GBAS installation at Phuket International Airport as 2024 and for Suvarnabhumi International Airport postponed. For En-route operations, new RNAV2 routes (L880, M633, N506, P629) between Bangkok and Phnom Penh FIR have been developed and became operational in October. In line with the Asia Pacific Seamless ANS Plan, RNAV2 specification is planned for all new ATS Routes, international and domestic.

5.12 Viet Nam provided the status information on RNP APCH, SIDs and STARs and ATS route development in accordance with their PBN implementation plan. The meeting was informed about the lesson learnt, such as Airlines not being approved for RNP APCH and coordination required with Military. The secretariat suggested that Flexible use of Airspace(FUA)could provide a solution to some of the issues related to Military coordination. In this regard ICAO Circular on Civil Military Cooperation in ATM, ICAO Circular 330 could be looked into.

CDO/CCO Implementation

5.13 China shared with the meeting implementation process for CDO/CCO, its benefits, and implementation status so far and planned implementation of CDO/CCO in China. It explained in detail about the technical research, Implementation Steps and Implementation results. It further elaborated that the guidance was derived from GANP, APAC Seamless ANS Plan, CDO, CCO and PBN Manual to design the implementation strategy. It also described the benefits from CDO/CCO such as Safety Improvement, Green Environment, reduction in Cockpit workload, improvement in comfort for the passengers. So far CDO/CCO have been implemented at six international airports including Guangzhou Baiyun Intl. airport and Kunming Changshui Intl. airport and etc. CDO/CCO will be implemented in more airports in China in phases.

5.14 India discussed with the meeting implementation process for CDO/CCO implementation at Delhi, its benefits, and challenges in terms of Traffic Pattern, Airspace Constraint, Pilot sensitization, ATC training etc. It shared some of the pictures from the actual CDO/CCO conducted at Delhi Airports and explained in detail how it is being done at one of the busiest airport with several airspace constraints.

5.15 The Secretariat presented the list of action items agreed by the previous meetings. The meeting was informed of the progress of 7 action items and agreed to close 6 items after deliberations. Pakistan pointed out that there is in-consistency between the number of instrument runways available in Asia/Pac e-ANP Volume II and data used by i-STARs for some States. After deliberations it was decided to add a new action item that “number of International Instrument Runway Ends to be included in iSTARS should be based on the latest information”.

5.16 The meeting noted the *Draft Conclusion PBNICG/7/1 - PBN Implementation Reporting in iSTARS* provided in the List of Action Items and agreed to keep it as an action item tasked to ICAO APAC RSO other than an APANPIRG conclusion.

Report of the First and the Second Meeting of Asia/Pacific GBAS/SBAS Implementation Task Force (GBAS/SBAS ITF/1 and ITF/2) (WP/12)

5.17 As per CNS SG/23 meeting Decision CNS SG/23/9 regarding establishment of the APAC GBAS/SBAS Implementation Task Force, the first Meeting (GBAS SBAS ITF/1) was held through VTC on 23-24 June 2020 in which 104 participants joined. The TOR of the Task Force as provided in Appendix J to the CNS SG/23 meeting report was discussed. Outcomes of the ICAO GBAS/SBAS Implementation Workshop in Seoul on 3-5 June 2019 were discussed in the GBAS/SBAS ITF/1. To better capture the issues and challenges faced in GBAS/SBAS implementations, an exercise was conducted amongst participants in GBAS/SBAS ITF/1.

5.18 To develop awareness among participants, as well as collecting needs from States for guidance or training, the Secretariat created an exercise to capture issues and challenges regarding GBAS/SBAS implementations in the States.

5.19 With reference to information captured in the exercise and explanations provided by the four rapporteurs, the Secretariat proposed to structure the wrap-up in the following way:

a. Training of the operational people Stakeholders (syllabus or training package)
b. Knowledge/ Experience sharing / platform in respect of systems and procedures
c. Review of the outcomes published by ICAO Ionospheric Study Task Force in 2016
d. Organize a workshop for airspace users / CONOPS / Fleet readiness
e. ATC Interface / NOTAM
f. Guidance Material on implementation / safety assessment
g. Involvement of regulators in the overall implementation process

5.20 It was agreed that the Secretariat would propose a list of actions of the Task Force.

5.21 The second Meeting of the ICAO APAC GBAS/SBAS Implementation Task Force (GBAS/SBAS ITF/2) was held through VTC on 9-10 September 2020 with attendance of 118 participants. Ten IPs prepared by States and industry were presented on GBAS/SBAS activities in the region.

5.22 The Secretariat received two nominations for chairperson of the Task Force: Mr. Susumu Saito from Japan and Mr. Wong, Tak Yuen George from Hong Kong China. After discussion within the Task Force, both nominated candidates were elected as Co-Chairs.

5.23 Australia presented the status of two currently functional GBAS Landing Systems at Sydney and Melbourne airports. There are more than 3000 GLS approaches conducted per fortnight at these two airports. Percentage of GLS equipped aircraft operating at Melbourne is 40% and that at Sydney is 29%. Australia and New Zealand have established a joint project to deliver a Satellite Based Augmentation System (SBAS) capability.

5.24 China presented that the Beidou (BDS) was one of the 4 core satellite constellations defined in Annex 10 and the validation of BDS was being discussed and promoted. BDS-3 constellation includes 24 MEOs, 3 IGSOs and 3 GEO3. The BDS will provide the worldwide service in 2020. The BD SBAS constellation and ground system will be completed in end 2020. The accuracy of BDSBAS SF Service satisfies the requirement of APV-I.

5.25 Hong Kong, China shared their strategy and experience in conducting a GBAS trial at the Hong Kong International Airport (HKIA), which aimed to assess the feasibility for GBAS implementation there and to identify potential impacts arising from local ionospheric effects as well as constraints induced by terrains/building structures around the HKIA.

5.26 The issue in VDB frequency assignment for GBAS was also raised by Hong Kong, China due to the VDB frequency using the same radio frequency band as other types of ground-based navigational systems, such as VHF Omni-directional Range (VOR) and Instrument Landing System (ILS), but with large (around 1MHz) channel space required from existing DVOR/ILS frequencies already in use. Hong Kong China drew States' attention to the need for the coordination with other State/Administration for the use of navigational facilities frequency, through collaboration with SRWG and assistance from ICAO APAC Office, for the implementation of GBAS.

5.27 Japan presented that MSAS (Michibiki Satellite-based Augmentation Service) SBAS has completed satellites transition from MTSAT to QZSS in end March 2020. Various developments are being conducted to enhance the MSAS system, including MSAS LPV service expected to commence in 2023. JCAB updated the status of the CAT-I GBAS at Tokyo Haneda airport, for which a trial had been conducted since July 2020 to aim for formal operation commencement by the end of 1Q 2021. In addition, ENRI is conducting activities on GAST-D and GAST-E/F.

5.28 The Korea Augmentation Satellite System (KASS) will be completed by 2023 for the provision of the Safety of Life (SoL) service across the designated coverage. Republic of Korea pointed out the difficulty to find Geo payload to rent for transmission of the SBAS signal.

5.29 IATA presented that GBAS infrastructure and GLS procedures should be implemented as appropriate based on a positive business case and consultation with airlines. Regarding SBAS, due to issues associated with overlapping satellite footprints States should not support the use of SBAS to fly LNAV or LNAV/VNAV minima and should publish LPV minima for all approach procedures to be flown using SBAS. Additionally, all procedures with SBAS LPV minima should also include ABAS Baro-VNAV LNAV/VNAV minima.

5.30 Activities of ICAO Navigation Systems Panel (NSP) GBAS working group (GWG) Ionosphere Gradient Mitigation (IGM) ad hoc group were introduced. It is working on enhancing GBAS performance in the low latitude region that shares the common interest with this task force related to the review of APAC GBAS guidance on the ionosphere threat mitigation.

5.31 The United States provided an overview of their research, design approval, commissioning, and oversight of GBAS, with highlights on benefits and technical differences between GBAS and ILS. US deployment plan for GBAS meeting GAST C standards was also presented. Discussion also highlighted the need to develop and apply a site specific ionospheric threat model for assessing risk to GBAS performance.

5.32 The Action List of the task force proposed by the Secretariat was discussed. Description, relevance and priority of those action items were assessed by the meeting. Action owners were assigned with target date agreed in GBAS/SBAS ITF/2.

5.33 The Action List from GBAS/SBAS ITF/2 and the TOR of GBAS/SBAS were presented in CNS SG/24 Meeting and there was no comment raised on them.

Outcome of the Seminar on Flight Inspection and Procedure Validation (WP/13)

5.34 The Seminar on Flight Inspection and Procedure Validation (FIPV) was held in the ICAO APAC Regional Office, Bangkok, Thailand from 24 to 27 September 2019. It was conducted in accordance with the Special Implementation Project of ICAO for 2019. The seminar noted the development of FIPV technology, computer simulation analysis techniques which have been used in the prediction and analysis of navigation signals that can be further used to analyse the accuracy of the signals when a new navigation station is commissioned, or an existing navigation station environment changes.

5.35 The need was emphasized to update the Catalogue of Asia and Pacific Flight Inspection and Flight Validation Service Providers more regularly to reflect the latest information that would benefit potential new customers seeking flight inspection/validation services within the Region or beyond.

5.36 The need for development of guidance material on the regional best practices for undertaking flight inspection was identified, considering the typical need of States/Administrations without a national FIS provider and some recommended measures necessary for conducting flight inspection at night. The initial table of contents based on the flight inspection manual of Hong Kong-China is provided. The guidance material will be presented to CNS SG for adoption and then will be posted on the ICAO APAC Website. The volunteering member of the group: Hong Kong CAD, CAAS, New Zealand Airways, CAAC FIC, FCS and Aeropearl (Hong Kong CAD acts as lead).

5.37 Further guidance from ICAO is expected on the use of UAS (RPAS) as a viable/supplementary solution to carry out the flight inspection including cost/effectiveness analysis for introducing this emerging technology.

5.38 Member States/Administrations in a position to do so are encouraged to continue conducting more research and trials using emerging technologies and best practices and provide regular reports to CNS SG of APANPIRG:

a) Assessment of UAS (RPAS) for Flight Inspection/Validation including the scenarios, advantages, limitations (such as FI range, UAV speed and payload, C3 etc.) and proposed processes and procedures for implementation;

b) Improved flight inspection efficiencies and operational risks of flight inspection at night;

c) Sharing PBN flight procedure validation methods and technologies, which can save cost, improve efficiencies, and facilitate PBN implementation; and

d) PBN vulnerability to GNSS Interference, and the need for spectral assessment.

5.39 States/Administrations capable to do so are encouraged to further study the application of computer simulation technology and ground testing technology before flight inspection of navaids in order to facilitate the set up and best performance state of the navaids in order to improve the efficiency of flight inspection.

Flight Inspection Guidance Material (FIGM) for APAC Region (WP/18)

5.40 Hong Kong China presented flight inspection guidance material for APAC region. In response to a recommendation from the "Seminar on Flight Inspection and Procedure Validation (FIPV)" held in the ICAO APAC Regional Office, Bangkok, Thailand from 24 to 27 September 2019, it is decided to complement existing SARPs to provide guidance on flight inspection and to serve as a reference for States/Administrations to develop their own specific practices and procedures. A first edition of the Flight Inspection Guidance Material (FIGM) is then developed with the experiences and knowledge contributed by volunteer APAC States / Administrations and industry partners and was presented to the meeting.

5.41 It includes recommendations of key activities and milestones in planning, execution, and delivery of a flight inspection. Useful materials, including sample flight inspection reports are also included for reference. The FIGM is not intended to and shall not replace the relevant flight inspection requirements stipulated in Annex 10 and Doc 8071. Therefore, in the event of any inconsistency or conflict between this document and Annex 10 and Doc 8071, Annex 10 and Doc 8071 shall take precedence.

5.42 There are four chapters in FIGM named Introduction, planning for flight inspection, conducting flight inspection, and reporting of flight inspection results. The FIGM introduces example flight inspection procedures for Instrument Landing System (ILS) including visual aids, Doppler Very High Frequency Omni-Directional Range (DVOR), Distance Measuring Equipment (DME), Primary Surveillance Radar and Secondary Surveillance Radar (PSR/SSR) and discusses about the arrangement for flight inspection at night and the emergency flight inspection. Reference was also made to the reference on the considerations of radio navigation aids flight inspection periodicity during COVID-19. Reference is also given on the example flight inspection system performance specifications and associated Test Accuracy Ratios (TAR) and the workflow on reporting of flight inspection results.

5.43 With aforementioned and further discussion on the material, the meeting formulated and adopted the following Conclusion: **Conclusion CNS SG/24/10 – Flight Inspection Guidance Material (FIGM) for APAC Region.**

RPAS-Based Flight Inspection Program Progress in China (IP/02)

5.44 China presented progress of RPAS based flight inspection status for the year 2020 along with previous trails and their outcomes. China completed first trial of RPAS based flight inspection technology in June 2019, which validated the feasibility and suitability both technically and operationally. Based on the result, hybrid VTOL fixed wing RPAS is the best selection. China described the technical aspects of their selection. China performed 10 more trials till October 2020 to evaluate the flight inspection capability: ILS, VOR/DME, NDB, ADS-B and preliminary GBAS testing in commercial airports as well as general aviation airports. They concluded that the RPAS-based flight inspection payload developed by the joint team in China can support most of the navaids inspection in civil airport.

5.45 It was also discussed that the ability of the RPAS can limit actual inspection function, for example polarization was not evaluated during trials since the unmanned aircraft cannot incline to desired degree in flight for safety consideration. It was told that no COTS RPAS fulfill flight inspection requirements and listed additional features of special RPAS to be developed.

5.46 China has published the first technical Specification for the RPAS-based Flight Inspection System as CAAC Information Bulletin (IB-TM-2020-005) in September 2020. China will work further on to improve RPAS technology, performance, and standards establishments with taking into considerations of different ICAO Docs requirements.

Navigational Aids Check by Using Drone in Republic of Korea (IP/19)

5.47 Korea Airports Corporation developed an ultra-compact and lightweight receiver that can be mounted in drone for check of Navigational Aids. The Korea Airports Corporation's Drone System for Navigational Aids check (DIVA) can accurately check the airborne radio signal of Navigational Aids such as ILS, VOR, and TACAN just in about 20-minutes flight. PAPI and ALS checks are under development. Compared to aircraft, drone is easy to control flight speed and can fly freely. It is possible to continuously check change in radio signal at specific point. Korea Airports Corporation built up Drone systems in each six divided regions nationwide. Guidelines on the operation procedure and safety management of drone around the airport and SOP for Drone System are prepared.

5.48 New infrastructure near airport can cause distortion of radio signals of Navigational Aids. The origin of radio wave obstacles can be identified by surveying the air wave environment using a drone. Thus, Republic of Korea is using drones for Non-disruptive operation of Navigational Aids. Republic of Korea has completed European CE certification for the receiver of Navigational Aids for drone. In addition, Republic of Korea is conducting technical consulting for drone check in Brazil and Colombia.

5.49 The meeting appreciated the update from China and Republic of Korea, and PBNICG was requested to pay more attention and enhance regional connection on the flight inspection or navaids check activities with the use of RPAS and drones.

Protection of ILS Critical and Sensitive Areas in Three-Dimensional and ILS Facility Performance Category Requirements (WP/21)

5.50 Hong Kong, China shared their observations on a common scenario of potential impacts of departing aircraft on arriving aircraft under runway mixed-mode operation in many airports. ICAO Annex 10 Volume I, Attachment C, highlighting the need for States to extend protection of the ILS Critical and Sensitive Areas (CA/SA) from two-dimensional (2D) context to volumes. Currently, Annex 10 Vol. I Attachment C concerning guidance in protection of ILS CA/SA focuses on protection in 2D instead of three-dimensional (3D).

5.51 Hong Kong, China shared with the meetings cases encountered in Hong Kong International Airport (HKIA) on Localizer (LOC) signal fluctuations, which occurred during single runway mixed-mode operation. The pilots of arriving aircraft reported LOC signal fluctuations at the time when departing aircraft on the same runway flew over the LOC antenna. The ILS CA/SA on ground was found clear without any intrusion.

5.52 The consultant (NAVCOM Consult) for Hong Kong Civil Aviation Department provided his expert advice to the meeting on the theory, analysis, and recommendations for 3D ILS CA/SA as promulgated in ICAO Annex 10. He highlighted that those reported observations at HKIA was not unique but were applicable and observed at other airports as well, especially those airports which often use single runway mixed-mode operation. The consultant explained various contributory factors to such observations, such as lateral symmetry of departing aircraft and its climb rate, size of departing aircraft, and distance of arriving aircraft to touchdown, etc. The consultant considered that while it was important to draw attention from States to 3D nature of ILS CA/SA and seek guidance from ICAO on how to establish such 3D ILS CA/SA and protect them, it would be beneficial for States to proactively formulate and implement mitigating measures on possible impacts, including promulgation of relevant information to ATC controllers and pilots keeping them aware via aeronautical publication such as AIP/AIC/NOTAM as appropriate, providing sufficient separation between departing and arriving aircraft, as well as giving pre-warnings/alerts to the pilots when the runway is under mixed-mode operation, and alerting avionics manufacturers to incorporate such considerations into the design of avionics, etc.

5.53 Hong Kong China also shared considerations of applying the ILS classification system for newly installed ILS. According to ICAO Annex 10 Vol. I, Amendment 92 applicable on 5 November 2020, in order to utilize the Facility Performance Category II and III, the level of integrity and continuity of service of the new ILS in accordance with the ILS classification system shall be at least level 3. For meeting the level 3 requirements, at least 3,200 hours of the new ILS operations would be needed. However, taking into consideration the need to assess the seasonal influence of the environment, one year is typically required for new ILS installations. This period may be reduced in case the operating environment is well controlled and there are other similar proven installations. However, no further details are elaborated in Annex 10 as to how to reduce the evaluation period. More guidance on how to reduce the evaluation period was requested.

5.54 Hong Kong China invited States to note the importance of protecting the ILS CA/SA in volumes and the minimum evaluation period for specific ILS facility performance category. ICAO was requested to provide more guidance for ANSPs to protect CA/SA in volumes and to achieve the required facility performance category for new ILS installations within the shortest evaluation period.

5.55 Australia echoed the observations and views expressed by Hong Kong China and its consultant concerning the ILS 3D CA/SA, and supported the recommendations. ICAO APAC will forward this WP/21 and its presentation file to secretary of the ICAO Navigation Systems Panel (NSP) for consideration by Conventional Navaids and Testing Working Group (CNTWG). **ACTION ITEM 24-7**

5.56 In view of significance of this subject with impacts on flight safety, the meeting adopted the following Conclusion: **Conclusion CNS SG/24/11- Protection of ILS Critical and Sensitive Areas in Three Dimensional.**

BDS SARPs Development and Validation Status in ICAO (IP/03)

5.57 China presented the status of BDS Open Service SARPs development and validation work in ICAO, which is at the final stage of completion in ICAO NSP.

5.58 China discussed that BDS has always been willing to serve civil aviation users. China proposed to ICAO to include BDS into ICAO SARPs at the 37th ICAO Assembly in 2010. ICAO agreed to start it in ICAO Council 192nd session. BDS has started Open Service SARPs development work in ICAO NSP since May 2012. ICAO NSP initiated the SARPs validation work for four core constellations including GPS, GLONASS, Galileo and BDS in April 2018.

5.59 GNSS SARPs except the generic sections for all the four cores constellations including BDS have been fully validated and translated into various ICAO languages. After NSP JWGs/6 meeting in June 2020, the open requirements of BDS in GNSS generic sections pending for validation are the Radio Frequency Interference related ones. ICAO NSP/6 meeting held from November 2nd November to 13th November. China presented BDS RFI related working paper WP 25. All the open requirements on RFI for BDS in GNSS SARPs generic sections were closed.

5.60 This is an important milestone for BDS standardization work in ICAO and a good start and guidance for future BDS MOPS development. The next step for BDS SARPs review in ICAO is supposed to be the submission from NSP to ANC to review and the state letter process.

BDSBAS Status Update Report (IP/04)

5.61 China presented updates of BDSBAS, including the BDSBAS architecture, the GEO satellite status, the BDSBAS B1C ICD, the service testing results and the certification plan.

5.62 The BeiDou Navigation Satellite System (BDS) was formally commissioned on July 31st, 2020. BDSBAS will provide Single-Frequency (SF) and Dual-Frequency Multi-Constellation (DFMC) services, in accordance with the ICAO standards, in China and surrounding areas and achieve APV-I and CAT-I precision approach capabilities.

5.63 BDSBAS is comprised of space segment, ground segment and user segment. The BDSBAS space segment includes successfully launched 3 Geostationary Earth Orbit (GEO) satellites at 80°E, 110.5°E and 140°Ewith PRN codes 130,143, and 144. The BDSBAS ground segment consists of 30 Monitoring Stations (MS), 2 Data Processing Centers (DPC), 1 Operation Control Center (OCC) and 3 Uplink Stations (US). The BDSBAS user segment refers to the SBAS terminals used in civil aviation, maritime and railway applications etc.

5.64 China explained the technical characteristics of three GEO satellites and informed that the ICD of BDSBAS B1C has been published by China Satellite Navigation Office in July 2020 and is available on BDS website. The paper also presented TEST RESULTS OF BDSBAS SF SERVICE. As per the results, both horizontal and vertical safety indexes are larger than 1, which means no appearance of the integrity risk during the test periods. It was estimated that BDSBAS SF service will broadcast SF test signals based on ICAO SARPs and BDSBAS B1C ICD by the end of 2020 and the certification process having three parts i.e. technical review, system test and initial operation. BDSBAS SF certification scheme will be carried out accordingly, and last for at least 3 years.

Status of GBAS Implementation in Japan (IP/13)

5.65 Japan presented the status of GBAS implementation as well as the research and development related to GBAS in Japan. Japan have been working on implementing CAT-I GBAS in Japan including development of specifications, certification framework, ionospheric threat model, and other operation related frameworks. Japan has also been working on a CAT-I GBAS prototype, APAC common GBAS ionospheric threat model, validation of GAST-D standards, and evaluation of DFMC GBAS concepts. Japan discussed about first CAT-I GBAS implementation manufactured by NEC Corporation and currently in trial phase at Tokyo Haneda. Its ionospheric threat model is based on the APAC common GBAS ionospheric threat model with some modification based on the observation and analysis by ENRI. It has two ionosphere field monitor (IFM) stations and four reference stations. CAT-1 GBAS approach procedures have been published as AIP supplement.

5.66 A GAST-D ground experimental prototype and an airborne experimental subsystem have been developed by ENRI and its results contributed to the standardization of GAST-D. Japan continues to support refining the GAST-D standards in the ICAO NSP. Additionally, DFMC GBAS study is being conducted by ENRI for evaluating concepts of DFMC GBAS. Japan will contribute to ICAO activities on DFMC GBAS standardization.

5.67 Japan is actively contributing to the APAC GBAS/SBAS ITF and would welcome the first face-to-face meeting.

GBAS VDB Frequency Compatibility for Tokyo Haneda (IP/14)

5.68 The ICAO standards on the frequency compatibility between VHF radio navigation aids have been defined. Japan presented GBAS VDB frequency compatibility analysis with other VHF radio navigation aids near Tokyo Haneda is called “airport-to-airport compatibility” while compatibility with other systems in the same airport considering the geometry of the VHF facilities and runways is called “same-airport compatibility”.

SBAS Status Update in Japan (IP/15)

5.69 Japan’s SBAS MSAS has started operation with MTSAT in Japan’s FIR on September 27th, 2007. A decision of MSAS LPV implementation was made on March 13, 2018. MSAS LPV using three GEOs (QZS3, 6 and7) is expected to be operational in 2023.MTSAT-2 was broadcasting two PRN codes (129 and 137). During MSAS transition from MTSAT to QZS-3 (GEO) at the end of March 2020, PRN129 and PRN137 were transferred from MTSAT to QZS (GEO) satellites. QZSS seven satellites configuration is expected in 2023 with three GEOs broadcasting L1 SBAS signal. Additional PRN is necessary for three GEOs configuration in 2023 to perform a successful transition from the NPA service to the LPV service.

5.70 Using MSAS V2 by only QZS-3, MSAS LPV250 approach will be introduced step by step from 2021 as MSAS LPV250 trial operation in advance of MSAS LPV full-scale operation. This trial operation will be expected to boost the proficiency of Airline pilots maneuver and the motivation for introducing SBAS LPV receiver in Airline. Japan will start LPV operation at all airports to designed IFR approach, excluding 2 military control airports. L5 augmentation signals with PRN196 (QZS2: IGSO) for DFMC SBAS validation became available on September 23rd, 2017. In addition to the L1 SBAS signal, all QZSS satellites but QZS-1 have the capability of broadcasting DFMC SBAS messages through the L5S signal. Additional L5 augmentation signals are available with PRN197 and PRN200. PRN assignment for non-GEO SBAS satellites is still pending in DFMC SBAS SARPs development. The L1 SBAS ranging will not be provided at the start of the service with the QZSS GEO. Evaluation of ranging accuracy from the view point of GEO orbit and clock accuracy as well as the ranging signal quality may make it possible to provide the ranging function in far future. Same possibility will be evaluated for DFMC SBAS L5 signal not only for GEOs but also for IGSOs.

Agenda Item 6: Surveillance

5th Meeting of the Surveillance Implementation Coordination Group (WP/10)

6.1 The meeting noted the Proposal for Amendment (PfA) to the Regional Supplementary Procedure (SUPP Doc 7030) from SURICG/2 has been processed in accordance with established procedure, and the approved PfAs were circulated to States on 18 June 2020 through a State Letter with reference: T8/11.2 – AP130/20 (CNS), and this change will be incorporated in the new Six Edition of Doc 7030/6 as part of the restructuring process of Doc 7030.

PNG Deployment of Space Based ADS-B

6.2 After a successful space-based ADS-B trial using a VPN on the internet to deliver data, PNG has contracted for space-based ADS-B to serve the whole PNG FIR plus 50 miles. Service acceptance testing will be performed by the ANSP, supported remotely by Aireon (due to COVID). It is expected to become operational later in 2020 and will operate in tandem with existing ADS-B and radar services.

6.3 The system will initially use dual MPLS lines to USA to receive the service, but PNG has joined CRV and expects to transition to a dual CRV solution in 2021. The CRV solution will use two Package C nodes, supported by 1 MPLS and one VSAT terminal. A CRV contract has been signed with PCCWG to provide the CRV connections supporting AFTN/AMHS, Voice, AIDC, ADS-B ground station sharing and space-based ADS-B. Aireon was approved to connect to the CRV earlier in 2020 and can now deliver pace-based ADS-B to other CRV customers potentially without additional communication links. PNG also anticipates sharing ADS-B ground station data with Australia and Indonesia via CRV.

FAA's Operational Evaluation of Space-based ADS-B in the Caribbean

6.4 Review of the received SBA data has highlighted the following potential issues:
1) Lack of detection for single antenna installations (e.g., Bottom only)
2) Poor performance (e.g. low power) from diversity installations
3) Short periods of time with single satellite coverage.

6.5 The FAA, in collaboration with Aireon, have identified the following as potential mechanisms to improve airspace performance:

1) Identify poor performing aircraft for remediation;
2) Aireon to modify their system to optimize coverage and improve probability of detection (Pd); and
3) FAA implement an exclusion list for poor performing aircraft

6.6 The FAA will continue to analyse data to identify improvements made from coordinated work with Aireon and relevant stakeholders. This analysis and coordinated work will assist in identifying the potential impact that each issue is having on aircraft detection. If necessary, the FAA will also work with appropriate foreign counterparts to create an adequate Standard Operating Procedure (SOP) for handling aircraft with diversity antenna installations versus non-diversity installations.

Long-range Air Traffic Surveillance Display System for ATFM

6.7 Hong Kong China has developed an in-house system for displaying long-range air traffic surveillance tracks up to 4,000km from the Hong Kong International Airport, which is approximately 5 hours of flying time beyond airspace boundary. The system is designed to enhance the situational awareness of flow managers on the air traffic and assist in flow control decision making. It is currently used by ATFM Unit of Hong Kong China in assessing the overall impacts of certain flow restriction imposed by other airspaces.

6.8 The long-range air traffic surveillance display system is based on terrestrial ADS-B data service for monitoring air traffic from "departure to destination". Space-based ADS-B data is planned to be integrated into the system to strengthen the coverage by early 2021. The Human Machine Interface (HMI) of the display system has been specially designed for flow managers with an aim to reduce display clutter caused by various elements and enhance HMI efficiency.

Additional System Area Codes (SAC) for Surveillance Systems in APAC and Update on Regional Supplement to ASTERIX ICD

6.9 With the development and expansion of surveillance facilities, there is a need to introduce additional System Area Codes (SAC) for surveillance systems in APAC. Subsequently, the Regional Supplement will have to be updated to cater the new introduction.

6.10 The secretariat informed the meeting through the working paper that Australia had requested ICAO APAC Regional Office for an additional SAC for its surveillance facilities. According to the Recommendation in paragraph 3.1.2 of the ICD, ICAO APAC Regional office has accepted the A4hex to be the additional SAC as proposed by Australia.

6.11 The acceptable code A4^{hex} is to be reflected into the next edition the Regional Supplement as in Table 1, and the System Identification Code (SIC) provided by Australia, Laos PDR and the Philippines, as well as the editorial updates on the binary representation of SAC of Brunei Darussalam are to be reflected into the next edition the Regional Supplement which is provided in **Appendix L** to this Report.

PCCWG Solution on Surveillance Data over SWIM/CRV

6.12 PCCW Global presented their capability to provide a hosted platform over SWIM/CRV for sharing of surveillance data.

6.13 The meeting discussed the draft decision proposed by Singapore to set up a multi-disciplinary study group, to be led by SURICG, including subject matter experts from surveillance, SWIM and ATFM, etc. in APAC Region to further explore the solutions on surveillance data sharing, and agreed to take it as a SURICG ACTION ITEM at this stage, and invite interested member States / organization to join. Singapore will take the lead to prepare working papers for SWIM TF/4 and CNS SG/24 on behalf of SURICG, and Hong Kong China will support this initiative.

The ICAO Aircraft Address Monitoring in Japan

6.14 As an agreed action item by SURICG/4, Japan presented to the meeting on its experience on the ICAO Aircraft Address (Mode-S address) monitoring since 2007, which including monitoring activity, tool function, monitoring results and reporting paths. JCAB already took 6 correcting actions for Japanese civil aircraft and JSDF (Japan Self Defense Force) aircrafts in recent 4 years. The meeting thanked Japan for this sharing, and agreed to incorporate the main content of this paper into the AIGD.

Introduction to the Management and Application of 24-Bit Aircraft Addresses for Chinese Civil Aviation

6.15 CAAC issued "Regulation for Aircraft Address Management of Civil Aircraft " to make use of aircraft addresses efficiently and standardly for civil aviation in China. The 24-bit address has a greater advantage to identify aircraft than the traditional SSR code. With the implementation of the National ADS-B Construction Project and the application of the Mode S radars, it becomes possible to identify aircraft by 24-bit aircraft address in ATM automation system.

Implementation of New Surveillance System within Pyongyang FIR

6.16 This paper presented the information on the transition of surveillance system from SSR to ADS-B within Pyongyang FIR. The relevant information of new surveillance system implementation was issued by NOTAM early in February of this year and published the relevant AIRAC AIP AMDT effective from October 08, 2020 through the AIS. RAIM prediction NOTAM is planned in future and ADS-B data sharing with adjacent States is also proposed.

Latest Update on ADS-B OUT Mandate in Europe

6.17 Hong Kong China informed the meeting about the deferral of European ADS-B mandate from 7 June 2020 to 7 December 2020. The announcement by European Commission (EC) on 5 May 2020 also included new amendments allowing certain non-ADS-B operations.

Standards to Support Global Interoperability

6.18 As invited by the meeting, Mr. Christian Schleifer Heingärtner, the Secretary General of EUROCAE presented to the meeting on the role, function, process and available resources of this worldwide recognised industry standards-development organisation for aviation. The presentation also covered the domains of activities with highlights on surveillance related updates.

6.19 The meeting expressed its appreciation and gratitude to EUROCAE, encouraged States to nominate members to attend various technical WG meetings. EUROCAE suggested to focus on challenges and priorities to effectively balance the needs in different regional environments in making standards. As it is globally and publically open, EUROCAE encouraged SURICG members to make use of the online resources by subscribing the email service from EUROCAE webpage at www.eurocae.net to enhance the engagement with EUROCAE, and benefit from this open consultation process in the standards development, to gain visibility and have the possibility to provide comments on draft standards. The meeting highly recognized the value to explore more on better collaboration with EUROCAE during various meetings in APAC region.

Report of SEA/BOB ADS-B WG/15 Meeting

6.20 The Chairperson of SEA/BOB ADS-B WG/15 from CAA Singapore presented the Report of the Fifteenth Meeting of the South-East Asia/Bay of Bengal Sub-Regional ADS-B Implementation Working Group (SEA/BOB ADS-B WG/15), held in Singapore from 3 to 5 December 2019. The meeting noted updates of ADS-B projects and activities in the South East Asia and Bay of Bengal sub-regions presented in the meeting report.

6.21 The meeting reviewed and further updated the ADS-B implementation information consolidated by SEA/BOB ADS-B WG/15 and SURICG/5, and the Table of ADS-B Implementation Status in the APAC Region is provided in **Appendix M** to this Report. Currently 30 States/Administrations installed ADS-B ground stations, 12 States issued ADS-B mandate and 8 States used ADS-B for separation and others for awareness, gap filling and redundancy.

ADS-B Data Sharing between China/Myanmar & China/Laos PDR.

6.22 China proposed to conduct the sharing of ADS-B data with Myanmar and Laos PDR in the following steps for consideration:

a) choose the existing ground transmission link for the ADS-B data sharing; or to promote the opening of the CRV link;
b) consider the implementation of the transmission link according to the actual business promotion plan;
c) conduct signal routing, testing and evaluation; and
d) implement ADS-B data sharing and advance data-related applications.

Update on ADS-B Avionics Problem Reporting Database (APRD)

6.23 Hong Kong China updated the meeting on the latest status of ADS-B Avionic Problem Reporting Database (APRD) after its deployment in ICAO APAC web site in 2017. The APRD could contain useful information of generic ADS-B avionics performance problem commonly encountered in the Region as well as specific avionics issues that States/Administrations need to pay attention during the ADS-B Implementation. However, the usage of APRD by States/Administrations appears to be low since its deployment. States/Administrations were encouraged to make best use of the database to improve the quality of avionics equipage in ADS-B mandated airspace, report and share avionics issues. APRD direct link: https://applications.icao.int/ADSB-APRD/login.aspx

6.24 The States/Administrations, which have yet registered for APRD, to nominate point of contact to ICAO Regional Office for accessing the APRD. States/Administrations were also urged to report problems of ADS-B avionics and sharing of experience through the APRD.

Demonstration on space-based ADS-B data and DCPC SATVOICE trials

6.25 The meeting appreciated a brief demonstration presented by Singapore on the ADS-B data derived from space-based ADS-B and the audio recording of HF, VHF and DCPC type of

SATVOICE conversations between ATC controllers and pilots for voice quality comparison. An in-house developed processing server can filter the ADS-B data for the specified airspace for display or for onwards transmission to another user.

Achievement and future of SEA/BOB ADS-B WG

6.26 The meeting reviewed and discussed the paper jointly presented by Singapore, CANSO and the Secretariat. The meeting recalled that the SEA ADS-B WG was established by APANPIRG in 2007 through APANPIRG conclusion 18/38. In 2011, SEA ADS-B WG was renamed as SEA/BOB ADS WG.

6.27 The meeting discussed next step and the possible future work for the ADS-B WG including a number of new tasks identified in the proposed amendment to TOR. The meeting also discussed whether the SEA/BOB ADS-B WG should be closed and a new working group – regional ADS-B working group be established to deal with identified new subject/works. The meeting further considered an option to merge the work of the working group into work programme of SURICG. The meeting discussed benefits and cost of each option, but could not reach a consensus by all members of SEA/BOB ADS-B WG. As such a vote was proposed and conducted among members of SEA/BOB ADS-B WG. Finally, based on the outcomes of the vote, the meeting agreed to formulate a draft Decision on the dissolution of SEA/BOB ADS-B Working Group for CNS SG/24 consideration.

6.28 With aforementioned, this meeting adopted the following Decision: **Decision CNS SG/24/12 (SURICG/5/2) - Dissolution of SEA/BOB ADS-B WG.**

6.29 The meeting highly recognized the great achievements made by SEA/BOB ADS-B WG in past years, SURICG was requested to carefully design future meeting structure in four days to maintain the effectiveness in promoting ADS-B and implementing data sharing.

Report of DAPs WG/3

Utilization of Mode-S DAPs Data for Weather Forecast

6.30 As advanced ATM, like Trajectory Based Operation (TBO), requires high-accurate trajectory prediction. One of major factors of estimated flight time error in TBO is weather uncertainty. DAPs data are expected to be useful for improving numerical weather prediction because temporal and spatial intervals of DAPs data are very short. Japan conducted experiments for improving weather forecast accuracy by utilizing DAPs data extracted from BDS 5,0 and BDS 6,0, and the experimental results indicated that Mode S DAPs data have a potential to improve weather forecasts.

Guidance Material for Assignment of Interrogator Codes (IC) for MLAT and ADS-B

6.31 In the previous Mode S DAPs WG meetings, there were discussions on which II codes should be used by MLAT and ADS-B with interrogators. In practice, interrogators for MLAT are assigned II code = 0. While its logical for II code = 0 to be used for such equipment, some of the content in the Annex 10 Vol 4 and Doc 9924 seemed to either contradict or do not give clear indication. While the ICAO provisions do provide some guidance on the use of II Codes = 0, it does not provide the reader with clear guidance whether interrogators installed with MLAT and ADS-B may use II Code = 0.

6.32 The ICAO Surveillance Panel (SP) Aeronautical Surveillance Working Group (ASWG) has been informed in Sep 2019 on the lack of guidance material relating to this issue. During the ASWG meeting, it was generally agreed that II=0 may be used for interrogators in both MLAT and ADS-B. It is expected that new text will be adopted by ASWG sometime this year.

II/SI Operations

6.33 Although ICAO mandated that all aircraft transponders have to be SI capable for radars to use SI codes by 1 January 2003, but not all are SI capable.

6.34 Non SI capable transponders will only be able to recognize the last 4 bits, hence will mistakenly lock out to other radars with different SI codes, but with the same last 4 bits. To work around the situation, parts of Europe employed a special mode of operation known as the II/SI Operation. Under this operations, the radar will only lock-out aircraft with SI capable transponder but will not lock out non-SI capable transponder.

Mode S Roadmap

6.35 Mode S DAPS WG/3 discussed the recommended roadmap for various Mode S DAPs related issues to be adopted by SURICG.

Mode S Mandates

6.36 Considering that a number of applications will require Mode S DAPs, and that it would be easier for new aircraft to be fitted with Mode S upon delivery rather than to retrofit at a later date. It is also noted that Enhanced Surveillance (EHS) can support more applications than Elementary Surveillance (ELS), States are strongly encouraged to mandate forward fit of Mode S of EHS by 1 Jan 2022. IATA expressed support to Mode S in general as well as forward-fit of EHS. As for retrofitting existing airframes equipped with Mode A/C with Mode S transponders, the proposed timeframe for 1 Jan 2022 was tight for airlines that had portions of their fleet with Mode A/C only. It was a challenging target date to meet in normal circumstances and with the impact of the COVID crisis on airline economics, it could become even more challenging. As such, the meeting agreed to defer retrofit of Mode S transponder to DAPs WG for further deliberation. IATA would also be invited to take part in discussion on Mode S roadmap/mandate in the coming meetings of DAPs WG.

6.37 Therefore, a Draft Conclusion is formulated for consideration of APANPIRG/31: **Draft Conclusion CNS SG/24/13 (SURICG/5/3(DAPS WG3/1)) - Mode S Forward Fit Equipage in APAC Region.**

Use of SI Codes

6.38 Some Asia Pacific States/Administrations may require the use of SI code due to high concentration of Mode S radars. It is possible for certain regions in Asia Pacific to commence the use of SI codes first while the rest continue to uses the II code first. To overcome the issue with non SI-capable aircraft, the II/SI Code Operation may also be considered.

Radar Clustering

6.39 Very few States are practicing radar clustering. States with the competency and operational requirement may apply such technique.

Use of Conspicuity Code

6.40 Most Asia Pacific States still uses Mode A codes for flight plan coupling. In anticipation that Mode S codes would be used in future, it was agreed that the Mode A code of 1000 be reserved as the conspicuity code for Asia Pacific so as to match the European region. It is likely to take many years before all States can support this capability across APAC and EUR. The ATM systems must support the conspicuity code feature. In preparation on the use of the conspicuity code, States developing new automation systems are encouraged to include the conspicuity code capability into the system.

Weather Reporting Capability

6.41 Based on information provided by aircraft manufacturers, there is currently no service bulletins that will help upgrade aircraft with such weather reporting capability. There is also currently no plan to develop such upgrades. It is envisaged that weather reporting capability will be available in the next generation transponder. Instead of mandating weather reporting capability, it may be more practical to Mandate Enhanced Mode S and derive weather information using algorithms.

Datalink Map

6.42 Europe is experiencing very high usage of the 1090MHz frequency. In order to prevent States from over interrogating, Europe has a datalink map which restricts the registers that States can extract from. Europe even have rules stating that Mode S radars should not actively interrogate for Mode A and Flight ID unless there is a change. At this moment, the frequency congestion situation within Asia Pacific is not as severe as that in Europe. Hence it is not foreseen that such datalink map is required soon within APAC region.

6.43 The SURICG/5 meeting noted the effectiveness and achievements made by DAPs WG in last year, and recognized that the complex situation in publishing the regional roadmap on evolving Mode S technology, Mode S DAPs WG was then tasked to conduct more studies and further polish the roadmap, aiming to formulate a new version for consideration by SURICG/6 meeting in 2021.

Amendments to the Guidance Materials

6.44 The edition 1.0 of the Mode S DAPs IGD has been adopted in 2019 to provide guidance for States in the implementation and operational application. The Mode S DAPs WG made further improvements to the Mode S DAPs IGD. The main changes include adding introduction of Mode S DAPs data source, additional text for Mode S mandates, supplement benefits to ATC operation brought by Mode S DAPs, revise procedure of DAPs extraction, refine the regulations and procedures related to the use of ICAO 24-bit Aircraft Address/Aircraft Identification and add one specific example of Mode S DAPs application.

6.45 Accordingly, the meeting adopted the following Conclusion drafted by SURICG/5: **Conclusion CNS SG/24/14 (SURICG/5/4(DAPS WG3/2)) - Mode S DAPs IGD 2.0.**

Allocation of 24-Bit Aircraft Addresses

6.46 The Mode S DAPs WG was briefed on possible changes to the allocation of 24-bit aircraft addresses. Blocks of 24-bit aircraft addresses are assigned to States by ICAO. Each block is defined by a fixed pattern of the first 4, 6, 9, 12 or 14 bits of the 24-bit address. Thus, blocks of different sizes (1,048,576, 262,144, 32,768, 4,096 and 1,024 consecutive addresses) are made available.

6.47 In the last decade, some States with 1,024 addresses have developed their air hub and does not have enough addresses. The SP-ASWG has tasked its Technical Sub-group (TSG) to investigate/identify options for additional allocation of 24-bit aircraft addresses to States who currently have a small number of addresses (such as 1024).

Review ADS-B Implementation and Operations Guidance Document (AIGD)

6.48 Proposed changes to AIGD are summarized as below:

- Updated the status of known ADS-B avionics problems in Attachment A of Appendix 2 “List of known ADS-B avionics problems”, including:
  - B787 NACv = 0 Issue
- Updated Section 5.1.4.5.1 on ICAO Aircraft Address Monitoring
- Added the following new sections:
  - Use of ADS-B for Airport Surface Movement (Section 9.3.6)

- o 1090 MHz Spectrum and 24-bit Aircraft Address Issue with Unmanned Aircraft Systems (UAS) (Section 9.3.7)
- o Measures for Enhancing the Security of ADS-B (Section 10.3)
- o Time Difference of Arrival (TDOA) Based Position Verification Method (Section 10.3.1)

6.49 The meeting agreed to adopt the following Conclusion formulated by SURICG/5: **Conclusion CNS SG/24/15 (SURICG/5/6) - Revised ADS-B Implementation and Operations Guidance Document (AIGD).**

SSR Reception Malfunction Caused by UAV Video Transmitter

6.50 The UAV video transmitter device is using 1,080MHz to 1,200MHz, which overlapped the frequencies of SSR and DME, and may have a significant impact on SSR and DME.

Collaboration in Sharing of Surveillance Data in SWIM (WP/22)

6.51 Hong Kong China and Singapore presented some key considerations leading to a proposal of a Commercial-ANSP collaboration scheme in sharing and enriching surveillance coverage for the region to benefit the aviation community and accelerate the implementation of SWIM.

6.52 SWIM data is to be carried over CRV. At CRV OG/5, Hong Kong China presented a working paper on the three infrastructure models, namely Distributed model, Centralized model, and Hybrid model as potential implementation of SWIM infrastructure in the region. It was proposed that similar to other SWIM services, the sharing of surveillance data could be implemented in any of the three infrastructure models. It was proposed to use ADS-B data as the prime candidate for sharing because of lesser concern on data sensitivity, data ownership, data accuracy and data accountability on the part of contributing ANSPs. However, there are commitments from contributing ANSPs in terms of efforts and cost. It was said that it is desirable for the shared surveillance data service to be available to all parties who can access the regional SWIM to quicken implementation of SWIM.

6.53 The paper proposed an infrastructure named Surveillance Central Data Processor (SCDP) for sharing surveillance data. It considered two business models, namely (i) “ANSPs as SCDP operators”; and (ii) “Commercial Concern(s) as SCDP Operator with ANSPs’ Collaboration”. The paper suggested that the business case for an ANSP(s) to play the SCDP role might not be strong. However, in the second model, with a commercial concern(s) as SCDP operator and the assumption of subscription-based charges, the issues of commitment to resources, accountability and upfront costs could be shifted to the commercial provider while a shorter lead time to service availability is to be expected. Furthermore, the potential collaboration scheme by way of strategic locations of an ANSP’s receiver sites together with a commercial concern’s data source would provide a much wider coverage map in the region and an additional layer of data source redundancy.

6.54 It is suggested to establish a Study Group under SURICG and supported by subject matter experts in SWIM, CRV and ATFM etc. and under the guidance of ICAO APAC to advise CNS SG on the best approach for regional surveillance data sharing. This proposal was also presented to SWIM TF/4 as WP/13 and resulted into an action item 4-4. The meeting was invited to consider the Commercial-ANSP collaboration scheme and the various consideration factors leading to this potential scheme. It is requested to consider the potential developments in surveillance data, particularly ADS-B data as SWIM services carried over CRV and support the establishment of the Study Group to recommend solutions on regional surveillance data sharing to provide surveillance from “departure to destination”.

6.55 The meeting noted the Draft Decision SURICG/5/1 as well as the relevant outcome from SWIM TF/4, and an ad hoc group led by Hong Kong China had prepared a draft TOR for the proposed Study Group for further consideration by CNS SG. After deliberation, the meeting discussed the draft TOR through **Flimsy/06**, and deferred to the Study Group to fine-tune its TOR and decided its time schedule and deliverables for updating to SURICG. It was agreed that SURICG will be held after

SWIM TF, so that the progress made by the Study Group would be shared with SWIM TF before reporting to SURICG. The meeting adopted the following Decision: **Decision CNS SG/24/16 (SURICG/5/1) - Establishment of Study Group under SURICG on Sharing of Surveillance Data in SWIM.**

Air Traffic Control Surveillance Activities in India (IP/05)

6.56 India is continuously upgrading and augmenting the current surveillance capabilities. Indian airspace is covered by redundant surveillance coverage including 16 nos. of ASR/MSSR, 02 nos. of ARSR/MSSR, 12 independent MSSR, 04 ADS-C/CPDLC links, 21 ADS-B Ground receivers, and 11 Nos. of ASMGCS.

6.57 India has entered a service contract with service provider of space-based ADS-B for Chennai and Mumbai. India has entered into agreement or planning to share ADS-B data with neighboring countries such as Myanmar, Malaysia, and Indonesia. 36 Nos of ADS B ground receivers have been planned. These will enhance redundancy for surveillance in existing Radar airspace and extend surveillance coverage to low density airports and certain oceanic airspace including facilitate extension of surveillance coverage for low altitude. ADS-B based surveillance approach centers have been established for 7 Non-Radar airports i.e. Calicut, Tiruchirappalli, Patna, Agartala, Bhubaneshwar, Coimbatore, and Jaipur. ADS-B based Surveillance services has been established for 'Terminal and En-route' operations at 4 airports i.e. Ahmedabad, Cochin, Guwahati, and Trivandrum. Work is in progress for 5 more such airports i.e. at Amritsar, Mangalore, Lucknow, Varanasi, and Mumbai. ADS-B Based Surveillance for En-route operations have been done at Dibrugarh, Jaisalmer, Nagpur, Port Blair, and Vijayawada.

6.58 The DGCA of India has issued ADS-B Avionic mandate from 01.01.2020 onwards. All aircrafts flying over Indian continental airspace at or above FL-290, are to be equipped with on-board ADS-B equipment. Also, contemplating to provide priority in landing to the aircrafts equipped with ADS-B at airports where ADS-B based approach surveillance services are being provided is going on.

Japan's Effort to A-SMGCS: Data-Driven and Simulation-Based Research Activities on Airport Surface Traffic Flow (IP/16)

6.59 Growth in traffic volume in busy airports induces surface traffic congestion, which degrade operational efficiency and results in uncertain taxiing times. It is necessary that efficiency measures should be devised. In Japan, ENRI (Electronic Navigation Research Institute) is supporting the administrative activities on airport surface management by problem identification, development of airport surface traffic simulator (GRACE), and simulation studies on efficiency improvement. ENRI use Aircraft position data at every second by SMR, MLAT etc., parking gate assignment records, and ATC process records and input them to GRACE to compare the actual and simulated traffic situations precisely.

6.60 ENRI is studying surface traffic management methods to regulate departures' traffic volume and to stabilize taxiing times, based on surface traffic simulations. ENRI studies show that the uncertainty of the taxiing time of departure flight could be reduced by leveling the waiting time at the runway end. It is expected that ENRI's studies and airport surface traffic simulator "GRACE" should contribute to DMAN and SMAN operation, which are key enabler for one of the most important factors in A-SMGCS "Routing". ENRI will continue further studying for efficiency improvement on airport surface traffic flow.

Lockout Override Operation to Avoid IC(II) Code Collision (IP/20)

6.61 Republic of Korea presented information about the Mode-S radar configuration to avoid IC code collision with adjacent radars and the performance evaluation result. Acquiring ICAO 24-bit address by Mode-S radar is the first step to detect new target. Incheon airport has two Mode-S radar and one SSR radar. Shinbul#B radar (II:2 code) has Mode-S IC code collision allegedly against the unknown Chinese Mode-S radar at the Shandong peninsula airspace. Republic of Korea explained the technical details about the problem.

6.62 The significant implication about the Mode-S IC collision is that the detection results are different between inbound and outbound flights in the IC collision region. Shinbul#B Radar cannot newly acquire the aircraft address of AAR542 by using II:2 because AAR542 already locked out by the unknown II:2 Radar. Shinbul#B Radar does not have a lockout list for AAR542.

6.63 For countermeasure to avoid Mode-S IC collision, they proposed two ways. First is to change MIP (Mode interlace pattern) to add classic Mode-A, Mode-C and second is the use of lockout override with probability of ½. Pros and cons of both methods were described. It is discussed that to overcome IC collision, adding classic Mode A, C interrogation slot in the MIP configuration could be one solution with some disadvantages. It is informed that Incheon airport is testing "Lockout Override with PR 1/2". Current test result show that still there is no reason not to use Lockout override in the IC collision condition. No side-effect of lockout override configuration is observed. As the result, lockout override of probability 1/2 could be a good solution for the radar having the problem to acquire the new aircraft address in the Mode-S IC code collision region.

6.64 Republic of Korea was requested to bring this paper for further deliberation on DAPs WG/4 meeting. The Secretariat informed the meeting about the regional established practice on II code coordination through **Flimsy/05**, as well as the need for IC code inter-regional coordination, and urged States/Administration to provide the required information to ICAO Regional Office for updating the APAC II code list. **ACTION ITEM 24-8**

Agenda Item 7: Automation

Outcome of Seminar on Air Traffic Management Automation System and First Meeting of Air Traffic Management Automation System Task Force (WP/11)

7.1 The Seminar on Air Traffic Management Automation System and the First Meeting of the Asia/Pacific Air Traffic Management Automation System Task Force (ATMAS TF/1) were held from 27 to 30 October 2020. The seminar was conducted in two sessions, the Session 1 focused on Experience Sharing from CAA/ANSPs, while the session 2 focused on New Technology and Approach from Industry, it provided a platform for participants to exchange experience and keep abreast of the latest knowledge on the subject of air traffic management automation.

7.2 Ms. Xie Yu Lan, Deputy Director General of North China Regional Air Traffic Management Bureau of CAAC, and Mr. Kwek Chin Lin, Chief ATC Specialist (Systems Development) from Civil Aviation Authority of Singapore, who were both unanimously elected as the co-chairs of the ATMAS TF.

Global and regional ATM Automation System updates

7.3 The meeting recalled AN Conf./12 recommendations:**Recommendation 1/11 – Automation roadmap.**The meeting also noted the Action Item 54/13 of 54th DGCA Conference on ATM system.

7.4 The meeting noted the editorial change on air traffic automation system between the ICAO GANP (DOC 9750) edition 5 (published in 2016) and the GANP edition 6 as a portal at: **https://www4.icao.int/ganpportal/.** The meeting also noted the ICAO provisions relevant to automation.

7.5 Hong Kong China expressed its concerns on the absence of automation system roadmap in GANP edition 6, and the Philippines advised the meeting about one paragraph in GANP edition 6 to explain its section *Relationship with other Documents* of ***Introduction***, could be a response on ICAO roadmap.

ATM Automation System implementation in Indonesia

7.6 Indonesia has 14 ATM systems consisting of 12 for main system and 2 for backup system, deployed to provide ATC surveillance in 12 terminal and approach, also area control services (Jakarta ACC and Ujung Pandang ACC) . Indonesia adopted an phased approach to implement ATM automation system, covering System Plan and Design (meet the requirements of the airspace structure and services), System Installation and Commissioning (with reference to the instruction contained in documentation of each system), Systems Operations Management and Maintenance Practices (with respect to the SOP, site specific changes and technical personnel ratings).There are three phases for the Operational Transition: Dry Shadow Phase, Wet Shadow Phase and Cut Over. Contingency Plan was also introduced for Transition Period, Operational period while considering various system configuration and the scope of the failure.

Challenges in Implementation of ATM Automation System

7.7 The implementation of ATM Automation system is a complex task in terms of Time, Money & acceptance of ATM Automation system by the user. With the successful commissioning for a new ATM Automation system at Delhi International Airport and Delhi ACC recently, India shared the challenges faced during the implementation in different phases of project, as well as suggestions to address the challenges. (refer to para 7.38)

Software Management and Technical Support in ATM Automation System

7.8 China has more than 90 sets of ATM Automation System and established the software management and technical support system. It covers all system construction and operation stages, including many actives, such as system requirements analysis, system fault management, software release, test and evaluation, parameter configuration management. It is essential to the safe and regular operation of the system in the whole life cycle.

Radar Access Risks and Solutions to ACC ATM Automation System

7.9 Although more and more radars access enhances the multiple coverage of the airway and reduces the blind zone of coverage, it also brings certain risks to the ATM automation system, The paper proposed four solutions.

Different ATM Automation System Implementation in India

7.10 India has installed multiple ATM automation systems of various capabilities across the Indian airports to utilize the large network of surveillance sensors. Since each of the ATM automation system was installed in different stages, the Air Navigation Service Provider (ANSP), Airports authority of India (AAI) operates a combination of Automation systems from various vendors having different capabilities and with varied experiences. India shared the common features and differences between various Automation System architecture installed.

Application of Flight Data Exchange in ATM Automation System

7.11 In order to adapt to the rapid development of civil aviation in China and improve the safety assurance level of the Air Traffic Management Automation System (ATM AS), the Civil Aviation Administration of China (CAAC) issued the industry standard "Civil Aviation Air Traffic Control Automation System" (MH/T 4029). The third part: Flight Data Exchange (MH/T 4029.3), which defines the protocol, message type and data format for the flight data exchange between the ATM AS and related systems, the standard is mainly used for the ATM AS planning, design, construction, testing and operational use.

Application of Flight Plan Centralized Processing System in ATM Automation System

7.12 Flight plan centralized processing system (FCPS) is a set of intelligent control system independently developed by ATMB, which is responsible for processing National flight plans and telegrams. It was officially put into operation in September 2017. With the construction of National Flight Plan Processing Center, the unified processing of flight plans of 237 airports in China has been completed. The rudiment and new business mode of unified management of national flight plans have been preliminarily established.

Initial Application of CRACP in Flow Management System

7.13 CRACP (Cross-Border ATFM Collaborative Platform) can realize the data docking between China, Japan and ROK air traffic management units using their respective systems to achieve full situational awareness of cross-border flights from 2 hours before EOBT to the transfer point, and implement more accurate and more limited traffic on this basis Management measures. Thereby reducing the length of traditional interval restrictions and the number of affected flights, and improving the quality of operations.

ATFM-ACDM Integration

7.14 India presented a case study of the actual integration of Airport Collaborative Decision Making (ACDM) and Air Traffic Flow Management (ATFM). ATFM-ACDM integration is a process to achieve data exchange between these two systems without the need for any manual intervention.

Challenges in Implementation of DMAN

7.15 Singapore shared her experience in the implementation of Departure Manager (DMAN). Singapore introduced A-CDM in Oct 2016 at Singapore Changi Airport. A-CDM and DMAN are closely inter-linked and have high dependencies on one another. DMAN is a key system to support the implementation of A-CDM, and it uses the information shared through A-CDM to work effectively. DMAN requires the TOBT inputs from airlines or ground handling agents to calculate TTOT and TSAT. The importance of accurate TTOT was emphasized. The interdependencies between A-CDM and DMAN is highlighted. The success of DMAN implementation does not solely depend on the system itself. It is much more complex than Arrival Manager (AMAN) implementation, where automation alone can probably achieve the desired results. For DMAN to work, it requires a reasonable level of TOBT accuracy, and this can only be achieved if stakeholders act in the spirit of collaboration and commit to adhering to the agreed A-CDM processes and procedures.

7.16 Singapore also shared her plans to integrate the DMAN system with AMAN, and later with an SMAN which will result in greater automation. TTOT calculation will take into consideration of the arrival and thus impact the TSAT. With the systems integrated, this process is done automatically with information sharing. When the SMAN is integrated, a dynamic taxi time can be derived using ground sensors to determine speed and controllers' set taxi route to re-compute the taxi distance, thereby providing a real time adjustment of taxi duration time.

Preparation of Tailored MET-ATM Implementation in Indonesia

7.17 ATM-MET Integration system shows graphical information of meteorological forecasts in the air space, i.e. Flight Information Regions (FIRs), Upper Control Areas (UTAs), Flight Service Sectors (FSSs), Control Areas (CTAs) and Terminal Control Areas (TMAs) of Indonesian region.Impact-based weather information for the ground area is displayed according to aerodrome forecast and warnings, as well as for the holding area surround the airport. Forecast information in Holding Area consists of forecast information of some parameters which include temperature, wind direction and speed, and forecast of Cumulonimbus development in 6 hours ahead. Categorization of impact-based is determined according to the weather condition which will affect the reduction of capacity both of the airport and the air space managed by air navigation service provider. The categorization has been made based on mutual-understanding between meteorological service providers and ANSPs in each airport.

Implementation of Enhanced Wake Turbulence Separation and Approach Spacing Tool in Hong Kong China

7.18 Hong Kong, China has conducted a safety case study for the implementation of ICAO "enhanced Wake Turbulence Separation" (eWTS) at Hong Kong International Airport (HKIA). The study involved a 12-month wake study and analysis on the real-time data collection, generation and dissipation rates of wake vortices of different aircraft types in the local Hong Kong environment. The wake vortex data was analyzed by international experts, and a safety case was prepared to demonstrate with evidence that the safety assurance arguments supported the implementation of eWTS in HKIA operations, and that the wake encounter risk for each aircraft pair under eWTS would remain with the current acceptable safety risk level.

7.19 Based on the study of historical traffic data at HKIA, it is anticipated that the overall arrival spacing on final approach would be reduced safely under the application of eWTS. Additional arrival slots would be generated by AMAN dynamically according to actual traffic mix. As a result, an increase in runway capacity is anticipated through the implementation of the eWTS scheme.

Application of AMAN Technology in Busy Terminal Area

7.20 Shanghai and Beijing's AMAN system adopted the integrated AMAN system, and introduced the characteristics of the integrated AMAN system and the interaction with the ATM automation system.

Application of DAPs Data in ATM Automation System

7.21 In recent years, China has promoted the application of Mode S radar in ATM automation system in three stages. In the first stage, Mode S elementary surveillance data has been applied in ATM automation system. DAPs data with specific application scenarios are currently underway in the second stage, and the rest will be further studied in the third stage. At present, China is in the second stage and this paper concludes the specific application, benefits and problems of DAPs data in ATM automation system.

Application of DAPs in ATM Automation System in Singapore

7.22 Singapore shared their experience in the introduction of DAP. The ATM automation system in Singapore was upgraded in 2018 to display DAPS on the aircraft label. Singapore highlighted the issues (and resolution) and challenges in the implementation such as erroneous 24-bit address and MCP/FCU mismatch showing incorrect values. Since the introduction of the MCP/FCU Selected Altitude mismatch alert, multiple potential level bust had been prevented as the MCP/FCU Selected Altitude mismatch alerts provided controllers an additional layer of defence. Besides the display of information obtained from DAPs, the ATM automation system in Singapore was also enhanced to incorporate the information in its processing of existing safety nets which results in lesser false alerts.

Application of MTCD Functions in ATM Automation System

7.23 CAAC ATMB has deployed Medium Term Conflict Detection (MTCD) function in Beijing and Shanghai ATM Automation System. It is widely commended by controllers, mainly being ascribable to call their attention to keeping aircrafts separation in a certain time advance rather than in a closely short time, and is helpful for airspace safety especially in heavy traffic. China presented to the meeting on the concept of MTCD and the differences between MTCD and STCA, as well as the tuning experience and operational use of MTCD in ATM Automation System.

Progressive Implementation of Safety Net Functions in Hong Kong China

7.24 Hong Kong, China has adopted a progressive approach in the implementation of applicable safety net functions in the ATM Automation System, so as to minimize the risks involved in transition to the ATM Automation System, and to best suit the operational needs of air traffic control officers (ATCOs). Following this approach, three safety net functions, namely Short Term Conflict Alert (STCA), Special Use Airspace Intrusion Warning (SUAIW) and Cleared Level Adherence Monitoring (CLAM) have been successfully implemented since the full commissioning of the ATM Automation System in November 2016.

7.25 Another three safety net functions, namely Approach Path Monitoring (APM), Departure Path Monitoring (DPM) and Similar Callsign Advisory (SCA) have been successfully implemented in 2019. All the safety net functions have been operating satisfactorily. To assess effectiveness of the implemented safety net functions, post implementation review with ATC operations were conducted to obtain feedbacks from front-line ATCOs to identify if there was a need to fine-tune the system parameters. Riding on the experience gained, Hong Kong, China would continue to adopt the progressive approach to implement other applicable safety net functions.

Cyber Security Control for ATM Automation System

7.26 With the implementation of data exchange between ATM automation system and other external systems, the operational environment of ATM automation system has been changed. Considering the system boundary is constantly expanding, the cyber security of ATM automation system becomes a key issue which is supposed to pay special attention on.

7.27 Considering the operation of ATM automation system, it is recommended to give priority to P(protection) and D(detection)to set up technical mechanisms control for ATM automation system. it is suggested to optimize system network structure, deploy security equipment and related configuration strategies at the boundary, and improve the system capability to prevent and detect external threats. An optimized network structure of ATM AS and five measures were proposed for reference, and three suggestions were also provided as follow-up actions.

A Proactive and Systematic Approach in Protecting Digitised Air Traffic Services Against Cyber Threats in Hong Kong China

7.28 Hong Kong, China provided information about its proactive and systematic approach in protecting digitised Air Traffic Services (ATS) against cyber threats in Hong Kong. Hong Kong, China fully supported the ICAO's initiative on aviation cyber security management against cyber threats, and had taken proactive measures in a systematic manner to address an increasing challenge on cyber security for ATS systems.

7.29 The meeting was informed of the key elements of the provisions of the measures implemented by Hong Kong, China, covering aspects on policy, administration, procedures, drills, systems/technologies, as well as physical security. States are encouraged to strengthen their cyber security management to protect the increasingly digitised ATS against cyber threats.

Recommended Functions and Performances of ATM Automation System

7.30 The development of a guidance material of implementation of ATM automation system is one of the key deliverables of ATM automation system task force (ATMAS/TF) as per the Terms of Reference. This working paper was jointly prepared by China, Hong Kong China and Singapore to explore the Recommended Functions and Performances of ATM Automation System (RFAP of ATM AS) and proposed a draft as edition 0.0 for future formulation and development by the task force, as the guidance material for systems planning, design, testing and implementation of ATM automation system in the Asia and Pacific Regions.

7.31 China took the lead in preparing the initial draft of the RFAP of ATM AS, explained to the meeting about the main points of the edition 0.0 through a presentation. The meeting appreciated the excellent job done by China, Hong Kong China and Singapore, and agreed to use the edition 0.0 as the basis for future work of a specialized ad hoc group of volunteered experts from member States/Administrations. The meeting supported China to lead this ad hoc group, and consolidated a list of focal point of this ad hoc group to facilitate the various tasks shared by group members, which include China, Hong Kong China, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, Philippines, Singapore, Thailand and Vietnam. The Rapporteur of this ad hoc group is Ms. Cao Su Su from China.

Challenges in Implementation of ATM Automation System (IP/06)

7.32 India shared the challenges faced during implementation of ATM Automation System in different phases of project and suggestions to address the challenges. India has successfully commissioned a new ATM Automation system at Delhi International Airport and Delhi ACC. The various issues faced, and lessons learnt during the execution of this project into pre and post contract phases were explained. As per the discussion during pre-contract phase, purchaser should have clarity for system Architecture. Quality assurance level requirement needs to be well defined like Quality of Test in accordance with ISO-9001-20XX specifications or DO-278A/ED-109A assurance level or Valid CMMI Level xx as per requirement. Estimate of the project should consider latest version of Hardware & peripheral equipment along with the level of Operational Maintenance support. Timeline of project shall be framed in a realistic manner. The supplied software shall be thoroughly tested by the QA team at site in real environment. Selection of a successful supplier can be based on Quality cum Cost Based Selection (QCBS) criterion.

7.33 During post contract phase, a dedicated Project Monitoring group (PMG) drawn from all the concerned stakeholders should create. System Evaluation, HMI customization & prototype testing shall be performed before starting System evaluation. Database Creation Phase shall be completed in time before starting testing Phase. Training to ATSEPS and ATCOs should be provided before Factory Acceptance test as well as after installation of the System. System Testing, Quality Assurance Audit, Site Acceptance Test, System Reliability & Stability Test (SRST), System Anomalies resolution & Transitional phase are required to be monitored on continuous basis which results in timely acceptance of the system.

Lessons Learned from New ATM Automation System Implementation (IP/12)

7.34 Thailand initiated the Thailand Modernization CNS/ATM System (TMCS) project to replace previously aging CNS/ATM systems along with ATM automation support system. Transition to use new system completed in Q1 2020. Thailand presented summary of lessons learned from implementation of new ATM Automation System.

7.35 Thailand categorized lesson learned into several categories. It includes addition of importance of collaborative process from ATM automation system users into terms of reference (TOR), support from vendors for safety case in terms of reference development and setup structured data set management team. They advised to define clear external interfaces, good planning of Operations Room and Support Facilities, modified procurement process, relationship management between ANSP and ANS regulators, and vendor relationship management. Important of various factors and considerations in ATM system transition planning in shadowing, ghosting, and post cutover phases are proposed. Thailand highlighted importance of communication strategies during transition phase, project management office setup along with requirements to be fulfilled by them during transition phase in case of large scale system. Additionally, procedures on using and maintaining new ATM automation system along with availability of a Contingency / Training ATM automation support system were detailed. Thailand encouraged sufficient time and manpower for ATSEPs training.

Agenda Item 8: Review and updates

China Civil Aviation Ground-Ground Communicationnetwork Status (IP/07)

8.1 China presented the information of China civil aviation ground-ground communication network, including network scale, network topology, application technology and services accessing.

8.2 CCACN has been designed as a three-tier network architecture model which contains a common core layer, a convergence layer and an access layer. Important nodes have installed dual devices, two power supply modules for guarantee node reliability. CCACN is a historic milestone for the development of China's civil aviation communication network. Since the operation of the CCACN in November 2019, the service by ATM network have been gradually migrated to CCACN. By the end of September 2020, the services migration has been basically completed.

8.3 CCACN will not affect or make change communication mode with neighboring States. China joined the CRV Network in October 2020 and had already completed the implementation on 26 October 2020.The CCACN will setup interface for connecting the CRV for more selection in international communication in the future.

The Long-Term Vision for the Future Air Traffic Systems of Japan (CARATS) (IP/17)

8.4 Japan presented the information about status update of the long-term vision for the future air traffic systems of Japan, namely "CARATS: Collaborative Actions for Renovation of Air Traffic Systems".

8.5 ICAO GANP indicates comprehensive direction for the globally harmonized air navigation systems with safe, effective, and efficient air traffic and various measures as ASBUs and Technology Roadmaps. JAPAN established CARATS in 2010, which describes goals aimed at for 2025 such as improvement of safety, growth in global air traffic demand, improvement of user-friendliness, improvement of operational efficiency, etc. along with eight directions of renovation to achieve the goals, with a core of the "Trajectory Based Operations (TBO)".

8.6 CARATS is consistent with the ASBU Methodology. The main measures in CARATS are improved efficiency in ATC operations of take-offs, landings and surface using AMAN, DMAN, SMAN coordination, A-CDM, reduced wake turbulence separation minima, etc.; enhancement of ATC capacity by Continental Controller Pilot Data Link Communication; and realization of TBO utilized FF-ICE/SWIM. Japan has made decisions to implement Operational Improvements such as ATS operation by utilizing aircraft derived data CAP, utilization of wind information for ATS and enablers such as Information management infrastructure- FF-ICE filing service, utilization of aircraft derived data -enhanced DAPs data element. FF-ICE is the key to ATC digitalization, which has huge impact for relevant stakeholders. Japan has decided to introduce FF-ICE step by step. ATS operation by utilizing aircraft derived data is utilized DAPS for improving situational awareness for ATC.

Update of ADS-B &AIDC Implementation in Indonesia (IP/22)

8.7 In accordance with the Conclusion APANPIRG/30/15 – *Revised Surveillance for APAC Region*, member States are encouraged to maximize the use of ADS-B on major air routes and in terminal areas. Indonesia continue to undertake the ADS-B implementation program in order to harmonize the air navigation services among FIRs and enhances safety in the region. Indonesia has carried out several stages of ADS-B implementation and has implemented ADS-B mandate (Tier-1) for all transport category aircraft at all level in particular airspace, since 23 April 2020. Area of ADS-B implementation are class A airspace between FL245 – FL600, class B, C, D, and E airspace between Ground to FL245, at 9 control zones and terminals. the population of ADS-B equipped aircraft increase to 87% from all transport category aircraft from 85% initially. Additionally, new ADS-B ground stations are deployed to cover the eastern part of Indonesia and the Indonesian FIR boundary.

8.8 Indonesia also shared AIDC implementation status in Indonesia, especially Ujung Pandang ACC, until end of Q2-2020, until end of Q2-2020 as follows:

- with Brisbane ACC: **Implemented**
- with Manila: **Operational Trial**, target implementation in December 2020
- with Port Moresby ACC: **Success Testing**, target implementation in January 2021
- with Kota Kinabalu ACC: **Success Testing**, target implementation in 1Q-2021
- with Oakland ARTCC: **Success Testing**, target implementation in 1Q-2021
- with Jakarta ACC: Planned, target implementation in 2023.

8.9 Recently, Ujung Pandang ACC and Manila ACChave signed and agreed to implement AIDC, and will be **effective on 3 December 2020**. Ujung Pandang ACC and **Port Moresby ACC** have also been in operational trial since **8 October 2020,** and planned to implement in January 2021.

Reinforcement of CNS Capability around Fukue-Akara Corridor Area in Incheon FIR (IP/24)

8.10 ATMO (Air Traffic Management Office) of the Republic of Korea (ROK) has been made an endeavor to build up safe air traffic environment with an efficient air traffic control system by operating two ACCs, which divide Incheon Flight Information Region (FIR) into East & West sections. The Fukue-AKARA Corridor is recognized as one of the most traffic volume areas in the Asia-Pacific region in conjunction with the region's identification as LHD Hot Spot at the 20th Meeting of the APAC Regional Airspace Safety Monitoring Advisory Group (RASMAG/20).

8.11 For the need for coordination between States concerned in order to identify optimum solutions to address safety and efficiency issues, the Technical Working Group (TWG) was formed with technical experts designated by States Concerned. The paper described the Republic of Korea's (ROK) endeavor to reinforce CNS system around the Corridor area in support of addressing safety and efficiency issues in the said area. It includes new Installation of U/VHF Equipment, installation of DSC between Shanghai ACC and Incheon ACC, new installation of Radar (ARSR/SSR) on highland of Mt. Halla, installation of primary and secondary surveillance radar (SSR), and ADS-B establishment and implementation.

8.12 Republic of Korea insisted that while the current pandemic has temporarily reduced the air traffic volume, safety concern may resurge at any time with the expected increase of traffic in the future. As such, ATMO would do the best performance in preparation for resilience of air traffic volume when COVID-19 passed.

Updates on CNS Collaboration between ICAO Regional Office and EUROCONTROL (SP/02)

8.13 EUROCONTROL presented briefly about its history, structure, and current role, in particular the European Network Manager (including traffic flow management) and as an international Air Traffic Control center. The presentation highlighted the iCNS Unit activities including Datalink Performance Monitoring- DPM, Navigation systems Monitoring Ground + GNSS- NAVM, Surveillance Interrogators, Surveillance Avionics, ACAS and Altimetry Monitoring Service- SI3AM. The presentation covered 1030MHz-1090MHz status Monitoring, Altimetry Monitoring, Spectrum and Radio Frequencies monitoring, Datalink Implementation Support, COM – IP, COM - ATS Messaging Management and their associated tools. Various tools were also introduced, such as DEMETER and AUGUR, SUR Code Allocation Tool, SUR Services Tools, and NAV PBN tools. The participants were invited to visit EUROCONTROL website to get a network-wide view of European CNS infrastructure.

8.14 The meeting appreciated the valuable information sharing by EUROCONTROL, and discussed about potential cooperation between EUROCONTROL and Asia pacific region. EUROCONTROL tools were mainly developed for use at European level, however, they may be tailored to meet other national and regional needs. The meeting requested ICAO APAC Office to further identify the services, information and tools provided by EUROCONTROL that may benefit this region, further cooperate on specific topics with the APANPIRG contributory bodies reporting through CNS SG, and the member States were encouraged to individually contact EUROCONTROL for various services.

Agenda Item 9: Review status of CNS deficiencies (APANPIRG Deficiency List)

Action of Communication Status Improvement Between China and Pakistan and Suggestion on Removal of the Relevant CNS Deficiency (WP/16)

9.1 China presented a brief summary of China and Pakistan's activities in order to resolve communication deficiency and suggests removing relevant content from the current APANPIRG deficiency CNS list.

9.2 The ATS direct speech circuit and COM/SUR problems between China and Pakistan were identified on the RASMAG/19 meeting in May 2014. In order to resolve this problem, China and Pakistan planned to enhance the scope and the quality of communication, and expanded the scope of ATS surveillance as further improvement and remedial action.

9.3 In China and Pakistan COM Coordination Meeting organized by ICAO APAC Office, Beijing, China from 7 to 9 May 2015, China had submitted a proposal named SOLUTIONS FOR COMMUICATIONS BETWEEN CHINA AND PAKISTAN. Both states agreed to upgrade the communication circuit by setting up new satellite stations at Lahore and Urumqi and establishing satellite link between them.

9.4 The Afghanistan, China and Pakistan COM Coordination Meeting organized by ICAO APAC Office was held in Regional Sub-Office, Beijing, China from 24 to 25 July 2019. Based on the Large Height Deviation Events reported to China RMA (WP/05), the LHDs concerning Urumqi ACC interface with Lahore ACC was reducing year by year since 2015. According to the suggestion of China, Hot Spot E (Lahore-Urumqi) had been removed at the RASMAG/25 and there is improvement in bilateral communication and surveillance. China suggested that this deficiency be removed.

Review Status of CNS Deficiencies (WP/19)

9.5 The meeting was informed about the Conclusion APANPIRG/30/19 urging States concerned to establish action plan with defined target dates for resolution of deficiencies, update the status on the action taken and update contact details of a focal point to coordinate actions

9.6 The meeting noted the information provided in WP/16, highlighted the improvement in bilateral communication and surveillance between China and Pakistan, and the Hot Spot E (Lahore-Urumqi) had been removed at the RASMAG/25, therefore, the meeting agreed the removal of this deficiency in "Reporting Form on Air Navigation Deficiencies in the CNS Fields" from APANPIRG Air Navigation Deficiency list.

9.7 The meeting did not identify any additional deficiencies in the CNS fields. The updated list of CNS related deficiencies is provided in **Appendix Q** to this Report.

Agenda Item 10: Human Factors and Air Traffic Safety Electronics Personnel (ATSEPs) related training

10.1 The CNS SG fully recognized the importance of Human Factors and ATSEP training in support of ANS operations, and encouraged States/Administrations to share relevant information at its annual sub-group and any other appropriate meetings.

Review Outcomes of Small Working Group Study on Human Factor Issues of ATSEP (WP/25)

10.2 IFATSEA initiated the study with the objectives to study the human factor issues of ATSEP on their working environment, to identify the significant factors that add stress and fatigue and affect their safety job performance, to understand the stress and fatigue levels of ATSEP and for resolving potential risks to ANS, to identify the significant counter measures, and to identify the means for improving the safety culture and professional engagement.

10.3 ICAO's Human factors training manual was taken as a fundamental reference and SHELL model and REASON's model were taken for presenting the study to all participants. PEAR model and DIRTY DOZEN models were referred for further analysis of the inputs received. Based on the outcomes, final consolidated counter measures and significant factors were listed as recommendations in the Chapter 10 of the study report. Most important measures that ANSP need to take on priority are listed in the conclusion chapter. The detailed study report was given in the **Appendix R** to this Report.

10.4 The meeting appreciated the effort led by IFATSEA, and recognized the values of recommendations from the study report, and supported the further scope of work proposed by IFATSEA and then formulated the following conclusion for APANPIRG consideration: **Draft Conclusion CNS SG/24/17 - Addressing Human Factor Issues of ATSEP**.

Agenda Item 11: Cybersecurity of CNS/ATM systems

ICAO Trust Framework Update (SP/01)

11.1 Mr. Michael Goodfellow (TO/GIS) from Air Navigation Bureau, ICAO Headquarters, presented updates about the ICAO trust framework, which formally started after following AN Conf./13 Recommendation 5.4/1. ICAO presented its vision for the global trust framework, highlighting the risk of diverging efforts and the need for converging strategies for all aviation ecosystem stakeholders that build on existing foundations.

11.2 ICAO shared a short history and definition of ICAO Trust framework along with the update of the third meeting Trust Framework Study Group (TFSG). TFSG's work included reviewing a concept of operations for an international aviation trust framework, developing use cases for the international aviation trust framework, and developing requirements and guidance for identity management. TFSG/03 also covered requirements and procedures for technical and organizational trust, defining performance-based requirements for exchange and storage of information, an IPv6 address schema & allocation and management policy, supporting ICAO in negotiating with Internet governing bodies for a dedicated block of IPv6 addresses for current and future aviation needs, and working with the IETF to identify the necessary protocols to allow logical isolation of aviation data communications from the public internet. TFSG also provides coordination with ANC Panels and internet bodies such as ICANN.

11.3 ICAO shared information about the Enterprise Security Harmonization Proof of Concepts (ESHPOC) with EUROCONTROL and FAA for Validating Trust Framework technical documents and implementation strategies using SWIM Test cases.

11.4 The meeting was also informed about the *Aviation Cybersecurity Strategy* published in October 2019 and the 1st Edition of the *ICAO Cyber Security Action Plan* (CyAP) at following webpage: https://www.icao.int/cybersecurity/Pages/default.aspx

Outcome of APAC Cybersafety and Resilience Workshop with Tabletop Exercise (WP/14)

11.5 The ICAO Asia Pacific Cyber Safety and Resilience Workshop with Tabletop Exercise (APAC CSR TTX) was facilitated by Ms. Olga de Frutos Martin (TO/AN) and Mr. Michael Goodfellow (TO/GIS) from the Air Navigation Bureau, ICAO Headquarters. The objective of the Cyber Safety and Resilience Workshop was to empower CAAs and ANSPs with measures to mitigate the exploitation of critical information systems, develop awareness on cyber issues affecting aviation, and foster a cyber-safety culture that promotes a resilient and secure cyberspace. Particular focus was placed on the development and promotion of a common understanding of cyber threats, vulnerabilities and resultant risks across the aviation ecosystem. The workshop was also expected to identify gaps in State policies and operations and identify and promote regional mechanisms for information sharing on emerging threats and incident response.

11.6 During the Tabletop Exercise with three scenarios, the facilitators provided the participants an opportunity to simulate a cyber-event affecting international, regional and domestic operations. The scenarios focused on systems, which form an integral part of flight operations. By using a predefined scenario and introducing new challenges throughout the exercise, participants became aware of what coordination efforts would be required at a management level to successfully navigate a cyber-event.Discussions on the 3 Scenarios covered a lot of topics, and various recommendations were proposed, including general recommendations on cyber safety/risk, oversight needs, training needs, organizational needs, coordination mechanisms and other needs, as well as additional TTX observations summary.

11.7 The workshop was informed of a global trust framework promoted by ICAO, including its concept, latest development, recommendation by AN Conf./13 which has been approved by the Council, public key infrastructure; service and seamless operating resilient federated digital network. The work of TRON, Digital Identify and GRAIN working groups, under the global trust framework study group (TFSG), was presented.

11.8 The meeting appreciated the presentation on TFSG update and the outcome of APAC CSR TTX, and then quickly went through the APAC CSR TTX outcome report, discussed relevant issues regarding ICAO provisions on cybersecurity and the implementation, and noted CNS systems were facing a wide cybersecurity threat surface.

11.9 The meeting was informed that the TFSG updates were able to be provided to APAC States through regional officer. The ICAO guidance materials related to aeronautical communications system security were developed in coordination with the ICAO Communications Panel, and generic security related guidance from other ICAO publications also covered cyber issues, although some of them published a couple of years ago.

11.10 CANSO provided a publication to the meeting, *the CANSO Standard of Excellence in Cybersecurity*, which brings together best practices, knowledge and experience from various industry stakeholders to enable air navigation service providers (ANSP) to assess and improve their cybersecurity performance, as well as their suppliers. This document is available at: https://canso.org/publication/canso-standard-of-excellence-in-cybersecurity/

11.11 The meeting also recalled the regional efforts on cybersecurity issues in the past years, considering the nature of complexity and the need for inter section coordination within the APAC RO and with HQ and in relation to the Cybersecurity Action Plan and promoting similar drills in future, ICAO APAC is requested to plan a webinar on cybersecurity for the region in 2021.**ACTION ITEM 24-9.**

Agenda Item 12: Discuss and share experience and application of new technologies, including big data analysis, artificial intelligence, Digital-Tower counter UAS detection and identification system, UTM, etc.

12.1 Under this agenda item, as the response to APANPIRG's call on enhancing engagement with industry, various industry partners were invited to share and update the latest progress in relevant areas.

ANSP International Connectivity and Cybersecurity (SP/03)

12.2 Nokia presented a brief about its various aviation solutions in the domain of ATC, airlines, and airports along with latest research being carried out on ANSP International Connectivity and Cybersecurity. The presentation highlighted the need of High Performance Networking for ANSPs which requires G/G Network Upgrade without changing the current applications. Nokia presented its expertise on industries standards compliances and their proposed solutions for ANSP international connectivity based on migration from TDM/E1 to international IP network without disturbing ANSP E1 application. Nokia emphasized its focus on secure, efficient and lower cost of ownership for the Aviation community and introduced about its research project Future All Aviation CNS Technology (FACT). Lastly, Nokia discussed about Cyber Security Governance in Aviation and proposed ANSP Cyber Asset Model.

Application of New Technologies in ATC HMI Design (SP/04)

12.3 Thales discussed about its HMI 2025 research project based on technologies voice recognition, eye tracking, touch screens, and data mining. The objectives are to automate the controller's tasks and to ease controller's work on complex HMIs by providing voice commands and reducing complexity of HMI. Thales discussed importance of eye tracking with supplement AI and Machine Learning in research project to automate the controller's workflow. This project is also liking for answers if the concepts of personal touch devices can be applied in an ATC context and possibility of Hands-Off without physical actions. In order to fulfil these objectives, Thales is working on data mining including data gathering and data analysis. The topic gained a lot of interest among states and various questions were answered.

IT VCS for ATM (SP/05)

12.4 Frequentis presented advancement of current voice communication system as IT VCS. Frequentis presented their current innovative projects under voice communication system and their progress in this area. They discussed how voice communication system and virtual centers introvert each other. Frequentis discussed challenges faced by ANSP in current VCS and proposed their ATM masterplan targets using virtual centers while providing operational flexibility along with safety and reliability. The advantages of IT VCS system are its management like other IT systems along with high availability, security, and voice quality. It was said that SESAR also support this approach. Architecture for voice communication IT system was presented and its flexibility and redundancy were described. Concern of cyber security with IT system were discussed and Frequentis described their security features embedded into IT VCS system. Lastly, Frequentis presented various benefits of IT VCS system and encouraged states to see their systems.

Digital Transformation - The Airport and Beyond (SP/06)

12.5 Searidge presented its new technologies on digital transformation of airports in the form of digital ATC tower or Remote tower. Searidge started with its brief history, shareholders, key business locations, and key business areas. Searidge presented traditional ATC tower to digital ATC tower need, advantages, key enablers, and business cases along with different location, where it has been implemented. Lastly, it discussed about some use cases about LHR Heathrow Digital Tower, Paris Orly Digital Tower, and Singapore Smart Tower by describing their business case, proposed solutions, and operational application.

Agenda Item 13: CNS related work/projects impacted by COVID-19

ANS Planning and Provision – A New Normal? (WP/15)

13.1 CANSO presented the potential impact of Covid-19 on ANSPs in the planning and provision of air navigation services. ANSPs are losing revenue with the drastic downturn in air traffic but they must maintain airspace availability for the aircraft such as cargo, repatriation, and humanitarian flights.

13.2 CANSO hosted a webinar entitled 'New Normal', where it presented a survey conducted by Egis and the views of the panellists. The results of survey and views are presented in the paper. As per the survey, strategic priorities of the surveyed ANSPs before the pandemic and after the pandemic have been changed. Before pandemic out of 10 strategic priorities, top priorities were technological leadership, automation of services and increasing revenue. Cutting costs was at number 5 and service scalability was at number 8. After pandemic, the top priorities are cost cutting followed by a tie between increasing revenue and automation of services with closely followed by technological leadership and service scalability.

13.3 The paper also highlighted to use current reduced traffic demand as an opportunity to focus on implementing strategic changes, to review what are the really important investments, how to use better harmonized efforts, and ensure that benefits are optimized across the region. There are also opportunities to review current airspace restrictions and ways to improve service provision to minimize operational delays and inefficient routings along with greater collaboration and partnerships.

13.4 The meeting appreciated CANSO's sharing and reminded States to keep an eye in future while dealing with the cost-cutting due to COVID-19. The Egis report is available through the following link: https://en.calameo.com/read/0040249107c41ca06fa30?page=1

CNS Related Work/Projects Impacted by COVID-19 (WP/17)

13.5 India presented the impact of COVID-19 pandemic on CNS related work and projects of Airports Authority of India along with discussion of various measures undertaken to limit such impact. For projects under planning stage, delay in formulation/finalization of operational & technical requirement of CNS/ATM Systems has been addressed by conducting regular Web Conference meetings and coordination through electronic means. For projects under Tender stage, time delay in Tender invitation evaluation and award of contract is mitigated by mandatory to work on e-office. For projects where Installation & Commissioning was in progress and where Manpower is required to be deployed from Overseas to complete the installation, AAI coordinated with vendors to depute their Installation team as soon as International flight operations get started while for in house projects, various ILS, DVOR/DME replacement projects have been completed. India has invoked "Force Majeure" clause to all projects and other supply contracts to avoid any financial burden on the vendors.

13.6 During COVID19 Lockdown period since 22/03/2020 in India, Airports Authority of India, Flight inspection Unit carried out the flight inspection of radio navigational and ground aids installed at Airports in India with proper methodology and permission from MOCA (Ministry of Civil Aviation) and DGCA (India Regulator), with effect from. 22/03/2020 up to 31st August 2020, Flight inspection of 37 ILS,11 DVOR,15 DME and 74 ground Visual Aids(PAPI) were carried out.

Impact of COVID-19 to CNS Works (WP/20)

13.7 Most of the ICAO ASIA/PAC meeting schedules of 2020 were postponed and some had to be cancelled. As the report of progress and some action requirements need effective communication and efficient cooperation between Regional Office and member States, the COVID pandemic caused a great challenge to ICAO ASIA/PAC to achieve and accomplish all work programme.

13.8 For the consequence, the use of online meeting platforms for virtual meetings found some observations:

1) Number of participants increased significantly compare to face-to-face meeting.
2) Webinars were widely recognized.
3) Time Zone impacted meeting arrangement and effectiveness.
4) Difficulty for hands-on demonstration.
5) Postponement of required update.
6) Limitations on networking and coordination.
7) Workload of the Secretariat increased.

13.9 Quick Reference Guides (QRGs) were developed by ICAO, with the support of relevant subject matter experts, to provide guidance of a particular subject area in addressing COVID-19 related risks to the continuity of business and operations that were under consideration by a State for alleviations, while ensuring that safety risks introduced by changes from alleviations were also addressed.

13.10 The meeting appreciated the Secretariat's effort on this paper and recommended ICAO APAC Office to think and plan for meetings in hybrid mode by implementing IT technology with the meeting facilities, to allow more participants from States to access ICAO regional events. The meeting was informed that the newly refurbished conference hall in ICAO APAC Regional Office would be able to support hybrid mode meeting in near future.

Agenda Item 14: Dates of next meeting and any other business

Introduction of the Network Performance Assessment Center (IP/18)

14.1 Japan presented information about recently established (April 2020) Network Performance Assessment Center (NPAC) in Japan, which was established to monitor, analyse and assess the service level of each CNS system to assure if it meets the required performance specification for PBO (Performance Based operation).

14.2 Japan has been promoting to implement PBO, which requires the highly accurate position information and robust ATC communications and hence robust CNS systems. The NPAC has started GNSS performance monitoring and assessments including GPS augmentation systems (SBAS and GBAS) for improved RAIM prediction information service.

14.3 The NPAC will start Surveillance system performance assessments in late 2020. Japan described the system operations of NPAC. In addition to performance assessments, NPAC operates ATC datalink exchange system and SBAS. DLCS (Data Link Center Sortation equipment) processes all the datalink communications messages such as ADS, CPLDC, DCL and ATIS throughout Japan and delivers them via DSPs. MSG (MSAS Signal Generating equipment) connected to QZSS (Quasi Zenith Satellite System) to broadcast SBAS signal to the aircraft flying in Fukuoka FIR.

Briefing on the Technical Cooperation Bureau (SP/07)

14.4 ICAO secretariat presented briefing about the Technical Corporation Bureau. ICAO reminds the mission of the Technical Cooperation Bureau (TCB) to support States in implementing international civil aviation SARPs and policies. It shared brief history about TCB along with average number of projects implemented per year, average number of experts recruited per year and average Member States that have been benefited from TCB Services each year. TCB listed the fields in which it provides solutions to the civil aviation industry through customized programmes. TCB described its capabilities in projects & implementation, procurement of goods & services, experts & personnel, and training & fellowships. TCB coordinates with ICAO Technical Bureaus to develop packages that address current and future SARPs implementation needs. TCB presented data for project implementation in APAC region in the year 2018 along with percentage of TCB Projects per ICAO Strategic Objective in APAC. TCB discussed various on-going projects by the types in APAC in the year 2020 and benefits of regional projects for CNS/ATM. Lastly, TCB presented ICAO training portfolio having 250+ Courses and described different TCB services as an added value for APAC states.

The tentative CNS meeting Dates in 2021

14.5 The meeting noted the current status of CNS meeting planning contained in **Flimsy/01**, and agreed the meetings planned for the 1st half of 2021 would be conducted in VTC. Considering the uncertainty of the pandemic, the CNS SG/25 would be scheduled for the second half of 2021, and the meetings planned for 2021 were listed below. The specific meeting dates will be confirmed by the coordination of the Secretariat and the chairs of relevant contributory bodies:

No.	Meeting Name	Tentative Date
1	CRV OG/8	May/June
2	GBAS/SBAS ITF/3	March/April
3	DAPs WG/4	First half of March, 2021
4	APA TF/6	2nd half of 2021
5	PBNICG/8	June/July
6	APAC Aeronautical Fixed Service Safety and Protection Planning Working Group meeting (AFSSP WG 2020), Postponed	AFSSP WG 2021, to be discussed by ACSICG/8
7	SWIM TF/5	after May, TBD by next TL meeting
8	SURICG/6	after SWIM TF/5
9	ACSICG/8	2nd half of 2021
10	SRWG/5	2nd half of March, 2021
11	ATMAS TF/2	2nd half of 2021
12	Frequency Finder workshop, 5 days	2nd half of 2021
13	CNS SG/25	2nd half of 2021

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List of Conclusion/Decisions adopted by CNS SG/24 on behalf of APANPIRG on Technical Matters

Conclusion CNS SG/24/3(ACSICG/7-2 (ATFM/SG/10-3)) - Amendment of the AFTN/AMHS-based Interface Control Document (ICD) for ATFM	
What: That, the AFTN/AMHS-based Interface Control Document for ATFM Version 2.0 provided in **Appendix E** to this Report be adopted and posted on the ICAO Asia/Pacific Regional Office website to supersede the existing version, for use by Asia/Pacific Administrations in implementing cross-border ATFM communications in accordance with the provisions of the Regional Framework for collaborative ATFM.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: To align with message format provisions of Annex 10 Vol II, and to support implementation by States through amendment to specific provisions.	Follow-up: ☒Required from States
When: 4-Dec-20	Status: Adopted by Subgroup
Who: ☒Sub groups ☒ APAC States ☐ICAO APAC RO ☐ICAO HQ ☒ other: ACSICG/7	

Conclusion CNS SG/24/4 - Publishing of the CRV Operations Manual	
What: That the CRV Operations Manual provided in **Appendix F** to this Report be adopted as first Edition for publishing and use.	Expected impact: ☐Political / Global ☐Inter-regional ☐Economic ☐Environmental ☒ Ops/Technical
Why: Provides the information and directions required for CRV OG performance and CRV operations.	Follow-up: ☒Required from States
When: 4-Dec-20	Status: Adopted by Subgroup
Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other:	

Decision CNS SG/24/5 - CRV landing page on the ICAO APAC website	
What: That ICAO APAC Office is requested to create CRV landing page on ICAO APAC web page to providing information on CRV and guidance on how to join, leave or make changes.	Expected impact: ☐Political / Global ☒ Inter-regional ☐Economic ☐Environmental ☒ Ops/Technical
Why: Provides online access to the information and directions required for the Request Fulfilment Process and procedures to join, leave or make changes the CRV network	Follow-up: ☐Required from States

When: 4-Dec-20	Status: Adopted by Subgroup
Who: ☒Sub groups ☐APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other:	

Decision CNS SG/24/6(SRWG/4/1) - Frequency requirements for VHF-COM systems and ILS, VOR, DME and GBAS/VDB facilities	
What: That, the SRWG is tasked to develop a rolling frequency assignment plan for VHF-COM and ILS, VOR, DME and GBAS/VDB facilities to meet the operational requirements until [2030], subject to a regular review and updating by the SRWG.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: To secure adequate spectrum for these facilities for the near future.	Follow-up: ☒Required from States
When: 4-Dec-20	Status: Adopted by Sub-group
Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other:	

Conclusion CNS SG/24/7(SRWG/4/2) – Simulation of VHF COM Frequency requirements for next 10 years	
What: To conduct a new round of simulation for VHF COM frequency assignment based on new operational requirements of States to 2030 as necessary.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: To support regional strategy on the use of 8.33KHz channel spacing.	Follow-up: ☒Required from States
When: 4-Dec-20	Status: Adopted by Sub-group
Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other:	

Conclusion CNS SG/24/8(SRWG/4/3) – Establishment a list of focal point responsible for the operation of Frequency Finder in States	
What: That, States in APAC Region are requested to nominate a focal point responsible for operation of the Frequency Finder and coordination for frequencies assignments with ICAO APAC Regional Office in order to reduce operational error and improve quality management for the coordination process.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: To reduce operational error in accessing the tool of Frequency Finder and improve the spectrum management quality by enhancing the administrative process.	Follow-up: ☒Required from States

When: 4-Dec-20	Status: Adopted by Sub-group

Decision CNS SG/24/9 (SRWG/4/4) – Revision of the Term of Reference of the SRWG	
What: That, the revised Terms of Reference provided in **Appendix J** to the Report be adopted.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: Need to refine the scope of related tasks and include the new members.	Follow-up: ☒Required from States
When: 4-Dec-20	Status: Adopted by Sub-group
Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other:	

Note: This revision is to conduct simulation on VHF COM frequency assignment and expand its scope of work to cover Navigation systems with highlight on GBAS implementation.

Conclusion CNS SG/24/10 – Flight Inspection Guidance Material (FIGM) for APAC Region	
What: That, the first edition of the Flight Inspection Guidance Material (FIGM) provided in **Appendix K** to this Report be adopted.	Expected impact: ☐Political / Global ☐Inter-regional ☐ Economic ☐Environmental ☒Ops/Technical
Why: To provide additional guidance on planning, execution and delivery of flight inspection for States/Administrations in APAC Region.	Follow-up: ☒Required from States
When: 4-Dec-20	Status: Adopted by Subgroup
Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other:	

Conclusion CNS SG/24/11- Protection of ILS Critical and Sensitive Areas in Three Dimensional	
What: That, States to: a) take note of the importance in extending protection of ILS Critical and Sensitive Areas (CASA) from two dimensional to three dimensional as stated in ICAO Annex 10 (7th Edition, Amendment 92), Volume I, Attachment C, Paragraph 2.1.9.5; b) be aware that departing aircraft and/or manoeuvring helicopters/aircraft can cause disturbances to ILS signals	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒Ops/Technical

received by arriving aircraft under single runway mixed mode operation; c) take measures to mitigate potential impacts caused by disturbances in ILS signals under single runway mixed mode operation; and ICAO to: d) provide guidance materials in establishing three dimensional ILS CASA and their protection.		
Why: In accordance with ICAO Annex 10 (7th Edition, Amendment 92), Volume I, paragraph 2.1.9.5 – "While critical and sensitive areas are evaluated in a two-dimensional (horizontal) context, protection should actually be extended to volumes, as departing aircraft and/or manoeuvring helicopters/aircraft can also cause disturbances to the ILS signals". However, no detailed guidance was given as to how to establish the ILS CA/SA in three dimensional and how to protect them.	Follow-up: ☒Required from States	
When: 4-Dec-20	Status: Adopted by Sub-group	
Who: ☒ Sub groups ☒ APAC States ☐ICAO APAC RO ☒ICAO HQ ☐Other:		

Decision CNS SG/24/12 (SURICG/5/2) - Dissolution of SEA/BOB ADS-B WG	
What: Noting that most of the tasks outlined in the TOR have been achieved and the completion of residual part of action items will be performed by SURICG, That, the SEA/BOB ADS-B WG be dissolved.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐Economic ☐ Environmental ☒ Ops/Technical
Why: The SEA/BOB ADS-B WG terms of reference have been completed and pending action items will be performed by SURICG.	Follow-up: ☐Required from States
When: 4-Dec-20	Status: Adopted by Sub-group
Who: ☒Sub groups ☐APAC States ☒ICAO APAC RO ☐ICAO HQ ☐APANPIRG ☒Other: SURICG	

Conclusion CNS SG/24/14 (SURICG/5/4(DAPS WG3/2)) - Mode S DAPs IGD 2.0	
What: That, the *Mode S DAPs Implementation and Operation Guidance Document* Edition 2.0 provided in **Appendix N** to this Report be adopted.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: Editorial correction and revision to reflect regional updates in implementation.	Follow-up: ☐Required from States
When: 4-Dec-20	Status: Adopted by Sub-group

Who:	☒Sub groups ☐APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other:

Conclusion CNS SG/24/15 (SURICG/5/6) - Revised ADS-B Implementation and Operations Guidance Document (AIGD)			
What: That, the revised ADS-B Implementation and Operations Guidance Document (AIGD) provided in **Appendix O** to this Report, which consolidated all change proposals during SURICG/5, be adopted as Version 13.		Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical	
Why:	Updates and editorial correction	Follow-up:	☐Required from States
When:	4 Dec 2020	Status:	Adopted by Sub-group
Who:	☒CNS Sub group ☐APAC States ☒ICAO APAC RO ☐ICAO HQ		

Decision CNS SG/24/16 (SURICG/5/1) - Establishment of Study Group under SURICG on Sharing of Surveillance Data in SWIM	
What: Noting the operational needs of this region to enhance surveillance data sharing and new technologies available, That, the Study Group under SURICG on Sharing of Surveillance Data in SWIM (SurSG) with TOR provided in **Appendix P** to the Report, comprising subject matter experts in relevant areas including surveillance and SWIM to be set up to study and recommend solutions on surveillance data sharing to provide surveillance from "departure to destination", be established.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: To enhance surveillance coverage, enhance surveillance data availability by providing additional layers of surveillance services, and support implementation of advanced Air Traffic Management (ATM) tools such as Air Traffic Flow Management (ATFM).	Follow-up: ☒Required from States
When: 4-Dec-20	Status: Adopted by Sub-group
Who: ☒Sub Groups ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☒Other: SURICG	

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A List of Draft Conclusions from CNS SG/24 for Consideration by APANPIRG/31 Meeting

Draft Conclusion CNS SG/24/1 - Target Year of CRV Implementation in APAC Region	
What: That, set and monitor 2021 as the target for CRV implementation for all ANSPs.	Expected impact: ☐ Political / Global ☐ Inter-regional ☒ Economic ☐ Environmental ☒Ops/Technical
Why: Considering the challenges and difficulties faced by States/Administrations under current pandemic situation and recommended to postpone the target year of regional implementation of CRV from 2020 to end of 2021 and further align with follow up actions on Common Ground/Ground Telecommunication Network stated in the Beijing Declaration.	Follow-up: ☒Required from States
When: 16-Dec-20	Status: To be adopted by PIRG
Who: ☒ Sub groups ☒ APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other:	

Draft Conclusion CNS SG/24/2(ACSICG/7/1) - the Revised Regional Strategies on AMS and Datalink	
What: That, the revised Aeronautical Mobile Service (AMS) Strategy for the Asia/Pacific Region provided in **Appendix C** and the revised Strategy for Implementation of the Air-Ground Data Link in the Asia/Pac Region provided in **Appendix D** to the Report be adopted.	Expected impact: ☐ Political / Global ☐ Inter-regional ☒ Economic ☐ Environmental ☒Ops/Technical
Why: Need to update the regional strategies on AMS and Datalink based on the latest developments	Follow-up: ☒Required from States
When: 16-Dec-20	Status: To be adopted by PIRG
Who: ☒ Sub groups ☒ APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other:	

Draft Conclusion CNS SG/24/13 (SURICG/5/3(DAPS WG3/1)) - Mode S Forward Fit Equipage in APAC Region	
What: Regarding fitment of Mode S equipage, 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 2022 be equipped with Mode S avionics compliant with Enhanced Surveillance (EHS).	Expected impact: ☐ Political / Global ☐ Inter-regional ☒ Economic ☐ Environmental ☒ Ops/Technical
Why: Considering that a number of DAPs	Follow-up: ☒Required from States

applications will require EHS and that it's easy for new aircraft to be equipped with EHS. Retrofitting existing airframes with EHS will need further deliberation under challenging pandemic situation.	
When: 16-Dec-20	Status: To be adopted by PIRG
Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☒APANPIRG ☐ICAO HQ ☒Other: SURICG	

Draft Conclusion CNS SG/24/17 - Addressing Human Factor Issues of ATSEP	
What: That, a) the States are encouraged to make reference and implement the recommendations made out of the IFATSEA study report *Factors adding stress and fatigue to ATSEP* provided in **Appendix R** to the Report for pro-active measures; b) States are also encouraged to join the small working group for finding the left-out gaps and in preparing the regional ATSEP human factor guidance material.	Expected impact: ☐Political / Global ☐Inter-regional ☒ Economic ☐Environmental ☒ Ops/Technical
Why: to continuously improve the human performance management in practice to better support CNS/ATM system operations.	Follow-up: ☒Required from States
When: 16-Dec-20	Status: Draft to be adopted by PIRG
Who: ☒Sub groups ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other:	

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A List of Action Items Arising from CNS SG/24

There are 9 **Action Items** arising from the CNS SG/24 meeting which are summarised below. The quoted reference are paragraphs in the CNS SG/24 report.

Action Item No. 24-1 (ref. 2.17):

2.17 The meeting noted the criticality of the issue and the importance of action by States to address it by making use of the ICAO guidance provided in Doc 9849, *Global Navigation Satellite System (GNSS) Manual*.

Action Item No. 24-2 (ref. 3.43):

3.43 The meeting also noted the issues related to CRV operational support at a regional level, as more and more ANSPs, service providers and service consumers have been joining CRV, various services are being implemented over CRV. States/Administrations are encouraged to share their new ideas on this issue in future meetings.

Action Item No. 24-3 (ref. 3.48):

3.48 ACSICG chair remarked no technical difficulties for communications system and informed the meeting that there was no new target date for ACSICG on AMHS supporting IWXXM traffic. The meeting requested the MET SG and CNS SG to enhance mutual coordination and sharing outcomes of related survey and seminar/workshop, and encouraged States/Administrations to expedite responding to the ICAO's survey as soon as possible before APANPIRG/31, and the contributory body of MET SG (Meteorological Information Exchange Working Group (MET/IE WG)) should work collaboratively with ACSICG for a way forward in APAC region.

Action Item No. 24-4 (ref. 3.95):

3.95 The meeting congratulated Thailand and Singapore in leading this SWIM Demonstration, and highly recognized its contribution to the regional SWIM implementation. The meeting also encouraged SWIM TF to make better benefits from the cross cutting coordination with other contributory bodies of APANPIRG, in particular with CRV and ATFM, to further enhance the connection with infrastructure and the users.

Action Item No. 24-5 (ref. 4.21):

4.21 Support of the ICAO Position by ITU Member States is required to ensure that the position is supported at the WRC-23 and that aviation requirements are met.

Action Item No. 24-6 (ref. 4.28):

4.28 Through **Flimsy/03**, Singapore further informed the meeting about the proposal on a draft conclusion to encourage States/Administrations in APAC Region to participate in the ICAO DCIWG space-based VHF sub-group to review ICAO Annex 10 SARPs for adoption of space-based VHF operations. The meeting considered further work needs to be done and agreed to recommend States/Administrations who are interested and capable to join the relevant study, and as present ICAO Position for WRC-23 already included space-based VHF agenda. The Secretariat was requested to coordinate with SRWG chair and ACSICG chair to clarify how to track and monitor this initiative, and form an ad hoc group, if necessary, to take the concerns from States on a regional level so as to make the study meaningful, and the outcome of this deliberation will be reported back to CNS SG/25 for consideration.

Action Item No. 24-7 (ref. 5.60):

5.60 Australia echoed the observations and views expressed by Hong Kong China and its consultant concerning the ILS 3D CA/SA, and supported the recommendations. ICAO APAC will forward this WP/21 and its presentation file to secretary of the ICAO Navigation Systems Panel (NSP) for consideration by Conventional Navaids and Testing Working Group (CNTWG).

Action Item No. 24-8 (ref. 6.78):

6.78 Republic of Korea was requested to bring this paper for further deliberation on DAPs WG/4 meeting. The Secretariat informed the meeting about the regional established practice on II code coordination through **Flimsy/05**, as well as the need for IC code inter-regional coordination, and urged States/Administration to provide the required information to ICAO Regional Office for updating the APAC II code list.

Action Item No. 24-9 (ref. 11.14):

11.14 The meeting also recalled the regional efforts on cybersecurity issues in the past years, considering the nature of complexity and the need for inter section coordination within the APAC RO and with HQ and in relation to the Cybersecurity Action Plan and promoting similar drills in future, ICAO APAC is requested to plan a webinar on cybersecurity for the region in 2021.

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