INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

REPORT OF

THE EIGHTH MEETING OF AERONAUTICAL COMMUNICATIONS SERVICES (ACS) IMPLEMENTATION COORDINATION GROUP OF APANPIRG (ACSICG/8)

Video Tele-conference (VTC), 21-23 June 2021

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

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

Page

PART I - HISTORY OF THE MEETING

PART II - REPORT OF AGENDA ITEMS

LIST OF ATTACHMENTS

LIST OF APPENDICES

PART I – HISTORY OF THE MEETING

1. Introduction

1.1. The Eighth Meeting of the Aeronautical Communications Services (ACS) Implementation Coordination Group (ACSICG/8) was held from *21 to 23 June 2021*. The meeting was organised via Video Tele-Conferencing (VTC) using Microsoft TEAMS.

2. Attendance

2.1 The Meeting was attended by **120** participants from **Twenty** (20) States/Administrations, **Three** (3) International Organizations and **Two** (2) Aviation Industries including Australia, Bhutan, China, Hong Kong China, Macao China, Fiji, India, Indonesia, Japan, Malaysia, Nepal, New Zealand, Pakistan, Philippines, Republic of Korea, Singapore, Sri Lanka, Thailand, USA, Vietnam, IATA, IFALPA, IFATCA, Frequentis, PCCW Global and ICAO. A list of participants is provided in **Attachment 1**.

3. Opening of the Meeting

3.1 The Meeting was opened by Mr. Hoang Tran, International Telecommunications Lead, FAA ATO Program Management Organization and Co-Chair of ACSICG. Mr. Hoang Tran, extended warm welcome to all participants and expressed his thanks to Member States/Administrations and International Organization for the continuous support to ICAO regional activities. He informed that currently ACSICG is working closely with different CNS contributory bodies to meet expectations for AIDC, ATFM and Cybersecurity issues related to Aeronautical Fixed Communication (AFS) and hoped that ACSICG can work with SWIM TF to meet SWIM requirements of AFS. Lastly, he wished all Members to be safe and healthy and hoped to meet face to face in ACSICG/9 meeting.

3.2 Mr. Chonlawit Banphawatthanarak, Chief, Policy and Strategy Management Bureau, Aeronautical Radio of Thailand Ltd. and Co-Chair of ACSICG, extended a warm welcome to all participants, expressed deep appreciation and gratitude to the efforts of all parties to make great achievements, and expressed his thanks to the ICAO Secretariat for hard work. He expected that we may be in last phase of pandemic and once it is over, Aviation Sector may face sudden rise in traffic and consequently good performance from ANS infrastructure is required. Therefore, communications needs and requirements looked after by this group must be adequate and expandable to fulfill the demands. He congratulated the members for various achievements made by this group.

3.3 Lastly, Mr. Luo Yi, Regional Officer, CNS, welcomed all participants to the Meeting. He stated that the on-line meeting has provided opportunities to many participants to contribute and participate in ICAO regional meetings and number of registered participants is much more than the traditional face-to-face meeting of the Implementation Co-ordination Group. He reminded the history of ACSICG and its achievements with the highlight on the objective of the Meeting and emphasized the need for the ACSICG members to continue making efforts for the coordinated implementation and to work out solutions to the issues identified by the Meeting. He recalled and appreciated the contribution made by Mr. Li Peng, retired Regional Officer, CNS for various achievements of this group.

4. Officers and Secretariat

4.1 Mr. Hoang Tran from FAA and Mr. Chonlawit Banphawatthanarak from AEROTHAI co-chaired the Meeting. Mr. Luo Yi, Regional Officer CNS and Ms. Soniya Nibhani, Regional Officer ANS (CNS) Implementation, ICAO Asia and Pacific Regional Office, acted as secretary for the Meeting with the support of Ms. Bhabhinan Sirapongkosit, the Programme Assistant, Mr. How Sze Lung, Associate CNS Officer and Ms. Zhong Wenhan, Associate CNS Officer of the same office.

5. Working Arrangements, Language and Documentation

5.1 The ACSICG/8 met as a single body during the Meeting. The working language for the Meeting was English inclusive of all documentation and this Report. The Meeting considered **Ten** (10) Working Papers, **Twelve** (12) Information Papers, and **One** (1) Flimsy under its **Seven** Agenda Items. A list of Working Papers and Information Papers is provided in **Attachment 2.**

– – – – – – – – – – –

Agenda Item 1: Adoption of Agenda

Adoption of Agenda- Sec (WP/01)

1.1 The tentative agenda items presented in WP/01 were adopted as agenda for the Meeting.

Agenda Item 2: Review of Outcomes of Relevant Meetings

Review of Relevant Meetings - Sec (WP/02)

2.1 The paper summarized relevant information and updates with the highlight on the reviewed outcomes of ACSICG/7 and relevant discussions of other meetings of CNS SG/24 and APANPIRG/31 on AFS matters.

2.2 The CNS SG/24 Meeting adopted **Eight** (8) Conclusions and **Five** (5) Decisions. In addition, based on the outcome of discussions on various agenda items, the CNS SG/24 Meeting developed four (4) Draft Conclusions for consideration by APANPIRG/31 Meeting, which was adopted by APANPIRG/31. The Meeting noted Conclusion/Decision adopted by CNS SG/24 and reviewed the different Conclusions and Decisions adopted by APANPIRG/31 in December 2020 of interest to the group and discussed the follow-up.

Update on SWIM Regional Coordination- IATA on behalf of SWIM TF (IP/12)

2.3 IATA on behalf of SWIM TF provided a summary on key SWIM activities being undertaken in Asia & Pacific Region. IATA informed about updated Information Management Panel (IMP) definition of SWIM Region. The paper summarized the main outcomes of the discussion by SWIM TF/4 and informed that it is unrealistic to include all details within this update so the audience is invited to visit the Meeting Report for SWIM TF/4 to access content for broader discussions on SWIM research and development activities in the region

2.4 IATA discussed about APAC FIXM 4.1 Extension, concept of SWIM discovery services, and a SWIM Service Category Taxonomy. It summarized important updates related to SWIM from the MET Information Exchange (MET/IE) WG/19 and MET Services (MET/S) WG/ held in the week *22-26 March 2021*, The First Meeting of the Surveillance Study Group (SURSG/1) held from *20 to 22 April 2021*, the Sixth Meeting of the Asia/Pacific Airport-Collaborative Decision-Making Task Force (APA-CDM TF/5) held *28-30 April 2021*, The Eighth Meeting of the Common aeRonautical Virtual Private Network Operations Group (CRV OG/8) held from *17-19 May 2021*, The 16th Meeting of the ICAO Aeronautical Information Services − Aeronautical Information Management Implementation Task Force (AAITF/16) held from *7-11 June 2021*, ICAO Asia/Pacific Regional Cybersecurity webinar held on Monday, *14 June 2021* with the theme: "Management Framework for CNS/ATM Systems", and a virtual seminar on SWIM in *January 2021* by Electronic Navigation Research Institute (ENRI) in Japan.

2.5 The Meeting was informed that ICAO APAC Regional Office is progressively uploading SWIM reference and education material to the SWIM-APAC site of the ICAO Secure Portal and SWIM awareness / educational videos are available from both ICAO and IATA on YouTube. Additionally, IATA offers a two-day IATA SWIM Training classroom course and has developed a two-hour online SWIM introductory course. The registration link for online course and links for YouTube videos by ICAO and IATA were shared with the Meeting.

2.6 In response to a query on IATA's online and classroom training, IATA explained that these are commercial products available for procurement from IATA Training and that members can follow the link to get further information on the costs. The Meeting was reminded that the SWIM

introductory videos by IATA and ICAO are free for all to access via the links provided and that Member States are encouraged to take maximum advantage of the information available.

Agenda Item 3: Review the report of the Eighth Meeting of Common aeRonautical VPN Operations Group (CRV OG/8)

Review the report of the Eighth Meeting of Common aeRonautical VPN Operations Group (CRV OG/8) - Sec (WP/03)

3.1 The paper summarized the relevant outcomes of CRV OG/8 Meeting held via video tele-conference from *17 to 19 May 2021.*

3.2 The paper discussed major Draft Conclusions/Decisions proposed by CRV OG/8 for consideration of ACSICG/8 on AFS matters. The CRV OG/8 meeting report, working papers, information papers, and other resources can be accessed by following link:
https://www.icao.int/APAC/Meetings/Pages/2021-CRV-OG8.aspx

CRV Implementation Plan- IP Addressing Scheme for Third Party Service Provider- Singapore

3.3 Singapore presented the Internet Protocol (IP) addressing scheme for third party service providers, e.g. AIREON LLC providing Automatic Dependent Surveillance- Broadcast (ADS-B) data over the CRV and proposed the amendments to the CRV Implementation Plan.

3.4 Based on the proposal by CRV OG/8 in this paper, the ACSICG/8 Meeting formulated the following **Draft Conclusion** for the consideration of CNS SG/25 Meeting. The proposed *CRV Implementation Plan amendment (Version 2.1*) is provided in **Appendix A** to this report.

<table>
<tr><td colspan="3">Draft Conclusion ACSICG/08/01 (CRV/08/01) – CRV Implementation Plan amendment (Version 2.1, Attachment A)</td></tr>
<tr><td colspan="2">What: That, the CRV Implementation Plan be amended to include the following new text in paragraph 2.4.2 – IP Addressing

iii. In the development of the IPv4 plan, a flexible margin has been designated to allow future growth or change. Through draft Conclusion CRV OG/8/01, using 10.46.0.1 to 10.46.255.254, each third party Service Provider (e.g. AIREON LLC providing Automatic Dependent Surveillance - Broadcast data over CRV) is assigned 254, 510, 764 or 1022 usable Network addresses (depending on Service Providers’ technical requirements); and</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: To allocate IP addresses to third party service providers for the delivery of services over CRV</td><td colspan="2">Follow-up: ☒Required from States</td></tr>
<tr><td>When: 4-Oct-21</td><td colspan="2">Status: Draft to be adopted by Subgroup</td></tr>
<tr><td colspan="3">Who: ☒Sub-groups ☐APAC States ☐ICAO APAC RO ☐ICAO HQ ☒Other: ACSICG</td></tr>
</table>

Revisit the CRV solution for small Pacific Islands and small ANSPs in APAC- Fiji

3.5 Fiji presented the CRV solution for small Pacific Islands and small ANSPs in APAC region to implement CRV for voice & AMHS services. From the recent regional CRV implementation update submitted by PCCWG, it is noted that there has been slow implementation progress with the Pacific Island States and small ANSP in the region to date. With the target date for the implementation of

CRV by 2022, the CRV OG must find ways to assist these member States to implement CRV and ensures that No Country Left Behind (NCLB).

3.6 Based on the proposal by CRV OG/8 in this paper, the ACSICG/8 Meeting formulated the following **Draft Conclusion** for the consideration of CNS SG/25 Meeting.

<table>
<tr><td colspan="3">Draft Conclusion ACSICG/08/02 (CRV/08/02) - Implementation of CRV for small Pacific Island and small ANSP in the region using CRV Solution, PCCWG SLA Package D.</td></tr>
<tr><td colspan="2">What: That, the CRV OG should consider the following to assist small Pacific Islands & small ANSP in APAC in the implementation of CRV:
a) Small Pacific Island and small ANSP in the region to consider using CRV SLA package D as the CRV solutions to implement CRV for the exchange of voice & AMHS services
b) With target date to implement CRV by the end of 2021 by APANPIRG Conclusion C 31/12, it is recommended that the CRV OG to work closely with the small Pacific Islands, small ANSP in the region and PCCWG on a cost effective CRV solution to implement CRV.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☒ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: To facilitate the implementation of CRV for the small Pacific Island & small ANSP in the region</td><td colspan="2">Follow-up: ☒Required from States</td></tr>
<tr><td>When: 4-Oct-21</td><td colspan="2">Status: Draft to be adopted by PIRG</td></tr>
<tr><td colspan="3">Who: ☒Sub-groups ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☒Other: ACSICG</td></tr>
</table>

Agenda Item 4: Review report of Seventh Meeting of the Asia/Pacific ATS Inter-Facility Data - Link Communication Implementation Task Force (APA TF/7)

Review of Outcomes of APA TF/7 Meeting- Sec (WP/05)

4.1 The Seventh Meeting of the Asia/Pacific ATS Inter-Facility Data-Link Communication Implementation Task Force (APA TF/7) was held via video tele-conference from *07 to 09 June 2021.* APA TF/7 meeting report, working papers, information papers, and other resources can be accessed by following link:

https://www.icao.int/APAC/Meetings/Pages/2021-APA-TF7.aspx

4.2 Considering that, different States in the region are presently at different stages of AIDC implementation, necessity to maintain the functions of APA TF persists, to facilitate appropriate guidance for upcoming States and provide a coordination framework among States for wider and effective implementation of AIDC across the APAC region. The Meeting discussed that by comparing the Terms of Reference (ToR) of ACSICG and ATMAS/TF, it should be agreeable to identify ATMAS/TF, as the contributory body under CNS SG to take over any outstanding action items of APA TF, and the expertise of APA TF experts should be retained through appropriate arrangement after the dissolution.

4.3 It was proposed that AIDC specialists might work as nominated members of an ad hoc expert group within ATMAS/TF to follow up the concerns and issues arisen from the AIDC implementation activities in the region. As aforementioned, it was suggested to consider the **Draft Decision APA TF/7/1** - *Dissolution of APA TF* on the future of APA TF.

4.4 The Meeting was informed that the ICAO Secretariat will forward Draft Decision, if agreed by the Meeting, to ATMAS/TF for endorsement, to propose appropriate action on the ToR and tasks/action items of ATMAS/TF, and then will submit to CNS SG/25 for adoption. ACSICG/8 noted the **Draft Decision APA TF/7/1**- *Dissolution of APA TF* for consideration of ATM AS TF/2.

4.5 Mr. Chonlawit Banphawatthanarak asked the possibilities to break the remaining task of APA TF among ACSICG and ATMAS TF. The ICAO Secretariat informed that the AIDC Implementation Table will be maintained by ATMAS and all information related to AIDC, discussed and finalized into ATMAS, will be reported back to ACSICG for necessary action.

Update of AIDC Implementation Status- India (IP/04)

4.6 India informed that India is currently using APAC AIDC ICD version 3 in all the automation systems currently installed at various ATS units and trials have been carried out between various domestic ATS units are already exchanging live AIDC messages.

4.7 The Meeting was informed that trials with many ATSUs of neighboring FIRs have been completed. It included Chennai & Kuala Lumpur (Malaysia), Chennai & Male (Maldives), Chennai & Colombo (Sri Lanka), Chennai & Yangon (Myanmar), Mumbai & Male (Maldives), Mumbai & Mogadishu, Mumbai & Muscat, Ahmedabad & Karachi (Pakistan), Delhi & Lahore (Pakistan), and Kolkata & Yangon (Myanmar). The details of Implementation was attached with the paper.

4.8 The Meeting was informed that India is keen to conduct operational trials between Kolkata-Dhaka, Mumbai- Karachi (Pakistan), Chennai-Jakarta and Varanasi-Kathmandu subject to readiness from the concerned states and India is engaged towards entering into contract with PCCW for CRV in Q3 2021 and Service readiness by Q4 2021 in line with CRV contract and service readiness by counterpart BBIS states. This would provide with a robust and reliable medium for AIDC data interchange between the adjoining FIRs of neighboring countries.

Agenda Item 5: Review and update the AMHS/ATN Implementation Status

5.1 Update status of AMHS implementation

Update the AMHS/ATN Implementation Status Table- Sec (WP/07)

5.1 The ATN/AMHS/AIDC implementation table and the CRV implementation table further updated/reviewed by **CRV OG/8, APA TF/7** and **ACSICG/8** are provided in **Appendix B and Appendix C** respectively.

5.2 The Meeting noted for recommendation of APA TF/7 to remove AIDC and ATM System Implementation columns from the table provided in Appendix A to WP/07 and format it into a separate Excel Sheet. The Meeting noted that the ICAO Secretariat will take necessary action to create the new Excel sheet and will share with Member States focal point for future updates**.**

CAAP-FAA AMHS/AIDC Implementation and Routing Changes- Philippines and USA (WP/10)

5.3 Philippines and USA presented the completed routing changes associated with the AMHS service between Civil Aviation Authority of the Philippines (CAAP) and USA Federal Aviation Administration (FAA).

5.4 The Meeting was informed that FAA & CAAP conducted all activities necessary to establish AMHS service between the two states which were based on IPS using the CRV network and

operational service was initiated on *April 21, 2021*. It was further informed that the new AMHS service required AMHS routing changes between USA and Philippines, and may need other changes within the Region because no previous AFTN connection existed between Philippines and USA. The Routing Changes implemented were discussed which included FAA routed all "RP" traffic directly to Philippines and CAAP routed all "C", "K", "M", "P", "S" and "T" traffic directly to the U.S.A. Meeting noted that these changes have been coordinated with AEROTHAI and the AMC and other Routing Directory documents may require updates to reflect the new routes.

5.5 The Meeting was informed that the ICAO Secretariat has already updated the AFTN routing directory related to the updates provided in this WP/10.

ATN/AMHS/CRV Implementation Status in India (IP/05)

5.6 India presented a summary of current status of ATN/AMHS/CRV implementation in India and urged BBIS and BIS States to resolve the bilateral issues on priority basis for effective use of the AMHS/CRV network and the resources invested in by the states.

5.7 India informed that the AMHS connectivity is successfully implemented between Mumbai and three BBIS (viz. Singapore, Bangkok and Beijing) and with five BIS (viz. Karachi, Colombo, Dhaka, Kathmandu and Paro (Bhutan). India shared difficulties in AMHS implementation with pending states, which included AMHS connectivity trials over VPN between Mumbai and Nairobi (Kenya) in Sept/Nov 2020 without success due to compatibility issues with different AMHS and AMHS test trials between Mumbai and Muscat planned in July 2020 but postponed due to technical issues at Muscat end and presently in progress.

5.8 Additionally, India informed that regarding CRV implementation plan with BBIS and BIS states, India is committed to join the CRV and is in coordination with service provider M/s PCCW Global. The Implementation Task has been slightly delayed in arriving at an agreeable term with M/s PCCW Global proposed tax regime and prevailing Covid-19 pandemic in India and shared CRV implementation plan with different states by India.

5.9 The ICAO Secretariat requested to provide more details about unsuccessful AMHS connectivity trials over VPN between Mumbai and Nairobi (Kenya) in Sept/Nov 2020 to coordinate with ICAO Eastern and Southern African Office (ESAF) office to resolve the issue as soon as practicable.

5.10 The Meeting was informed that India will contract with PCCWG for CRV **Package B+** and after normal traffic resume, India might upgrade to **Package A** based on the future need.

AMHS to SWIM transition and mixed environment operation Implementation- Fiji (IP/08)

5.11 Fiji presented the AMHS to SWIM transition and mixed environment operations using staged approach implementation and service interoperability. It was discussed that the AMHS- SWIM transition is expected to generate a new era in exchanging of aeronautical messages from the normal Message Switching System (MSS) like AFTN & AMHS to the new Information Management System (IMS) using SWIM and ICAO Doc 10039, Manual on SWIM Concept, has provided staged approach implementation that will ensure service interoperability in the AMHS to SWIM Transition and Mixed environment operation. It was expected that AMHS supporting Extended ATS Message services using File Transfer Body Parts (FTBP) for AIXM/FIXM/IWXXM will be implemented between BBIS & BIS State ANSP over the *CRV network* for ATM operations and interoperability is possible via specialized gateways for messaging and a staged transition.

5.12 Fiji described about the staged transition for Current AFTN/AMHS Environment, Interoperability at Application level in the mixed environment, Interoperability in the Gateway in the

mixed environment, and Full SWIM environment for the exchange of SWIM services for which there will be no interoperability with 'legacy' systems.

5.13 Fiji shared that the integration between the ACSICG and the SWIM TF group works will be crucial in the planning and the AMHS-SWIM transition and mixed environment operation in defining how the two systems will interoperate using the AMHS /SWIM gateways. The staged transition approach of implementing gateway between the SWIM and AFTN/AMHS will allow ANSP that still operate AMHS that support FTBP to exchange AIXM/FIXM/IWXXM with SWIM Providers (ANSP or Global). In using this staged transition approach, the location where the gateway will reside is important for interoperability of services. Given that the number of operational AMHS system will be far more than the SWIM Providers at the beginning of the implementation it would be logical and justify (operational & economic term) to have the gateway resides with the SWIM Provider until the full SWIM service is implemented.

5.14 India queried about the availability of any documents on the specifications of AMHS/SWIM gateway. The Meeting was informed that the general concept of AMHS/SWIM Gateway along with the building blocks have been elaborated by SWAMWAY SG (AMHS/SWIM Gateway Study Group) which composes of ENAIRE (Spanish ANSP), Austro Control (Austrian ANSP) as well as the industry partners Frequentis Comsoft, Telefonica, Indra Avitech, Thales and Copperchase and SWAMWAY SG is currently working on a generic AMHS/SWIM Gateway Specification

5.2 Report on the readiness status of AMHS to support IWXXM

Implications of Cybersecurity and Associated Requirements for CRV Operations-USA (Flimsy1)

5.15 USA addressed the implications for existing services and the CRV resulting from the recent Cybersecurity Webinar and future support of SWIM and other proposed services for the Region. FAA recalled System Wide Information Management (SWIM) "*shifts the ATM information architecture paradigm from point-to-point data exchanges to system-wide interoperability*." SWIM has a five-layer architecture to support this change of paradigm. The lowest layer is the network that simply provides connections to request/reply or publish/subscribe functions of the SWIM infrastructure that allow access to multiple data exchange services. Broadening access in an IP environment beyond limited point-to-point connections can increase exposure to malicious infiltration. The Meeting was informed that Cyber Security Webinar organised by ICAO APAC RO on 14 June 2021 presented the International Aviation Trust Framework (IATF) initiative composed of *Digital Identity* and *Network Information Security* elements, which were further elaborated. It was explained that A User's client applications would access the hosted SWIM Information Exchange Services over the CRV that would interact with other SWIM deployments and information sources and could provide information consolidation and mediation services, e.g. translation from Traditional Alphanumeric Code (TAC) to ICAO Weather Information Exchange Model (IWXXM).

5.16 The Meeting was requested to comment and discuss suggested implications of ICAO Requirements for IPv6 dedicated address block, Name Space and field DNS, and Trust Framework for Digital Identities. Additionally, to discuss about CRV Network Requirements, Service Provider Options, and CRV user requirements. ***The flimsy01 was discussed with IP/06 presented by Fiji and PCCWG***.

5.17 The ICAO Secretariat informed that there were ***Sky-Talks*** about International Aviation Trust framework (IATF) and its implementation by ICAO, which are accessible at:

A40 Sky-Talks https://www.youtube.com/watch?v=52uk46wULx8&t=289s
AN Conf/13 Sky-Talks https://www.youtube.com/watch?v=_DzRpdJsxi4&t=1528s.

5.18 Additionally, the meeting was informed that Digital Identities discussed in the Flimsy01 is different than the identities provided to individuals today. Current identities usually composed of

credentials in the form of user ID and passwords or others while Digital Identities would be endorsed and issued by the Authorised Government's Entities or by the third party entities authorised by Competent Aviation Authorities to issue Digital Identities and authenticate the use of Digital Identities by the Authorised person.

5.19 India inquired about the estimate of the cost involved for setting up the digital certificates and the DNS system for Aviation and how the cost will be shared. The meeting was informed that such cost estimates are not available yet. In response to another query from India if implementation of PCCW EMS/SWIM infrastructure is subjected to the realization of International Aviation Trust framework (IATF) or moving independently, PCCWG informed that once IATF will be defined by ICAO, PCCWG will adopt.

5.20 With reference to CRV Network Requirements regarding the plan to implement IPV6 defined in Section 3.1.1, PCCWG informed that CRV supports ***IPv4 and IPv6 both*** and there should be no implication to States which have already joined CRV.

5.21 The Meeting requested the ICAO Secretariat to inform and follow-up about the different requirements defined in *Flimsy01* in ***Section 3*** with different CNS Contributory bodies for their simultaneous and timely implementation. Additionally, the Meeting requested CRV OG Chairs to note various requirements defined in ***Section 3*** and initiate action to prepare strategies for contracting other services on CRV for future potential needs. **ACTION ITEM 8-1**

Summary on ICAO Actions to Facilitate IWXXM Exchange over AMHS in APAC Region-Sec (WP/08)

5.22 The APAC Region has been discussing in APANPIRG and its contributory bodies on promoting the implementation of AMHS as a proper infrastructure identified for the Region to facilitate the exchange of IWXXM. To meet the minimum requirement for the exchange of IWXXM messages, the APANPIRG/28 Meeting urged States/Administrations to implement 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, which was endorsed as **Conclusion APANPIRG/28/16:** *Upgrade AMHS to support IWXXM traffic***.**

5.23 CNS SG/22 discussed the Draft Conclusion submitted by CRV OG/4 and discussed in ACSICG/5 that BBIS States/Administration were encouraged to commence the transition of AMHS to CRV network as early as possible to allow more BIS State/Administrations to establish connections over CRV, which was endorsed as **Conclusion CNS SG/22/4** *(CRV OG/4/2)-ATN/BBIS States/ Administration Use CRV for AFTN/AMHS Traffic.*

5.24 In last ACSICG/7 and CNS SG/24 Meetings, several States/Administrations shared the AMHS readiness and experience for supporting IWXXM Traffic, which were summarized in Appendix G to the Report of CNS SG/24 Meeting. 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 a synchronized AMHS distribution mechanism to support IWXXM exchange in the APAC Region. States/Administrations were urged to review and update the *AMHS readiness from States/Administrations* Table, and share issues and solutions of States/Administrations in implementing AMHS with FTBP to facilitate IWXXM exchange.

5.25 The AMHS Readiness Table for Supporting IWXXM Traffic updated from States/Administrations during ACSICG/8 is provided in **Appendix D** to the report.

5.26 The ICAO Secretariat informed that to further assist States, MET SG/24 considered the need to organize and conduct another regional survey to determine the status of States' progress on the planning and implementation of dissemination of meteorological information in IWXXM GML form. It

was expected that such a survey could also help the MET SG to identify States' needs for additional technical assistance, including another Regional IWXXM-specific seminar or workshop during 2021. Therefore, **Conclusion MET SG/24-09**: *IWXXM Survey and Online Workshop* was adopted by MET SG/24.

Description of FAA AMHS SWIM Gateway and IWXXM Status (WP/09)

5.27 FAA informed that FAA is currently prototyping an AMHS to SWIM Gateway that will be implemented as an enhancement to the FAA's operational AMHS. FAA shared that this AMHS SWIM Gateway (ASG) will support international exchange of XML-formatted messages encoded using the Aeronautical Information Exchange Model (AIXM), Flight Information Exchange Model (FIXM), or ICAO Meteorological Information Exchange Model (IWXXM). Furthermore, the ASG prototype will integrate with the FAA's existing ISODE AMHS software, which will send and receive Operational Meteorology (OPMET) data formatted using IWXXM utilizing AMHS File Transfer Body Part (FTBP) attachments, and will connect to the FAA SWIM in a bi-directional manner.

5.28 The Meeting was informed that IWXXM data will be originated by the United States National Weather Service (NWS) and published to the FAA via SWIM. The ASG will consume this data, generate an AMHS-compliant message that includes the IWXXM data as an FTBP attachment, and distribute the message through AMHS to international partners as well as will receive incoming data from the AMHS MTA, extract the IWXXM portion from the FTBP, and publish the data to SWIM. The Meeting noted that FAA has conducted testing with both Cuba and Japan and all development will be complete by the end of July 2021 while operational implementation is expected in the second half of year 2021.

5.29 The Meeting noted that AMHS/SWIM Gateway used by FAA is designed in house.

AMHS readiness to support ICAO Meteorological Information Exchange Model (IWXXM) in Australia (IP/03)

5.30 Australia informed that Australian Bureau of Meteorology (IWXXM producer) started publishing its IWXXM files to the Meteorological Information Server (MIS) from the 5th of November 2020 as per Amendment 79 to Annex 3. The MIS as a UA originates the AMHS messages with IWXXM attachment and delivery occurs to the national MTA. It was added that IWXXM is distributed in parallel with Traditional Alphanumeric Code (TAC) data that has previously been distributed by AFTN and AMHS while IWXXM can only be distributed by AMHS as a message attachment using the File Transfer Body Part (FTBP) function.

5.31 Furthermore, Australian Aeronautical Messaging System (AAMS) has been actively routing IWXXM reports via AMHS through the APAC region since the mandated date of 5 November 2020 and P1 AMHS connections with other member states have been established over the CRV network including USA (June 2019), Fiji (July 2019), New Zealand (October 2020), and Singapore (November 2020). Additionally, P1 AMHS connection with South Africa / Johannesburg remains on a leased line until South Africa subscribes to the CRV or an alternative, and the current AFTN connections with Indonesia and PNG are yet to be upgraded to AMHS over CRV. In addition, to increase resilience for the very unlikely event of an overall CRV failure, Airservices is working on the establishment of backup AMHS connections over B2B VPN protocols with its existing AMHS partners. Australia concluded that Australia is ready to support IWXXM exchange via AMHS, however no end users in Australia have indicated to plan for system upgrades to receive IWXXM as yet.

Presentation of PCCW Network Based IWXXM Translation And Exchange Services- Fiji and PCCWG (IP/06)

5.32 Fiji and PCCWG presented PCCW IWXXM Translation and Exchange Services, which can serve as an alternative solution for member States to fulfil the exchange of IWXXM messages as promulgated in Amendment 78 to ICAO Annex 3. It was informed that ICAO APAC CRV has been built leveraging PCCWG's high-speed international IP network, with mission-critical connections running across a diversified infrastructure supporting multiple aviation-specific applications.

5.33 PCCWG informed that PCCWG has been developing the SWIM service on a private and scalable platform in partnering with one of leading aviation vendors - Frequentis. Additionally, PCCW Network Based IWXXM Translation and Exchange Services is one of the modules on PCCW SWIM (IWXXM, FIXM and AIXM) which is hosted in the high availability private platform and fully controlled environment which connects to CRV network infrastructure. PCCW said that the services complied with ICAO and WMO standards and are designed to support the acquisition, management, processing and dissemination of meteorological data related to aviation.

5.34 PCCWG presented features supported by PCCW SWIM Platform and service components. It also described four functions namely Function 1 - *Translation and aggregation service*, Function 2 - *IWXXM Exchange Service,* Function 3 - *IWXXM Services for ANSPs without AMHS*, and Function 4 - *ANSPs without AMHS input TAC on message terminal*. PCCWG summarised that PCCW IWXXM Translation and Exchange services provide the flexibility and reliability to collect most of the current MET data from multiple designated sources and the processing functionality to validate, store and redistribute the data, along with the ability to display it on XML Browser via CRV private connection.

Relevant Outcomes from ICAO APAC MET/IE WG/19- Sec (IP/07)

5.35 The ICAO Secretariat presented relevant outcomes from the 19th Meeting of the Meteorological Information Exchange Working Group (MET/IE WG/19) held online from *22 to 24 March 2021*. The MET/IE WG/19 reviewed the status of planning and implementation by States of the ICAO Annex 3 Standards and Recommended practices for the dissemination of meteorological information in ICAO Meteorological Information Exchange Model (IWXXM) form. The MET/IE WG reviewed the latest developments of.an online registry for APAC States to share information on the IWXXM-exchange capabilities of their ROBEX centres and the relevant AMHS addresses supporting the exchange of IWXXM messages and is updating regional guidance in the APAC ROBEX Handbook to include a link to the online registry. The Meeting was informed that users can see the online registry at the following (view-only) web address:
https://docs.google.com/spreadsheets/d/1WEcGfMRZq2dgHsfdpFhiefJEcA8OeMhfbCJHTqA7NX0/edit#gid=0

5.36 MET/IE WG/19 incorporated an activity in the MET/IE WG work plan to update the ROBEX Handbook to include a link to the online registry. In addition, MET/IE WG/19 considered the respective merits of two potential technical solutions for the online registry, i.e., "Google Sheet" and "Github", and agreed to continue working with the currently used solution (i.e., "Google Sheet"). It was proposed that recognizing that for the online registry to be an effective tool to facilitate the implementation by APAC States of IWXXM-formatted OPMET exchange, the online registry should contain up to date information provided by all APAC States. Therefore, MET/IE WG/19 supported the Draft Conclusion for further consideration by the upcoming MET SG/25 Meeting for requesting States to use the online registry to provide up to date information on AMHS-capability of ROBEX centres to support IWXXM exchange.

Singapore's Readiness Status of AMHS to Support IWXXM Traffic & IWXXM Traffic Issues between APAC and Europe Regions (IP/09)

5.37 Singapore informed that as the exchange of IWXXM messages between States/ Administrations has been adopted for operations since *5 November 2020* and the need of File Transfer

Body Part ("FTBP") and Interpersonal Message (IPM) Heading Extension ("IHE") for the exchange of IWXXM messages is required and each AMHS message (including FTBP) of up to 4MB is permitted, to meet IWXXM guidelines, Singapore has completed its AMHS upgrade and implemented CRV to support IWXXM traffic in March 2019 and November 2019 respectively and has operationalised IWXXM traffic with Australia, Hong Kong China, Malaysia and Thailand, and Traditional Alphanumeric Code ("TAC") messages are exchanged in parallel.

5.38 Singapore informed further that Singapore, as the Interregional OPMET Gateways (IROG) between APAC and Europe regions, is required to establish IWXXM exchange with the United Kingdom ("UK") and Singapore-UK connection is also an interregional Aeronautical Fixed Services (AFS) link between the APAC and Europe regions. The implementation of IWXXM exchange between Singapore and UK has been postponed due to the absence of alternate network path to divert IWXXM traffic when the Singapore-UK connection is down as there is currently only one path between APAC and Europe regions that supports the exchange of IWXXM traffic and the flexibility to re-route IWXXM traffic is required.

5.39 Australia shared the concerns for need for interconnection of various regional networks to fulfill the need to share information globally. Australia informed that Australia has a link to South Africa while the link is very unreliable and creates many issues for AMHS connection to region outside APAC. The Meeting was informed that CRV is reserved for Member States for APAC/MID region. If any Member States other than APAC/MID region wish to join CRV, they may submit proposal to CRV OG.

5.40 The Meeting noted the importance of interconnection of regional network and that any States from MID region has not joined CRV yet. The meeting requested the ICAO Secretariat to take necessary action to discuss the interconnection of various regional networks at higher level. **ACTION ITEM 8-2**

New AMHS System Upgrade and IWXXM Readiness to Support IWXXM Data in Korea (IP/10)

5.41 Republic of Korea (ROK) presented the current status of a new AMHS system upgrade in order to exchange the IWXXM data. ROK informed that ROK has started a project to upgrade AMHS system to support the exchange of IWXXM over CRV and the new AMHS (extended version) with the file transfer body part (FTBP) function will be in service from the early of 2023. The Meeting was informed that ROK has signed a contract with Frequentis in April 2020 and installation of Hardware and Software will be finished by the third quarter of 2021. ROK shared further plans for IOT with China and Japan and exchange test of the IWXXM format with the Korean Meteorological Administration system. It was added that ROK has a plan to conduct a POT with Japan and China in 4Q of 2022 and after the successful POT, Republic of Korea aims to switch to New AMHS system in the end of 2022 and if successful, ROK will be ready to support IWXXM with FTBP of a maximum size of 2MB. It was anticipated that IWXXM format can be distributed by AMHS over CRV stably from the early of 2023.

Fiji's Readiness Status of AMHS to support IWXXM Traffic (IP/11)

5.42 Fiji shared updates on the status of Fiji's AMHS readiness to support IWXXM traffic and its upgrade plan to implement IWXXM service. Fiji informed that Fiji commissioned it existing Comsoft AMHS system in 2010 which supports both the Basic and the Extended ATS message service but currently, the Basic ATS Message services is used for the exchange of AFTN message and Fiji has successfully conducted IWXXM testing with Brisbane on AMHS using FTBP in September 2020. The Meeting was informed that due the impact of COVID-19 pandemic, Fiji Airports plans to conduct a staged approach on the AMHS & ROBEX system and shared its plan to upgrade to support IWXXM services.

5.43 The Meeting was informed that Fiji is a designated Regional OPMET Centre (ROC) for the Pacific region and also one of the five APAC regional OPMET Databank (RODB), as the Nadi ROC & RODB was not able to comply with the ICAO mandate to implement IWXXM by 05 November, 2020. However, it was agreed in the Pacific Island Aviation Weather Services Panel under the Pacific Meteorological Council that Wellington ROC will be providing the TAC to IWXXM translation center for the TAC ROBEX bulletin generated by Nadi ROC for the Pacific region as an interim solution until Nadi ROC is capable to implement IWXXM. This interim solution has been operational from January, 2021. Lastly, Fiji informed that as part of the AMHS upgrade, Fiji Airports has also discussed with Frequentis Comsoft on the best solution to implement the AMHS – SWIM transition and mixed environment operations.

Agenda Item 6: Review and update Subject/Tasks List

Review Work Programme for ACSICG- Sec (WP/06)

6.1 The work programme for ACSICG was developed by ACSICG/3 Meeting based on a project approach. The work programme reviewed by ACSICG/7 Meeting and discussed in ACSICG/8 for review and updates. The work programme of ACSICG reviewed and updated by the Meting is provided in **Appendix E.**

Agenda Item 7: Next meeting date and any other business

CRV Post Implementation Issues in Bhutan- Sec (WP/04)

7.1 The ICAO Secretariat summarised the issues faced by Bhutan related to CRV post implementation due to non-utilizing the services due to non-readiness of peer's states and the action taken by CRV OG for its resolution. It was informed that during the CRV OG/8 Meeting, Bhutan put forward that Bhutan has entered into contract for CRV with PCCWG in *December 2020* while Bhutan is not able to utilize the CRV since the peer States with Bhutan (*India and Thailand*) are in process to join CRV while Bhutan has to pay recurring charges every month to PCCWG. Bhutan requested the ICAO APAC Regional Office and CRV OG to help in negotiating with PCCWG to waive or reduce recurring charge till the peer States (India and Thailand) are ready or to explore the alternate solutions such as connection through Hong Kong, China or any other States hosting BBIS, which have joined CRV.

7.2 The Ad-hoc group formed by CRV OG/8 to resolve this issue proposed two alternate solutions. The first solution was to have a negotiation initiated by Bhutan with PCCWG by providing reference to WP/13 and IP/11 of CRV OG/8 presented by Fiji, which proposed a potential solution to downgrade the CRV Package. Bhutan informed to ICAO APAC office by email dated *7th June 2021* that PCCWG has not agreed to downgrade CRV Package C to Package D.

7.3 As an alternate solution, it was proposed by the Ad-hoc group that the New Zealand may act as a gateway between Bhutan and the existing AMHS services. In such case, there may be only *Six Countries* who need to change the routing table: *Bhutan, India, Thailand, Singapore, Australia, and New Zealand*. The Airways New Zealand volunteered to act as a BBIS and started the conversation internally and submitted technical requirements. The ICAO Secretariat reminded that such extent of discussion on the AFTN Routing Table change on temporary basis has never happened before and as the proposed alternate option required modifications into the AFTN Routing Table, the ACSICG should be a better platform to address it.

7.4 India and Australia extended their support to help Bhutan to implement Option 2 proposed by Ad-hoc group. However, they proposed that Option 1 suggested by Ad-hoc group was better option and as per current terms and conditions defined in Tender documents approved by CRV OG,

PCCWG should not deny request to downgrade the CRV SLA Package of Bhutan from Package C to Package D. Australia, India, Singapore, and USA requested the ICAO Secretariat to take necessary action to discuss this issue with CRV OG as States should have option to upgrade/downgrade the circuits based on the need. **ACTION ITEM 8-3**

7.5 Thailand informed that they will implement the CRV in first quarter of 2022. Additionally Thailand agreed to support Bhutan for implementing Option 2.

7.6 Singapore and New Zealand agreed to support Bhutan for Option 2. However, Singapore shared the need to define timeline to implement the option 2 as India may implement CRV in Q4 of 2021.

7.7 The Meeting requested to all six member States to create an Ad-hoc group with support of the ICAO Secretariat to further discuss about implementation of Option 2. **ACTION ITEM 8-4**

Update on ICAO APAC Regional Webinars-Sec (IP/02)

7.8 The Meeting was informed about the 18 webinars being hosted by ICAO APAC office in the year 2021 as ICAO APAC series of webinars along with the objectives of webinars related to CNS i.e. ICAO APAC Cybersecurity Webinar, Webinar on Implementation of CRV in APAC region, SWIM workshop, and Webinar on Implementation of ADS-B. The Meeting was invited to contribute individual practice and experience to the webinar of interest as a speaker and to take maximum advantages of the webinars by registering more participants from states.

Date and Venue for the Next Meeting

7.9 The Meeting identified the need to organize face to face meeting, if possible, to further progress tasks listed in the Terms of Reference, with a tentative date at the end of ***May 2022***. The Secretariat will coordinate for hosting the next meeting in members States of the group or will organise it in ICAO APAC Office Bangkok, and inform participants in due course for the exact dates and venue.

– – – – – – – – – – – –

INTERNATIONAL CIVIL AVIATION ORGANIZATION

COMMON AERONAUTICAL VPN (CRV) IMPLEMENTATION PLAN

Version 2.1

17 May 2021

Table of Contents

ABBREVIATIONS

ABBREVIATION	DESCRIPTION
AFTN	Aeronautical Fixed Telecommunication Network
AIDC	ATS Inter-facility Data Exchange
AMHS	Air Traffic Service Message Handling System
ANSP	Air Navigation Service Provider
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
APAC	Asia/Pacific
ATC	Air Traffic Control
ATM	Air Traffic Management
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Services
BBIS	Backbone Boundary Intermediate System
BIS	Boundary Intermediate System
CAA	Civil Aviation Authority
CAR	Caribbean Region
CBA	Cost Benefit Analysis
CNS	Communications, Navigation and Surveillance
ConOps	Concept of Operations
CRV	Common aeRonautical Virtual Private Network
DSCP	Differentiated Services Code Point
EUR	European Region
FIXM	Flight Information Exchange Model
FPL	Flight Plan
ICAO	International Civil Aviation Organization
IP	Internet Protocol
IPS	Internet Protocol Suite
IWXXM	ICAO Weather Information Exchange Model
MET	Meteorological
MPLS	Multi-Protocol Label Switching
NAT	Network Address Translation
NID	Network Interface Device
OH	Operational Hazard
OG	Operation Group
OSI	Open Systems Interconnections
PoC	Point of Contact
QoS	Quality of Service
RFI	Request for Information
RFP	Request for Proposal
SARP	Standards and Recommended Practices
SAT	Site Acceptance Test
SIP	Session Initiation Protocol
SME	Subject Matter Expert
SOP	Standard Operating Procedures
ST	Sealed Tender
SWIM	System-Wide Information Management

ABBREVIATION	DESCRIPTION
TF	Task Force
WXXM	Weather Information Exchange Model (based on XML)
UC	Use Case
VoIP	Voice Over Internet Protocol
VPN	Virtual Private Network
XML	Extensible Markup Language

1.0 INTRODUCTION

1.1 Purpose

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

The details includes in Table 1, Table 2 and Appendix A, a list of all States/ Administrations concerned, and for each State/ Administration it includes the:

i. National Points of Contact and Local Points of Contact; and

ii. expected deployment date.

The information contained in this document was first adopted by the 1st Meeting of CRV Operations Group (CRV OG/1). It is intended that this Implementation Plan shall be used as the means to:

i. identify all actions required to implement CRV;

ii. ensure a harmonized approach for the APAC Region;

iii. monitor and report on progress; and

iv. identify any issues, risks or problems which may arise.

1.2 Overview of the CRV

Currently, aeronautical ground-ground communications in the ICAO Asia/Pacific Region, and in particular Aeronautical Fixed Telecommunication Network (AFTN) and AMHS services, operate over point-to-point international leased circuits. However, this network configuration exhibits a number of limitations such as the inability to switch to new protocols like Voice over IP (VoIP) or System Wide Information Management (SWIM) efficiently, high cost for every connection and limited flexibility for increase in bandwidth.

A CRV Task Force (TF) was formally established in accordance with APANPIRG Decision (24/32), (Bangkok, Thailand, 24-26 June 2013). The concept of CRV was taken from other common network that has already implemented in other regions such as Pan-European Network Services (PENS) and FAA Telecommunication Infrastructure (FTI).

The CRV is a dedicated multiprotocol label switching (MPLS) Internet Protocol (IP) based Virtual Private Network (VPN) communication network provided by a common network service provider and support all Aeronautical Fixed Service (AFS) in the APAC region. Telecommunication costs are reduced as States/ Administrations will only require minimal connections to a far reaching network instead of individual connections to each neighboring State/ Administration. The CRV service provider provides the service to allow CRV members to exchange voice and data information with each other.

Each CRV member should determine the amount of bandwidth require for each Quality of Service (QoS) sub queue. In addition, each CRV member should also determine the total access bandwidth that they need to subscribe.

2.0 IMPLEMENTATION OVERVIEW AND PROCESSES

2.1 General Description of Implementation

States/ Administrations should refer to the implementation roadmap (see Appendix A) to take note of the estimated CRV implementation date provided by other States/ Administrations that they wish to exchange data/ voice via the CRV.

The implementation date, type of data, voice, bandwidth and QoS between the two States/ Administrations shall be negotiated and agreed bilaterally and supported by the CRV service provider.

CRV service provider is to put up individual service contracts for the two connecting States/ Administrations.

The work processes and CRV implementation roadmap in 2.2 provides a breakdown of the estimated schedule and serve as a guide.

2.2 Implementation Schedule/ Roadmap

The planned project timeline for each States/ Administrations to implement CRV could be based on the estimated work processes schedule and roadmap for CRV.

2.2.1 Work Processes

The projected activities and schedule to implement the services includes the following:

S/No.	Subject	Projected Activities	Projected Schedule
1	Technical requirements and SOW	1. Respective ANSPs develop their associated requirements and Statement of Work (SOW) that specify performance, interface, conversion, operational procedure, acceptance test procedure 2. Present to Vendor for comment and response 3. To seek CRV-OG concurrence on deviation from CRV common package 4. Finalize requirements	6 to 9 months
2	Negotiation and agreement between two connecting States/ Administrations	1. To decide the type of data or voice to be exchanged via CRC, QoS for each type of applications and the required bandwidth 2. CRV Contractor to comment and response to the agreed requirements 3. Agree to implementation schedule	6 to 9 months
3	CRV Contractor proposes Contract to ANSP	4. Contractual and Legal review 5. Technical and operational review 6. Finalize contract 7. Establish contract and payment system	6 to 9 months
4	Site preparation	Site preparation and implementation of the service	1 to 3 months

S/No.	Subject	Projected Activities	Projected Schedule
5	Test and evaluation	1. Perform acceptance test with associated applications 2. Perform acceptance test with respective ANSPs	3 to 6 months
6	Service acceptance	Service acceptance	1 week

2.2.2 Roadmap for CRV

The roadmap for CRV implementation in the APAC Region is appended in Appendix A.

2.3 Application Transition Schemes

This paragraph provides States/ Administrations the recommended transition scheme for each application (e.g. AMHS, ATFM, ADS-B, Voice, etc.) targeted to be implemented or migrated from the existing communication link/ network.

2.3.1 AMHS

Being IP, it should be possible to reroute the existing connection at the IP layer either by an address translation or by pointing the LA at a new IP address in the AMHS system. However the recommended approach will be to setup a parallel connection using the CRV that can be thoroughly tested to the satisfaction of both ANPS's. Once the stability of the CRV has been verified, the cutover would be conducted by the respective com-centers at the AMHS system level. The actual approach taken will require a negotiation between each pair of ANSP's.

2.3.2 AFTN

Depending on the existing AFTN connection there are a number of migration strategies available.

Option 1. Migration to AMHS

Setting up a new AMHS link over the CRV as per ICAO grand master plan *xyz.123* would be the preferred option for migration of AFTN. It would allow the new connection to be setup and tested independently.

Option 2. Migrate from native X.25 to XoT

Where the existing connection is a native X.25 connection end to end, and migration to AMHS is not possible, then XoT is the next preferred option. It is recommended that a new LA be setup that uses the XoT over CRV path. Once the XoT connection has been verified and tested by each ANSP then actual migration of AFTN would be performed by the respective com centers similar to AMHS in 2.3.1 above. If PCCW are not able to provide serial interfaces on their CE routers then it would be incumbent on the ANSP to deliver the AFTN traffic as a XoT connection.

Option 3. Migrate from XoT to XoT

Where the AFTN connection between two ANSP's is already using XoT, and if the trust in the performance of the CRV is high, then the cutover from the legacy link to the CRV could be as simple as an X25 route change on each ANSP's respective XoT routers. Alternatively, a new LA could be setup and tested before being cutover at the system level by the respective ANSP's com-centers.

2.3.3 ADS-B

To deliver their stream to the PCCW gateway, likewise at the other end it would be up to the partner ANSP to ensure that that there is a multicast path available from the CRV egress to their flight data management system. Being multicast it is possible for the same information to traverse the same two endpoints via multiple network paths simultaneously, however some ANSPs may decide to setup new multicast groups via the CRV so that the performance of the CRV can be measured against the legacy link. Alternatively, ANSPs may decide to replace the multicast stream with unicast data flows that operate via an ADS-B filter.

PCCW could implement Generic Routing Encapsulation (GRE) tunnel solution (NID to NID) between States/ Administrations who are agreeable to have direct connection for routing control over the any to any MPLS layer 3 backbone.

2.3.4 Voice

The specific strategy used to migrate the voice services will vary depending on the existing setup, the proposed voice interface between the ANSP and PCCW (E&M / ISDN / VoIP), how the partner ANSP is setup and their intended connection to PCCW. Despite this there are two main options.

Option 1 – New buttons on the operator consoles - Preferred

This option involves setting up new buttons on the operator consoles at each end. The new buttons are configured from the outset to route via the CRV. This strategy allows the new service to be configured and tested with minimal disruption to operators and also allows for an almost seamless cutover (pressing a different button). Another great advantage of this strategy is to ability to do a practical test of the voice quality by allowing the same pair of controllers test both paths within a few seconds of each other.

Option 2 – Reconfigure existing connections to use the CRV

Where Option 1 is not possible, the only other alternative is to reconfigure the existing connection. This will involve increased coordination between the two ANSP's and PCCW as well as potentially multiple technical groups within an ANSP as it is likely that multiple systems will need to be reconfigured at the same time. E.g. Voice switches, networking devices etc. This option would also involve a lengthy outage and interruption to operational staff.

2.4 Technical Specifications of CRV (for applications reference)

CRV envisaged in the ICAO CNS/ ATM concept via through two backbones (one Multiprotocol Label Switching (MPLS), based on a terrestrial, satellite, or both networks, and one based on a secured Virtual Private Network over the public internet.

i. It will be a homogeneous and generalized application of the IP protocol in the transport network for voice and data aeronautical communications;

ii. It will established an appropriate Quality of Service (QoS) quality requirements;

iii. It will have a centralized and common network management;

iv. It will have a homogeneous and standardized interface, consisting Network Interface Device(s) (NID(s)) linked to the existing local switches, satellite and/or terrestrial links based on the Multiprotocol Label Switching (MPLS) technology, as well as ground services, based on a Virtual Private Network (VPN) over the public internet;

v. It will have voice and data gateway service by the Service Provider; and

vi. For IT security, individual ANSPs may implement an authentication service based on a cooperative public key infrastructure (PKI) including IPSec for IPv4 and IPv6 and digital certificates management for public IP links between ANSPs.

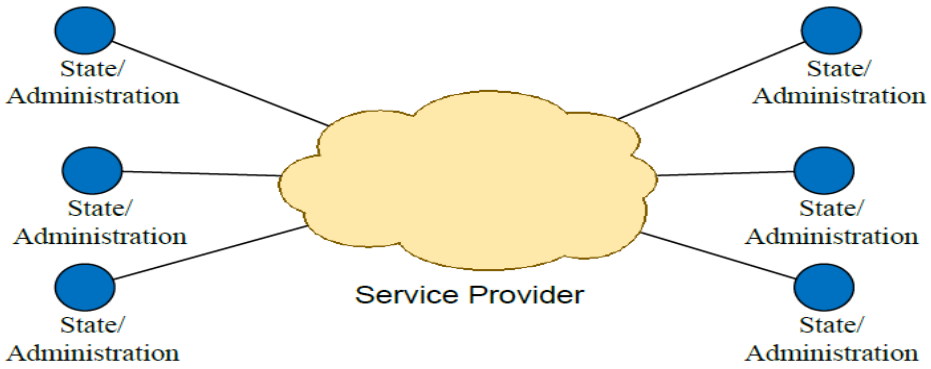


Figure 1: High level system overview of CRV

2.4.1 Service Level Agreement & Quality of Service

i. QoS are implemented using guidance from IETF RFC 4594 Configuration Guidelines for Different Service Classes. The routing protocol, voice, voice signaling, real-time interactive and standard data types shall all be given separate QoS bandwidth;

ii. Differentiated Services Code Point (DSCP) QoS markings to traffic will be used before it enters the network; and

iii. SLAs are based on States/ Administrations' requirements (i.e. Packages A, B, B+, C, C+ and D offered by CRV contractor).

2.4.2 IP Addressing

i. CRV supports IPv4 and IPv6 addressing. The overall IP addressing plan will be centrally managed by the CRV contractor and will be known as the CRV IP address plan;

ii. An IPv4 plan, appended as Appendix B, was agreed in the APAC region and was concluded through Conclusion 21/22 - Asia/Pacific ATN Interim Addressing Plan;

iii. In the development of the IPv4 plan, a flexible margin has been designated to allow future growth or change. Through draft Conclusion CRV OG/8/XX, using one vacant /19 IP address block "10.46.0.1 to 10.46.255.254", each third party Service Provider (e.g. AIREON LLC providing Automatic Dependent Surveillance - Broadcast data over CRV) is assigned 254, 510, 764 or 1022 usable Network addresses (depending on Service Providers' technical requirements); and

iv. The Middle East Regional (MID) region IPv4 plan is appended as Appendix C of this document.

2.4.3 Interface

i. The interface type provided by the NID to the CRV User is the Ethernet IEEE 802.3ab (1000 Base-T).

2.4.4 Routing Restrictions

i. Route advertisements will be restricted so that each CRV User which interacts with the CRV routing protocol can only advertise subnets which are allowed in the CRV IP Address Plan.

ii. When peering with the CRV Contractors network, it is permissible to use the CRV User's own Public IP addressing and ASN, and the CRV Contractor will use a Public AS.

2.4.5 Packet Loss Rate:

i. Packet loss rate of less than 0.1% for all the SLA-Voice; and

ii. Packet loss rate of less than 0.5% for all the SLA-Data.

2.4.6 For VoIP Transport (ED-137)

i. The VoIP Transport shall provide a maximum jitter of 40ms;

ii. The VoIP Transport shall provide a maximum packet loss of 0.1%;

iii. The VoIP Transport shall provide an availability greater than 99.9%; and

iv. The CRV shall use the high priority tags in the VPN packet headers to ensure that VoIP traffic is given high priority and minimal delay. An appropriate level of priority will be given to ED-137 SIP signaling.

2.4.7 Standards used

i. SNMP and MIB-II management protocols, implemented in accordance with RFC 1157 and RFC 1213;

ii. Implementation of the RTP/RTCP and RTP "header compression" protocols, in accordance with RFC 2508;

iii. The multiservice IP network permit the creation of VPNs using MPLS, in accordance with RFC 2547 and RFC 3031, and QoS configuration over MPLS/VPN, in accordance with RFC 3270 and RFC 2983;

iv. QoS is implemented using guidance from IETF RFC 4594. (Covered under QoS); and

v. The CRV provide transport for the ED-137 VoIP.

*Note: If at the time of the publication of this document the specific rules and standards mentioned in any of the other Sections have been revoked, superseded or updated, the new rules or standards shall be deemed as applicable.

2.5 Use Cases

Use Case 1 – ANSPs Interconnect AMHS

Summary of Situation
ANSP 'A' and ANSP 'B' wish to have a direct connection between their AMHS. Both ANSPs decide that the AMHS application shall be built upon the Aeronautical Telecommunication Network (ATN). The ATN will in turn use the CRV.

User Response
Each ANSP already has a connection to the CRV. Each ANSP:
1. Notifies the CRV-OG Coordinator of their intention to establish the new facility.
2. Determines if their existing access speed is sufficient. If it is not the ANSP will arrange with the CRV Service Provider to increase their bandwidth.
3. Negotiates bi-laterally with the other ANSP to determine what IT security arrangements are required. In this User Case they decide to implement an IPSec VPN.
4. Negotiates bi-laterally with the other ANSP to determine what testing, acceptance and commissioning procedures are required.
5. Notify CRV-OG on completion of the implementation to update records.
Operational Needs

UC1.1 The CRV link must meet the reliability and availability needs of AMHS.
UC1.2 The CRV link must provide IP version 4 transport for the ATN.
UC1.3 The CRV link must provide IP version 6 transport for the ATN.
UC1.4 The CRV link must allow the ANSPs to implement IPSec VPN tunnels.
UC1.5 The CRV link must allow for bandwidth changes.

Use Case 2 – ANSPs Implement ATC Voice over Internet Protocol Circuits

Summary of Situation
ANSPs 'A' and 'B' wish to build upon the success of their AMHS implementation and have identified four Voice over Internet Protocol (VoIP) voice circuits which should be moved to the CRV.

User Response
Each ANSP already has a connection to the CRV. Each ANSP:
1. Notifies the CRV-OG Coordinator of their intention to establish the new facility.
2. Determines if their existing access bandwidth is sufficient. If it is not, the ANSP will arrange with the Service Provider to increase their bandwidth.
3. Negotiates bi-laterally with the other ANSP to determine what IT security arrangements are required. In this Case they decide to implement an IPSec VPN to provide secure end-to-end transport between ANSPs.
4. Negotiates bi-laterally with the other ANSP to determine what testing, acceptance and commissioning procedures are required.
5. Tags the VPN traffic containing the Voice over Internet Protocol (VoIP) Real-time Transport Protocol (RTP) and Session Initiation Protocol (SIP) data with appropriate priority markings to allow the CRV Service Provider to identify the voice traffic.
Operational Needs

UC2.1 The CRV link must meet the reliability and availability needs of ATC voice.
UC2.2 The CRV link must provide an IP version 4 VPN tunnel to transport IP version 4 VoIP and SIP signaling.
UC2.3 The CRV link must provide an IP version 6 VPN tunnel to transport IP version 6 VoIP and SIP signaling.

UC2.4 The CRV link will use the high priority tags in the VPN packet headers to ensure that VoIP traffic is given high priority and minimal delay.

Use Case 3 – ANSPs Implement Automatic Ring-down Circuits

Summary of Situation
ANSPs 'A' and 'B' wish to build upon the success of their AMHS implementation and have identified an Automatic Ring-down (ARD) analog voice circuit which should be moved to the CRV.

User Response
Each ANSP already has a connection to the CRV. Each ANSP:
1. Notifies the CRV-OG Coordinator of their intention to establish the new facility.
2. Determines if their existing access bandwidth is sufficient. If it is not, the ANSP will arrange with the Service Provider to increase their bandwidth.
3. Negotiates bi-laterally with the other ANSP to determine what voice quality Mean Opinion Score (MOS) is required. Perceptual Evaluation of Speech Quality (PESQ) ITU-T Rec. P.862 may be used to measure the effects of distortions (e.g. errors, packet loss, delay, etc.) to provide the MOS score.
4. Negotiates bi-laterally with the other ANSP to determine what testing, acceptance and commissioning procedures are required.

UC3.1 The CRV link must meet the reliability and availability needs of ATC voice.
UC3.2 The CRV link must provide conversion from analog voice to VoIP.
UC3.3 The CRV link must provide appropriate SIP signaling to support the ARD functionality.
UC3.4 The CRV link must provide IP version 4 transport for the VoIP.
UC3.5 The CRV link must provide IP version 6 transport for the VoIP.
UC3.6 The CRV link will use the high priority tags in the packet headers to ensure that VoIP traffic is given high priority and minimal delay. The CRV must give an appropriate level of priority to SIP.
UC3.7 The CRV link must deliver voice so that it is clearly understood with minimal delay.

Use Case 4 – ANSPs Implement Analog Voice Circuits

Summary of Situation
ANSPs 'A' and 'B' wish to build upon the success of their AMHS implementation and have identified four analog voice circuits which should be moved to the CRV.

User Response
Each ANSP already has a connection to the CRV. Each ANSP:
1. Notifies the CRV-OG Coordinator of their intention to establish the new facility.
2. Determines if their existing access bandwidth is sufficient. If it is not, the ANSP will arrange with the Service Provider to increase their bandwidth.
3. Negotiates bi-laterally with the other ANSP to determine what voice quality Mean Opinion Score (MOS) is required. In this Case they decide a MOS of 4.0 is required so they select a CRV service level that provides the required voice quality.
4. Negotiates bi-laterally with the other ANSP to determine what testing, acceptance and commissioning procedures are required.
Operational Needs

UC4.1 The CRV link must meet the reliability and availability needs of ATC voice.
UC4.2 The CRV link must provide conversion from analog voice to VoIP.
UC4.3 The CRV link must detect analog signaling and provide appropriate SIP signaling and vice versa.
UC4.4 The CRV link must provide IP version 4 transport for the VoIP.
UC4.5 The CRV link must provide IP version 6 transport for the VoIP.
UC4.6 The CRV link will use the high priority tags in the packet headers to ensure that VoIP traffic is given high priority and minimal delay. The CRV must give an appropriate level of priority to SIP.
UC4.7 The CRV link must deliver voice so that it is clearly understood with minimal delay.

3.0 IMPLEMENTATION SUPPORT

3.1 Introduction

The aim of the transition is to be interruption less. But as the services must migrate from the current network infrastructure to the CRV, an interruption time due to disconnection and reconnection, is mandatory and the team involved (CRV-OG, CRV Members and Contractor) will be of utmost importance to the overall process.

This chapter comprises the basic teams involved in the implementation of the CRV infrastructure, the roles of each professional and the main coordination steps and stakeholders including the CRV-OG.

These responsibilities come in addition to those stated in the Terms and Conditions and Terms of Reference.

Figure 3 describes the relevant entities for the CRV implementation.

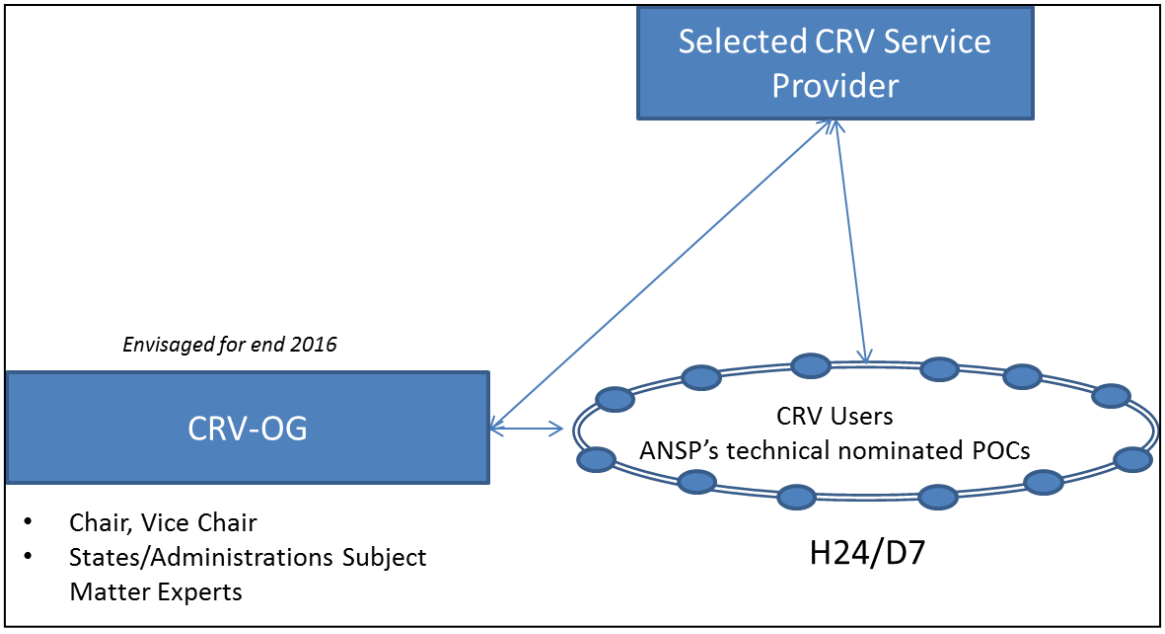


Figure 3: Relevant Entities to this Project.
(Source: CRV Tender doc - Att II - Terms of Reference_v3)

3.2 Implementation Team

The implementation team will be composed of the CRV-OG representatives, the National Points of Contact (NPOC), Local Points of Contact (LPOC) and the CRV Contractor Team, as described in the following sections.

3.2.1 CRV-OG

The CRV Operations Group (OG) will provide oversight of the function and performance of the network after the CRV is completely installed. Besides, it will be involved in the oversight of the implementation of the CRV post Contract Award.

The main activities and roles applied to the CRV-OG during the implementation of the CRV infrastructure are:

i. Develop close coordination with the National CRV POC and Contractor for the complete implementation of the CRV node;

ii. Provide the CRV IP Addressing Scheme (Plan) to the Contractor, in close coordination with the National CRV POC; and

iii. Provide the classification and marking scheme for the prioritization of traffic for the QoS to be used by the aeronautical applications in the CRV network.

Note: When applying QoS, the end-to-end configuration needs to be observed (LAN- layer 2 switches and WAN- Layer 3 routers devices). So, this activity will involve close coordination with the National CRV POC and Contractor, taking into consideration the tender document Att II - Annex b - Matrix of Flows for CRV services_v2), SLA, and the tender document Att II - Annex c - Mapping of services for quality management_v2.

3.2.2 National CRV Points of Contact

Table 1 contains the National CRV Points of Contact that will be in charge of the whole process in each CRV Member, independently if the State involved has more than one node.

The main activities and roles of the National CRV Points of Contact are:

i. Develop close coordination with the CRV-OG representatives, Contractor and Local CRV POC for the complete implementation of the CRV node;

ii. Receive the requests for site surveys from the Contractor, coordinating the actions with the Local CRV POC;

iii. Participate and/or Coordinate the participation of the Local CRV POC and Local Staff in the implementation meetings with the Contractor;

iv. Participate and/or Coordinate the participation of the Local CRV POC and Local Staff in the training package (on line, on site, initial and refresh) as defined in the Section 3.12 (Training) of the Terms of Reference (TOR) document;

v. Coordinate the actions and instruct the Local CRV Points of Contact regarding all activities

involved in the implementation phase;

vi. Review and approve the System Design Document (SDD), System Engineering plan (SEP) and other documents, part of the tender package, prepared by the Contractor upon the contract award and signature;

vii. Review and approve the Validation Plan, including the Site Acceptance Test (SAT), prepared by the Contractor;

viii. Oversee if the Contractor is following the national laws and procedures concerning the assignment of frequencies with the radio regulator authorities in each country (case of microwave and satellite equipment);

ix. Update the ICAO CNS Regional Officer (ICAO Asia and Pacific Regional Office) with regard to the timeframe, situation, difficulties and other topics deemed necessary for the implementation of the CRV node(s);

x. Provide the local CRV IP Addressing Scheme - Plan to the Contractor in close coordination with the CRV-OG representatives.

xi. Provide the current numbering plan for the ATS Switched Voice Circuits to the Contractor;

xii. Provide the current direct hotline Voice Circuits configuration to the Contractor;

xiii. Provide the classification and marking scheme for the prioritization of traffic for the QoS to be used by the aeronautical applications in the CRV network (See note in the paragraph 3.2.1.3);

xiv. Receive the requests for site surveys from the Contractor and coordinate the activities with the Local CRV POC; and

xv. Approve the implementation planning.

Table 1: National CRV Points of Contact

Asia Pacific Region:

State/ Administration	ANSP/ CAA	National CRV Point of Contact (POC)	Job Title	E-mail	Telephone/FAX	Address
The information is restricted and can be accessed by New Zealand hosted CRV portal at https://airwayscorporation.sharepoint.com/teams/APAC-CRV/SitePages/Home.aspx or ICAO APAC **CRV** Secure Portal. If you are an ANSP wishing to connect to another ANSP or consume a service, please email the APAC CRV Portal administrator at vaughan.hickford@airways.co.nz. to get access to New Zealand hosted CRV portal If you are proposing the provision of a service be added to the CRV, please liaise through your sponsoring ANSP. To get access to ICAO Secure portal, please use group Name: **CRV**						

MID Region (CRV) Focal Points (updated in December 2017 at CRV OG/3 meeting):

State	Name/Title	Contact Details (Tel./Fax/Mobile/Email)
The information is restricted and can be accessed by New Zealand hosted CRV portal at https://airwayscorporation.sharepoint.com/teams/APAC-CRV/SitePages/Home.aspx or ICAO APAC **CRV** Secure Portal. If you are an ANSP wishing to connect to another ANSP or consume a service, please email the APAC CRV Portal administrator at vaughan.hickford@airways.co.nz. to get access to New Zealand hosted CRV portal If you are proposing the provision of a service be added to the CRV, please liaise through your sponsoring ANSP. To get access to ICAO Secure portal, please use group Name: **CRV**		

3.2.3 Local CRV Points of Contact

Table 2 contains the Local Points of Contact. In fact, the professionals nominated and listed in the referred tables will really take part in the installation, on behalf of the States, and will be in charge of the oversight of the Contractor´s team in each site. They will report directly to the National Points of Contact of each CRV Member. The main activities and roles for the Local CRV Points of Contact are:

i. Instruct and coordinate the actions with all the local staff involved in the CRV implementation;

ii. Develop close coordination with the National CRV POC and the Contractor´s site staff for the complete implementation of the CRV node;

iii. Coordinate the actions for the site surveys with the National CRV POC;

iv. Participate in the implementation meetings with the Contractor (if decided by the National Point of Contact);

v. Participate to the elaboration of the implementation planning;

vi. Participate in the Training Package and nominate, to the National CRV POC, the Local staff there will participate in the referred events;

vii. Report, give feedback and update the National CRV POC regarding all aspects concerning the implementation of the CRV node;

viii. Assist the National POC in the revision and approval of the SDD, SEP and other implementation documents, prepared by the Contractor;

ix. Assist the National POC in the revision and approval of the Validation Plan including the SAT, prepared by the Contractor;

x. Oversee the installation in order to ensure that the Contractor team is keeping the working area clean and free from fire hazards and if after installation, all excess material is duly removed;

xi. Make sure that the local safety rules are observed by the Contractor in terms of intervention on operational systems;

xii. Oversee the installation in order to ensure that the Contractor is following what is described in the TOR, item 3.3.2.9, concerning the Electromagnetic compatibility/ grounding;

xiii. Oversee if the QoS configuration is duly performed by the Contractor, as defined by the CRV-OG representatives and the National CRV POC;

xiv. Oversee if the CRV IP Addressing Scheme (Plan) is duly performed by the Contractor, as defined by the CRV-OG representatives and the National CRV POC;

xv. Oversee if the configuration of current numbering plan for the ATS Switched Voice is duly performed by the Contractor, as defined by the CRV-OG representatives and the National CRV POC;

xvi. Oversee if the configuration of the current Direct Circuits (DIR) is duly performed by the Contractor, as defined by the CRV-OG representatives and the National CRV POC;

xvii. Coordinate the actions for the site surveys and assist the Contractor´s personnel during the visits; and

xviii. Hold meetings with the Contractor as deemed necessary and report to National POC.

Local CRV Points of Contact (installation and oversight of the Contractor´s team on each site)

State	State/ANSP	Site	Local CRV Points of Contact	Email	Telephone / Fax	Service installation
The information is restricted and can be accessed by New Zealand hosted CRV portal at https://airwayscorporation.sharepoint.com/teams/APAC-CRV/SitePages/Home.aspx or ICAO APAC **CRV** Secure Portal. If you are an ANSP wishing to connect to another ANSP or consume a service, please email the APAC CRV Portal administrator at vaughan.hickford@airways.co.nz. to get access to New Zealand hosted CRV portal If you are proposing the provision of a service be added to the CRV, please liaise through your sponsoring ANSP. To get access to ICAO Secure portal, please use group Name: **CRV**						

3.2.4 CRV Contractor

The Contractor shall nominate all the staff involved in the implementation of the CRV node, mainly the Program Manager for the CRV program. The Contractor will follow all the steps described in the tender documentation, specially the TOR and Instructions to Tenderers, for the implementation of the CRV node. The main activities to be carried out by the Contractor during the implementation are:

i. Submit the updated SDD and the SEP to the CRV-OG, to the CNS Officer for the Asia/Pacific Regional Office and to the National CRV POC;

ii. Submit the requests for site surveys to the National CRV POC following the procedures described in the paragraph 4.1.2.2;

iii. Update and submit the Installation Transition Plan to the CRV-OG, to the CNS Officer for the Asia/Pacific Regional Office and to the National CRV POC;

iv. Be responsible for the supply, transport, installation, start-up and operation of all CRV equipment especially designed for a given CRV node;

v. Be dealing with customs and transport company about shipping and introducing the equipment in the Country;

vi. The interconnection (to be provided by CRV users) of the Network Interface Device (NID) to the Local Area Network (LAN) switches and other local equipment, including Voice Communication System (VCS), will be confirmed during the site survey;

vii. Demonstrate before the final validation of the SDD and through a test bed that the main characteristics of the intended design of the network will meet the performance requirements, SLA, safety, security and contingency requirements;

viii. Implement the CRV IP Addressing Scheme (Plan), following the information provided by the CRV-OG and/or the National CRV POC;

ix. Implement the classification and marking scheme for the prioritization of the traffic and Quality of Services (QoS), as described in the document Att II - Annex c - Mapping of services for quality management_v2 and in coordination with the CRV-OG and the National and Local CRV POCs (See note in the paragraph 3.2.1.3);

x. The Contractor shall measure the established parameters during circuit implementation (in accordance with ITU-T), and shall also monitor them for 24 hours to show compliance with the established specifications;

xi. Implement the configuration of current numbering plan for the ATS Switched Voice, as defined by the CRV-OG representatives and the National CRV POC, and taking into account the tender document Att II - Annex b - Matrix of Flows for CRV services_v2;

xii. Implement the configuration of the current Direct Circuits (DIR), as defined by the CRV-OG representatives and the National CRV POC and taking into account the tender document Att II - Annex b - Matrix of Flows for CRV services_v2;

xiii. Submit, in details, the escalation process to be followed for the implementation in each CRV node;

xiv. Submit, to the CRV National POC, the documentation for the training of the CRV technicians;

xv. Contractor Representative shall record the minutes of the meeting and distribute the minutes within three (3) Business Days of the meeting date;

xvi. The Contractor shall propose a planning chart that includes all the actions, steps, milestones, meetings, after negotiations with CRV Local and National POC and respect it once approved by the CRV User Representative or amend it in coordination with CRV User representatives; and

xvii. The Contractor shall help the CRV User in the uptake of responsibility before commissioning the equipment by accompanying the CRV User technicians in charge of the equipment.

4.0 BASIC SITE IMPLEMENTATION REQUIREMENTS

Chapter 4 describes the site and facilities requirements envisaged in the implementation phased for the CRV infrastructure, divided into CRV User´s and Contractor´s responsibilities, and also the main hardware and software for the proof of concept and implementation of the WAN links, LAN protocols, applications and main equipment.

These responsibilities come in addition to those stated in the Terms and Conditions and Terms of Reference.

4.1 Site/ Facilities Requirements

4.1.1 CRV User Responsibility

i. The CRV User shall provide the physical space for the installation of cabinets and equipment;

ii. The CRV User shall deliver to the premises the electric power required to feed the equipment to be provided by the Contractor;

iii. The CRV User shall provide access to the equipment to be connected to the CRV NID and to analog/ digital voice gateway;

iv. The CRV User shall accompany and assist the Contractor during the whole operation;

v. The CRV User shall provide room for storing the equipment, received before its installation; and

vi. The CRV User shall inform the Contractor about the local safety rules and procedures and produce suited documents as deemed necessary.

4.1.2 Contractor Responsibility

i. The Project Manager, on behalf of the Contractor, shall nominate and introduce all the staff involved in the site surveys and in the implementation of a CRV node. The list with the staff nominated will be submitted to the National and Local CRV POCs with the formal requests for the site survey and beginning of the very implementation of the CRV equipment and following the

procedures described in the paragraph 4.1.2.4;

ii. The Contractor shall identify the exact locations of the equipment during the site survey;

iii. The Contractor will be responsible for providing the accessories, switches, cables, connections between the main distribution panel and the NID;

iv. The Contractor shall be responsible for the installation of the CRV network equipment, accessories and the provision of the tools, testing equipment and software for the Site Acceptance Tests (SAT);

v. The procedures to the Contractor for the site surveys aiming the installation of the equipment are as follows:

a) Send a formal request to the national CRV POC, with an anticipation of 20 days for the required coordination with the local CRV POC, sending the names of the staff to be involved with the visit;
b) If authorized, the Contractor shall proceed to the site survey in the date and time indicated by the national CRV POC;
c) If the Contractor fails to comply with the survey in the exact date, the national POC will cancel the visit and the Contractor will have to restart the whole site survey process; and
d) The Contractor will provide all of the instruments and tools deemed necessary for the site survey.

vi. The Contractor shall be held liable for any damage to existing property in each CRV User facilities caused to the facilities by its staff and/or its sub-contractors';

vii. The Contractor shall comply with the site safety rules especially during critical phases such as commissioning or interferences with operational systems by following CRV User staff indications in charge of technical safety and not take personal initiatives that could have an impact on operational systems;

viii. The Contractor shall be responsible for storing the equipment before its installation;

ix. The Contractor may be asked to sign additional documents in order to follow local safety rules;

x. The Contractor shall keep the working area clean and free from fire hazards. After installation, all excess material shall be removed;

xi. The Contractor shall identify the exact locations for the installation of cabinets and equipment during the site survey;

xii. The Contractor shall provide the CRV equipment grounding in each node;

xiii. If necessary, the Contractor shall install protection against atmospheric discharges for all the equipment to be implemented for the provision of the CRV infrastructure in each node;

Note: The Contractor will be responsible for reviewing the characteristics of any existing devices that might be available as long as it is allowed the usage by the CRV representative;

xiv. The Contractor shall be responsible for the connection to the power supply in the installation site, including electrical wiring between the power outlet and the equipment rack of the Contractor, including the respective circuit breakers and devices to protect against surges and atmospheric

discharges;

xv. The Contractor shall be running simulations over a period that has to be determined before commissioning the equipment. CRV User representatives shall be involved in the setting and execution of these simulations; and

xvi. The Contractor shall procure the results of the tests.

4.2 Hardware and Software Requirements

4.2.1 General Topics

i. For the installation of the equipment to be provided, the Contractor shall follow and consider all the tender documents, especially the TOR, the Att II - Annex e - CRV IRS_v2 and the Att II - Annex f - Additional Voice and Data Gateway Service_v3.

ii. Although the Contractor operates MPLS data transport solutions, it is fully committed to the perfect operations of the applications and shall follow the initial end-to-end applications trials.

4.2.2 Hardware Requirements

i. For the satellite equipment, the Contractor shall install the indoor and outdoor units.

ii. Where Applicable, the basic satellite equipment to be provided and checked is: Block Up Converters (BUC), Low Noise Block (LNB) down converters and Satellite Modems and VSAT Network management sub-system.

iii. Where Applicable, the basic ground/terrestrial equipment to be provided will comprise: routing system of the IP VPN Internet (with the needed interfaces), the basic ground voice and data gateway (with the needed interfaces), the NID (with the needed interfaces), switches (with the needed interfaces), A/B baseband switch (with the needed interfaces), Multiprotocol Label Switching (MPLS) for the Wide Area Network (WAN) (optical and/or microwave) links equipment.

iv. Before connecting the NID and the analog/digital, if needed, the contractor´s team shall install the new racks and prepare the transition cables, such as junction coaxial cables, junction sub-d cables or RJ based cables.

v. All the test and measurement tools shall be provided by the Contractor. No testing and measurement equipment will be provided by the CRV User representatives.

vi. All the needed equipment must be shipped and acknowledge by the CRV-User before the installation phase with sufficient delay. The Provider have to take the customs procedure delay into account.

vii. All the received items must be inventoried and tested before the beginning of installation in order to avoid dispute.

4.2.3 Software Requirements

Where applicable, the basic software to be provided and/or used in each site is: Network Management Systems (NMS) software, if the SDD indicates that one or more CRV nodes will be selected to manage the CRV network in parallel with the Contractor´s Network Operations Center (NOC), software for BUC, Satellite Modems, NID, Voice/Data Gateway and switches.

4.2.3.1 Documentation Requirements

The needed documentation for the uptake of the equipment shall be provided to CRV User on its demand as deemed necessary.

5.0 TESTING AND EVALUATION.

The tests for the acceptance of the implemented equipment in each CRV node will be performed using simulations of the applications and, eventually, the real application tests that will follow the operational requirements as described in the tender documents, mainly, but not restricted to:

i. Att II - Annex a - CRV CONOPS_v2;

ii. Att II - Annex b - Matrix of Flows for CRV services_v2;

iii. CRV Implementation plan (Chapter 5); and

iv. Validation Plan including the Site Acceptance Test (SAT) protocols (prepared by the Contractor).

The main testing and measurement equipment and tools that shall be used by the Contractor are:

i. Spectrum Analyzer;

ii. cable analyzer;

iii. audio analyzer/generator;

iv. Multi-meters;

v. LAN/Network protocol analyzer; and

vi. Telephones.

Note: This paragraph doesn´t exhaust all the testing and measurement equipment to be used during the implementation phase, and the Contractor shall describe all of them in the documentation to be provided after the contract signature.

The Contractor shall test its backbone (end-to-end) and the connection to its Network Operating Center (NOC). The links will be tested using computers for asynchronous and IP flows for example, and analogical phones.

An example of asynchronous test is opening a HyperTerminal session and send characters and a Bit Error Rate Test using a software such as WinSSD.

The requirements for the test procedures will be reflected in the Chapter 5 (Testing and Evaluation). Notwithstanding this fact, the tests procedures will need some software for the applications as reflected in the following paragraphs.
Note: The following paragraphs don´t exhaust all the software and the Contractor shall describe all of them in the documentation to be provided after the contract signature.

For AFTN simulation: The simulation will consist of connecting a PC to the AFTN port at the back of the rack (with the right rate described in the document Att II - Annex b - Matrix of Flows for CRV services_v2) and close the serial interface at the other end of the circuit (loop). With the PC launch the *winssd* program (or other similar) and start the Bit Error Rate (BER) test. Run the test for 5 minutes and check that there are only a few errors.

For AMHS simulation: AMHS service is over IP (see the document Att II - Annex b - Matrix of Flows for CRV services_v2. To simulate it:

i. ping any remote equipment in the network according to the following cross matrix; and

ii. Verify that the end user is exchanging information correctly.

IP based RADAR and Asterix: The simulation will consist in selecting two sites, configuring sufficient bandwidth and multicast an IP flow.

ATS/DS Circuits: All ATS/DS calls are auto-dialed. The communication is established after the user picks up the phone. The simulation will consist of connecting a telephone on the desired line at the back of the rack, pick-up the phone make the call to the other end of the circuit. For E1 based circuits, to be connected to a VCS, this cannot be simulated.

ATS Switched Circuits: ATS switched calls are dialed. The communication is established after the user picks up the phone and dials the remote dial number. The simulation will consist of connecting a telephone on the desired line at the back of the rack, pick-up the phone and dial a remote number in order to call the other end of the circuit. For E1 based circuits, connected to a VCS, this cannot simulated.

6.0 CONTINGENCY PLAN/ BACK-OFF PLAN

6.1 Purpose

States/ Administrations are to establish contingency plan, with the CRV contractor in case of the following scenario:

i. CRV total failure;

ii. CRV partial failure (e.g. voice channel failure);

iii. Provider Edge (PE) to Customer Edge (CE) link failure (e.g. ANSP1 lose connectivity to CRV); and

iv. PE to PE failure (e.g. ANSP1 and ANSP2 unable to exchange data/ or voice).

6.2 Harmonized Contingency Plan

States/ Administrations could also bilaterally/ multilaterally setup additional IPLC(s) as a contingency. This contingency plan could be harmonized in the APAC region to reduce costs.

7.0 MIXED OPERATING ENVIRONMENT

7.1 Routing of AFTN/ AMHS messages to non-CRV States/ Administrations

During the initial phase of the CRV implementation, States/ Administrations who have joined CRV are to ensure the routing of AFTN/ AMHS messages to States/ Administrations who have not joined CRV.

7.2 Inter-Region common network connectivity

It is envisaged for common networks (e.g. PEN, FTI and CRV) in different Regions to be inter-connected.

Appendix A

1 Introduction

1.1 Objective

This document is meant to describe the addressing plan for IPv4 addresses throughout the Asia/Pacific Region. This document defines the recommended address format for IPv4 addresses. The IPv4 network is to be used within region.

1.2 References

[1]	ICAO Doc 9705-AN/956	Manual of Technical Provisions for the ATN
[2]	ICAO Doc 9896	Manual for the ATN using IPS Standards and Protocols
[3]	ICAO Doc 7910	ICAO Location Indicators
[4]	RFC 1518	An Architecture for IP Address Allocation with CIDR
[5]	RFC 1918	Address Allocation for Private Internets
[6]	RFC 2050	BGP-4 Internet Registry IP Allocation Guidelines
[7]	RFC 3330	Special-Use IPv4 Addresses
[8]	RFC 4271	BGP-4 Specification

1.3 Terms Used

Administrative Domain	–	An administrative entity in the ATN/IPS. An Administrative Domain can be an individual State, a group of States, an Aeronautical Industry Organization (e.g., an Air-Ground Service Provider), or an Air Navigation Service Provider (ANSP) that manages ATN/IPS network resources and services. From a routing perspective, an Administrative Domain includes one or more Autonomous Systems.
Autonomous System	–	A connected group of one or more IP prefixes, run by one or more network operators, which has a single, clearly defined routing policy.

Intra-domain (interior gateway) routing protocol	–	Protocols for exchanging routing information between routers within an AS.
Inter-domain (exterior gateway) routing protocol	–	Protocols for exchanging routing information between Autonomous Systems. They may in some cases be used between routers within an AS, but they primarily deal with exchanging information between Autonomous Systems.
Local Internet Registry	–	A Local Internet Registry (LIR) is an IR that primarily assigns address space to users of the network services it provides. LIRs are generally ISPs, whose customers are primarily end users and possibly other ISPs. [LACNIC]

1.4 Acronyms

AMHS	–	ATN Message Handling System
ARP	–	Address Resolution Protocol
ATN	–	Aeronautical Telecommunications Network
BGP	–	Border Gateway Protocol
DNS	–	Domain Name Service
IANA	–	Internet Assigned Numbers Authority
ICS	–	ATN Internet Communication Service
IP	–	Internet Protocol
IPv4	–	Internet Protocol Version 4
IPv6	–	Internet Protocol Version 6
IPS	–	Internet Protocol suite
LACNIC	–	Latin American and Caribbean Internet Address Registry
LIR	–	Local Internet Registry
OSPF	–	Open Shortest Path First
RIR	–	Regional Internet Registry

1.5 Overview of Addressing Issues

The following subsections present issues that affect the completion of the addressing plan for operating the IPS-based AMHS network.

1.5.1 Public or Private Address

An important decision for the region is whether to use private or public addresses. Private addresses can be used if coordinated by all participating States and Organization; however, it is possible that existing networks already use addresses in the private block ranges. Public addresses must be obtained from a Regional Internet Registry (RIR). The Internet Assigned Numbers Authority (IANA) has delegated responsibility for administration of Internet numbering to the Latin American and Caribbean Internet Address Registry (LACNIC).

1.5.2 Address of Systems in External Regions

Systems in external regions could be assigned an address from the APAC address space rather than use an address in their regional address block. Note however that this must be coordinated with private addresses so as to avoid collisions.

2 IPv4 Addressing Overview and Fundamentals

In the Internet Protocol a distinction is made between names, addresses, and routes. A name indicates what we seek. An address indicates where it is. A route indicates how to get there. The Internet protocol deals primarily with addresses. Its main task is to forward data to a particular destination address. It is the task of higher-level protocols to make the mapping from names to addresses, for example using a domain name service (DNS). The Internet protocol forwards packet data units (PDU) to a destination address using routing tables maintained by a routing protocol. The routing tables contain the address of the next hop along the route to the destination. There are in general two classes of routing protocols: inter-domain or exterior routing protocols such as the Border Gateway Protocol (BGP) and intra-domain or interior routing protocols such as the Open Shortest Path First (OSPF) protocol. In order to forward PDUs to the next hop address, there must be a mapping from this address to the link level address, for example, an Ethernet address. This mapping is maintained by an address discovery protocol such as the Address Resolution Protocol (ARP).

An IPv4 address consists of four bytes (32 bits). These bytes are also known as octets. For readability purposes, humans typically work with IP addresses in a notation called dotted decimal. This notation places periods between each of the four numbers (octets) that comprise an IP address. For example, an IP address that a computer sees as

00001010 00000000 00000000 00000001

is written in dotted decimal as

10.0.0.1

Because each byte contains 8 bits, each octet in an IP address ranges in value from a minimum of 0 to a maximum of 255. Therefore, the full range of IP addresses is from 0.0.0.0 through 255.255.255.255. That represents a total of 4,294,967,296 possible IP addresses.

A network may be set up with IP addresses to form a private or public network. On a private network a single organization controls address assignment for all nodes. On a public network there must be some conventions to assure that organizations do not use overlapping addresses. In the Internet this function is performed by the Internet Assigned Numbers Authority (IANA), which delegates authority to Regional Internet Registries (RIR). For the CAR/SAM Region the RIR is the Latin American and Caribbean Internet Address Registry (LACNIC).

IPv4 Addresses are a fixed length of four octets (32 bits). An address begins with a Network ID, followed by a Host ID as depicted in Figure 2-1.

Figure 2-1. IPv4 Address Format

The original IP addressing scheme divided the Network ID from the Host ID is in a several octet boundaries. In this scheme the main classes of addresses were differentiated based on how many octets were used for the Network ID. This method is called classful addressing. Classful addressing was by convention further modified so that the Host ID could be split into subnet ID and sub host ID. This is typically accomplished using a subnet mask and is called classful addressing with subnetting. This eventually evolved into classless addressing where the division between the Network ID and Host ID can occur at an arbitrary point, not just on octet boundaries. With classless addressing the dividing point is indicated by a slash (/) followed the number of bits used for the Network ID. This value is called the prefix length of the address and the address value up to that point is called the network prefix.

Private Addressing is defined in RFC 1918. IANA has reserved the following three blocks of the IP address space for private Internets:

10.0.0.0 - 10.255.255.255 (10/8 prefix)
172.16.0.0 - 172.31.255.255 (172.16/12 prefix)
192.168.0.0 - 192.168.255.255 (192.168/16 prefix)

Because of the number of bits available to users, these blocks are referred to as a "24-bit block", a "20-bit block", and a "16-bit" block. An enterprise that decides to use IP addresses out of the private address space defined by RFC 1918, can do so without any

coordination with IANA or an Internet registry. Addresses within this private address space will only be unique within an enterprise or a group of enterprises (e.g., an ICAO region), which chose to cooperate over this space so they may communicate with each other in their own private Internet.

3 IPv4 Addressing

3.1 Overview CAR/SAM

3.1.1 During the fourth meeting of ATN/TF4 (Santo Domingo, Dominican Republic, 27 to 28 June 2008) the group analyzed different alternatives for the implementation of the TCP/IP in the CAR/SAM Regions identifying the available options that would facilitate this implementation in the AMHS Service and future applications. This was reviewed in accordance with Document 9880 Part IIB of the ICAO. In this respect the Meeting decided two viable options for the implantation the TCP/IP:

a) AMHS using the RFC1006 on Guiders TCP/IP (IPv4) to allow AMHS to directly interface with IPv4 Guiders for the intra-regional connections.

b) Configurating AMHS, as specified in a) with capacity for IPv4 conversion to IPv6 through the implementation of a function of IP router as gateway for the interregional connections.

3.1.2 The Sixth Meeting of Committee ATM/CNS (ATM/CNS/6) (Santo Domingo, Dominican Republic, 30 June to the 04 July 2008) analyzed this Plan of IP Addressing for CAR/SAM Regions and considered that such a plan would be sent to the ICAO for revision.

3.1.3 During the ACP/WG/I/8 (Montreal, Canada, 25 to 29 August 2008) it was concluded that it is possible to consider a regional scheme of IPv4 addressing. Taking into consideration that the private sector would be using the propose addressing scheme in other applications, the Meeting considered nonviable to apply the IP addressing scheme at a global level.

3.1.4 The Third Meeting of the Group of Regional Implementation SAM/IG/3 (Lima, Peru, 20 to 24 April 2009) considered that, taking into account specified in Table CNS 1Bb from the FASID, the AMHS system to be installed in the SAM Region will use IP protocol and will initially use the IPv4 version. The block of used IPv4 addresses will follow the format established during the ATM/CNS/SG/6 Meeting.

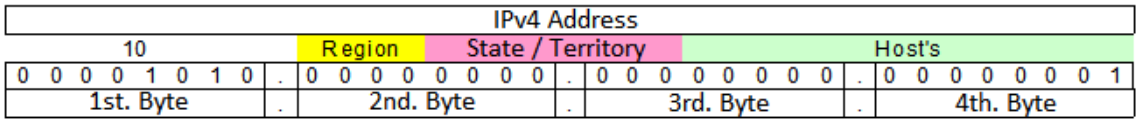
3.2 IP Addressing Plan

When we began to work on the plan of IP addressing, we once again reviewed the scheme that was originally proposed, analyzed the amount of States/Territories by

Region, the amount of addressing that each State/Territory could use and the amount of addressing reserved for the interconnection between States/Territories. The result of this study concluded that:

3.2.1 1 bit would be reduced to State/Territory level. This means the transfer of 256 States to 128 States by region. In the EUR/NAT Region, which is most numerous, has 53 States/Territories, means that there are many vacant numbers.

3.2.2 1 bit at Host's level would be added. This would allow the transfer from 4096 to 8190 hosts per State/Territory. This was considered due to the amount of future applications that would be implemented, mainly in the more developed States, and could cause the amount of directions not to be sufficient. The structure is shown below:



3.2.3 It should be noted the networks assigned to each State are private networks (RFC 1918). The first Bytes that integrate the assigned address will always maintain a decimal value of 10. Whereas the other three Bytes are used to distribute, in hierarchic form, the blocks of directions corresponding to each State.

3.2.4 The first four bits of the second Byte (4 bits) will be used to identify the regions in around which the States/Territories of the world are grouped:

- 0000 => SAM: South American Office.
- 0001 =>. NACC: North American, American Power station and Caribbean Office.
- **0010 => APAC: Asia and Pacific Office.**
- 0011 => MID: Middle East Office.
- 0100 => WACAF: Western and Central African Office.
- 0101 => ESAF: Eastern and Southern African Office.
- 0110 => EUR/NAT: European and North Atlantic Office.

3.2.5 On the other hand, the last four bits of the second Byte, and the first three bits of the third Byte (7 bits) will be used to identify the States/Territories of each region.

3.2.6 Whereas the last five bits of the third Byte and the eight bits that compose the fourth Byte (13 bits) will be used by each one of the States/Territories to assign addressing to their terminals/servers

3.2.7 The IPv4 address allocation scheme will be able to cover:

- 16 Regions.

- 128 States/Territories by each Region.
- 8190 Host' s for each State/Territory

3.2.8 The IPv4 addressing plan would allow each State/Territory to be able to make use of the block of directions assigned as needed.

a) Each State has been assigned 8190 usable Network addresses, which seem to be sufficient to cover existing needs.

b) In the development of the mentioned scheme, a flexible margin has been designated so that it will allow the future growth or change in the network in the future. For example, if a region were subdivided in two or more regions, or the emerging of a new State/Territory.

c) Argentina has already implemented its ATN network with a scheme of addresses different from the proposed one, prior to the publication of this document, has placed a border devise with the intention that this devise will make the address translation between the outer directions.

3.3.1 Network Assignment for ASIA/PACIFIC

Ref	State/Administration	Network	Direction used	Decimal notation	Binary Notation	Region	State/Territory	Host's
The information is restricted and can be accessed by New Zealand hosted CRV portal at https://airwayscorporation.sharepoint.com/teams/APAC-CRV/SitePages/Home.aspx or ICAO APAC **CRV** Secure Portal. If you are an ANSP wishing to connect to another ANSP or consume a service, please email the APAC CRV Portal administrator at vaughan.hickford@airways.co.nz. to get access to New Zealand hosted CRV portal If you are proposing the provision of a service be added to the CRV, please liaise through your sponsoring ANSP. To get access to ICAO Secure portal, please use group Name: **CRV**								

3.3.2 Network Assignment for USA

Ref	State/Administration	Network	Direction used	Decimal notation	Binary Notation	Region	State/Territory	Host's
The information is restricted and can be accessed by New Zealand hosted CRV portal at https://airwayscorporation.sharepoint.com/teams/APAC-CRV/SitePages/Home.aspx or ICAO APAC **CRV** Secure Portal. If you are an ANSP wishing to connect to another ANSP or consume a service, please email the APAC CRV Portal administrator at vaughan.hickford@airways.co.nz. to get access to New Zealand hosted CRV portal If you are proposing the provision of a service be added to the CRV, please liaise through your sponsoring ANSP. To get access to ICAO Secure portal, please use group Name: **CRV**								

3.4 Using IPv4-Compatible Address Formats

In many instances, you can represent a 32-bit IPv4 address as a 128-bit IPv6 address. The transition mechanism defines the following two formats.

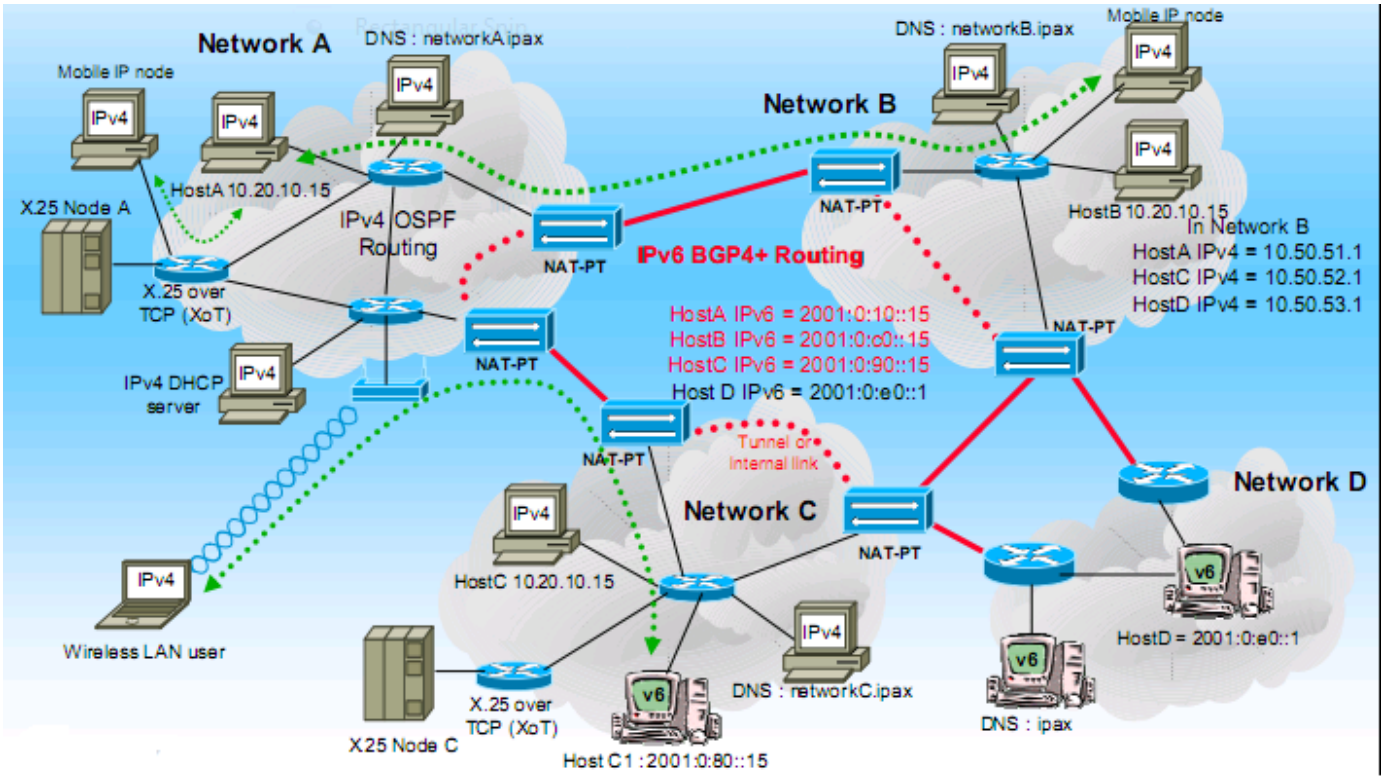
IPv4-compatible address

000 ... 000	IPv4 Address

IPv4-mapped address

000 ... 000	0xffff	IPv4 Address

The mapped address format is used to represent an IPv4 node. The only currently defined use of this address format is part of the socket API. An application can have a common address format for both IPv6 addresses and IPv4 addresses. The common address format can represent an IPv4 address as a 128-bit mapped address. However, IPv4-to-IPv6 protocol translators also allow these addresses to be used.



Appendix C – MID IPv4 Address Plan

Appendix B

No.	State	Network IP Address	Hosts IP addresses				
			Decimal Notation	Binary Notation			
				1st Byte	Region	State	Hosts

The information is restricted and can be accessed by New Zealand hosted CRV portal at https://airwayscorporation.sharepoint.com/teams/APAC-CRV/SitePages/Home.aspx or ICAO APAC **CRV** Secure Portal.

If you are an ANSP wishing to connect to another ANSP or consume a service, please email the APAC CRV Portal administrator at vaughan.hickford@airways.co.nz. to get access to New Zealand hosted CRV portal

If you are proposing the provision of a service be added to the CRV, please liaise through your sponsoring ANSP.

To get access to ICAO Secure portal, please use group Name: **CRV**

ATN/AMHS/AIDC Implementation Status in the APAC Region

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
AFGHANISTAN					
AUSTRALIA	ATN tests were conducted. BIS Router and Backbone BIS Router and AMHS implemented. CRV operational since May 2019. AMHS over CRV with: Singapore, New Zealand, Fiji and USA AMHS over leased line with: South Africa Planning to migrate existing AFTN connections over leased line with Indonesia and PNG to AFTN over CRV (2021) prior to upgrading to AMHS over CRV (TBC) Extended AMHS with FTBP in support of IWXXM exchange in operation since Nov. 2020.	Frequentis Comsoft	AFTN/AMHS based AIDC Implemented between Brisbane and Melbourne. For neighbouring ANSP of Brisbane, AIDC implemented with Auckland, Nadi, Oakland, Port Moresby, Ujung Pandang For neighbouring ANSP of Melbourne, AIDC implemented with Johannesburg and Mauritius.		CPL and CDN exchange limited
BANGLADESH	In Q1/2013, Bangladesh installed ATN/AMHS and BIS Router at Dhaka (VGHS) with User Agents at Chittagong (VGEG) and Sylhet (VGSY).	COMSOFT	Tentative date of implementation of AIDC is Q4 of 2023 with Kolkata and Yangon.		Implementation of AIDC is included in the "Modernization of CNS-ATM System of

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
					CAAB" project which is going on G2G agreement with French Government and likely to be implemented by the end of 2023.
BHUTAN	ATN/AMHS circuits, using IP over VPN, with Thailand (Bangkok) and India (Mumbai) commissioned in June and July 2017 respectively. IOT and POT with Mumbai completed on 27th June 2017. IOT and POT with Thailand completed on 2nd May 2017. TMC signing with both countries signed.	AEROTHAI'S AMHS System	Currently not applicable. If required in the future, will decide after CRV implementation.		
BRUNEI DARUSSALAM	ATN BIS Router planned for 2015 and AMHS planned for 2015				
CAMBODIA	BIS Router and AMHS installed. Cambodia (CATS) AMHS connected with Bangkok via VSAT IP link since 10 December 2013	AVITECH	AIDC function and capability made available.	THALES which supports AIDC ICD Version 1.	

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			Ready for testing with neighbors ATS Facilities starting from 2017 and target date of implementation with Bangkok in 4Q2019		
CHINA	ATN Router and AMHS including NCC deployed in 2008 which is being upgraded to support ATN/IPS with target date of completion in December 2013. The Beijing-Hong Kong AMHS link was put into operation in 2018; With Thailand was put into operation in Q12020 AMHS/ATN technical tests with Macau completed in 2009. Plan for ATN/AMHS implementation with Macao China is TBD. ATN/AMHS circuit with ROK has been put into operation since June 2011. ATN/AMHS tests with India has been put into operation since 2016. ATN and AMHS IOT with Mongolia is completed in May 2018. Plan for	IN-HOUSE (Aero-Info Technologies Co., Ltd)	AIDC between some of ACCs within China has been implemented. AIDC between several other ACCs are being implemented. AIDC between Sanya and Hong Kong China put into operational use since 8 Feb 2007. AIDC between Dalian and Incheon implemented in Nov. 2016; AIDC between Sanya and Hong Kong China put into operational use since February 2007.	ATN Router and AMHS including NCC deployed in 2008 which is being upgraded to support ATN/IPS with target date of completion in December 2013. The Beijing-Hong Kong AMHS link was put into operation in 2018; With Thailand is completed POT, after sign the TMC circuit and was put into operation in Q12020 AMHS/ATN technical tests with Macau	IN-HOUSE (Aero-Info Technologies Co., Ltd)

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
	commissioning after POT completion in 2021 Connection tests with Nepal is TBD. AMHS testing with Japan was completed in March 2021.It will put into operation after TMC is signed. AMHS testing with Russia in 2021.		AIDC between Shanghai/Guangzhou and Tapei China put in to operational use since 2013. AIDC between Dalian and Incheon put into operational use since October 2016. AIDC between Guangzhou and Hong Kong China put into operational use since May 2018. OLDI between Shenyang and Khabarovsk put into operational use since Oct.2019. AIDC between Kunming and Vientiane put into pre-operational trails since January 2021. AIDC technical test between Beijing ACC	completed in 2009. Plan for ATN/AMHS implementation with Macao China in 2019. ATN/AMHS circuit with ROK has been put into operation since June 2011. ATN/AMHS tests with India has been put into operation since 2016. ATN and AMHS IOT with Mongolia is completed in May 2018. Plan for commissioning after POT completion in 2021 Connection tests with Nepal is TBD. with the Beijing - Japan AMHS link was put into operation in in 2020.	

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			and Ulaanbaatar ACC conducted since 2018. Kunming/Yangon under test and progress since May 2017 AIDC technical test between Sanya ACC and Hanoi ACC conducted since 2019.	AMHS testing with Russia in 2021	
HONG KONG, CHINA	**Manila / Philippines** CRV/AMHS circuit was put into operation in May 2019. **Beijing / China** CRV/AMHS circuit was put into operation in April 2021 Macao / China ATN/AMHS circuit was put into operation in December 2009. Wait for Macao to join CRV. **Bangkok / Thailand** ATN/AMHS circuit was put into operation use in 2014. Wait for Thailand to join CRV. **Fukuoka / Japan**	COMSOFT	AFTN-based AIDC with Sanya put into operational use in Feb 2007. AIDC with Taibei put into operational use in Nov 2012. AIDC with Guangzhou put into operational use in May 2018. AIDC with Manila put in operational use in May 2019.	Raytheon ATM system Support AIDC ICD Version 3 commissioned in November 2016.	Already support exchange of IWXXM messages based on FTBP. Support of IHE is planned since November 2020.

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
	CRV/AMHS circuit was put into operation in September 2020. **HoChiMinh / Vietnam** Currently on AFTN. Simple AMHS IOT was conducted in Dec 2019. Wait for Vietnam to join CRV. **Taibei** CRV/AMHS circuit was put into operation in June 2020.				
MACAO, CHINA	ATN/AMHS interoperability test with Beijing commenced in March 2009. ATN/AMHS circuit with Hong Kong put into operational use in end Dec 2009. Upgrade of ATN/AMHS to support IPS and IWXXM planned with tentative target date of Q3 2021.	COMSOFT	[Not applicable for using AIDC, looking into the possible application between TWR and ACC/APP]		

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
COOK ISLANDS					
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	The ATN BIS Router and AMHS planned for in 2011.		With neighboring ACCs to be implemented		
FIJI ISLANDS	ATN BBIS IPS router and AMHS implemented over CRV for connection to USA in April, 2019 with Australia planned for June, 2019. . For connections with sub-regional centers: For New Caledonia using AMHS since 2017; For connection with Kiribati using UA/AMHS implemented in 2015.	COMSOFT	AFTN based AIDC implemented between Nadi/ Brisbane, Auckland and Oakland.	- Support and implemented AIDC messaging: ABI, EST, CPL, CDN, ACP, TOC, AOC with all three centers - AIDC ICD version 2.0 implemented with Auckland and Oakland. - AIDC ICD Version 1.0 implemented with Brisbane	B2B connection between Nadi AMHS and Brisbane AMHS planned for Q3, 2021 as backup for CRV.

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
FRANCE *(French Polynesia Tahiti)*	Planned for implementation of AMHS in 2022 (T1). Using IP with New Zealand since 2017.		Implementation of AIDC (based on Version 3) with adjacent centers (Oakland and Auckland) since 2009.	THALES EUROCAT for AIDC	Alternate routing for backup between Tahiti and Christchurch via Tahiti/New Caledonia IP link
INDIA	Dual stack ATN/IP router and AMHS implemented at Mumbai in 2011. Operational AMHS connections with Bangkok, Dhaka, Singapore, Kathmandu, Karachi implemented. With Beijing implemented in 2016; With Colombo implemented in May2017; With Bhutan implemented in July 2017; (IOT/POT) between Mumbai – Muscat is scheduled with mutual agreement between India & Oman between 0600-0900 UTC from 21.06.2021 onwards. IOT with Nairobi in September 2020 failed due to compatibility issues noticed at Nairobi, which has Thales system, Messages from Mumbai did not go out of the transmit queue. System software level compatibility problems need to be resolved by Nairobi taking the OEMs on board.	COMSOFT	Initially-15-May-2017, AIDC implemented between Chennai and Kuala Lumpur with ABI and EST messages. India is currently using APAC AIDC ICD version 3. **A. Implementation within India:** Testing & trials: I. At Delhi with: Ahmedabad, Varanasi, Nagpur II. At Chennai with: Mumbai, Kolkata, Trivandrum, Mangalore, Trichy, Hyderabad, Bengaluru	Mumbai: Raytheon Auto track-III Chennai- Raytheon Auto track-III + Delhi: INDRA Aircon Kolkata: INDRA Aircon Bengaluru: SELEX Hyderabad: SELEX Ahmedabad: INDRA Aircon 2100 Nagpur: INDRA Aircon 2100 Varanasi: INDRA Aircon 2100 Guwahati: INDRA Aircon 2100 Trivandurm: INDRA Aircon 2100 Mangalore: INDRA Aircon 2100	INDIA

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			III. At Kolkata with: Chennai, Nagpur, Varanasi, Guwahati IV. At Mumbai with: Chennai, Ahmedabad, Nagpur Operational: Chennai- Mumbai; Delhi-Nagpur; Delhi-Ahmedabad, Functional: Delhi-Varanasi, LOA to be signed shortly. **B: Implementation with Neighboring States:** The status on AIDC implementation with following ATSUs of neighboring FIRs is as under: I. **Chennai & Kuala Lumpur** (Malaysia) – ABI, EST successful. CDN is done with voice	Trichy: INDRA Aircon 2100 All these systems follow APAC AIDC ICD Ver 3.0 of 2007	

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			confirmation. TOC/AOC is implemented w.e.f. 1st Jan 2021. LOA signed on 26th May 2021 effective from 1st June 2021. II. **Chennai & Male (Maldives)** –Trails have been successful. LOA in process. Safety Assessment conducted on 9th April 2021 for implementation III. **Chennai & Colombo** (Sri Lanka) - Colombo in process to address the syntax errors in ABI. Thereafter, trails will be conducted. LOA in progress. IV. **Chennai & Yangon** (Myanmar) – Trials commenced in January 2018. Issues of incorrect reference number in Counter CDN from Yangon persists. Yangon has intimated that, they will inform Chennai for conducting the Test, as soon as they		

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			are ready V. **Mumbai & Male (Maldives)** – Safety Assessment conducted on 9th April 2021 for implementation. Final LOA to be signed shortly. **VI. Mumbai & Mogadishu** - Successful trials conducted in March 2021. Minor adaptation system issues with Mogadishu automation system identified. Resolution awaited from Mogadishu. **VII Mumbai & Muscat** - Successful trials conducted in March 2021. System issues with Muscat's automation system identified. Resolution awaited from Muscat ATCAS vendor **VIII. Ahmedabad & Karachi (Pakistan) –** Automatic message		

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			exchange (e.g. ABI, EST) happens for most of the East bound flights between Karachi & Ahmedabad. Karachi Automation system not generating auto ACP message in response of EST messages. Pakistan is currently doing technical trials between Lahore and Delhi ACCs in first phase. Pakistan will take up test trials between Karachi and Mumbai & Karachi and Ahmedabad in second and third phase respectively. **IX. Delhi & Lahore (Pakistan)-** Under test trails. During the first test trials during the March'2021 it was identified that Lahore Automation system not generating automatic ACP messages. Also Delhi system is rejecting the AIDC messages		

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			because of the extra space in messages from Lahore. **X. Kolkata & Yangon (Myanmar)** – Initial trials were conducted in Q4 of 2018 in which some ABI and message reference errors were encountered. Vendor at both ends modified the software and issues were mitigated. In the next trials in Q1 of 2020 most message exchanges were successful. LOA to be negotiated and signed. **C. Under Planning** I. To conduct operational trials between Kolkata-Dhaka, Mumbai-Karachi (Pakistan), Chennai-Jakarta and Varanasi-Kathmandu subject to readiness from the concerned states. D. Seychelles and Sana ATSU do not have a		

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			compatible ATM Automation system in place for AIDC coordination with Mumbai ATSU E. Delhi – Karachi: AIDC between Delhi & Karachi will not be required due to re-structuring of FIRs		
INDONESIA	ATN BIS Router and AMHS with Singapore implemented since February 2018; AMHS Trial (IOT) with Brisbane pending for CRV implementation.	IDS	AIDC implementation in Ujung Pandang ACC conducted as follows: 1) Ujung Pandang ACC – Brisbane ACC: Implemented since July 2017. 2) Ujung Pandang ACC – Manila ACC: Implemented since 4Q 2020; 3) Ujung Pandang ACC – Kota Kinabalu ACC: - Successfully tested and target date for operational trial in 4Q2020;	Thales TopSky in Makassar able to support ICD version 3 since December 2015.	For CRV, target of contract in 3Q2021 and implementation in 4Q2021.

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			- Target date for implementation 4Q2021. 4) Ujung Pandang ACC – Oakland ARTCC: - Successfully tested and target date for implementation in 4Q2021. 5) Ujung Pandang ACC – Port Moresby ACC: - Successfully tested on 7 July 2020; - Target date for operational trial in 3Q2020. - Target date for implementation 2Q2021. 6) Ujung Pandang ACC – Jakarta ACC; - Target date for operational trial in 3Q2021. - Target date for implementation 4Q2021; AIDC implementation in Jakarta ACC will be carried out with the following priorities: 1) Jakarta – Ujung Pandang (4Q2021);		

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			2) Jakarta – Chennai (2Q2022); 3) Jakarta – Melbourne (3Q2022); 4) Jakarta – Colombo (4Q2022); 5) Jakarta – Singapore (2Q2023); 6) Jakarta - Kuala Lumpur (3Q2023); 7) Jakarta – Kota Kinabalu (4Q2023).		Priority is in accordance with Hot Spot identified by RASMAG/23
JAPAN	ATN BBIS router and AMHS installed at **USA** in 2000. Connection tests with USA in 2000 - 2004 and put into operational use in 2005. ATN BBIS router (to apply to Dual Stack) and AMHS (to upgrade in 2015. The connection test with each country which is not currently connecting is started after update. Hong-Kong AMHS/FTBP over CRV was put into operation in September 2020.	NEC	AIDC implemented between Fukuoka ATMC and Oakland ARTCC in 1998. AIDC implemented between Fukuoka ATMC and Anchorage ARTCC in 2005. AIDC implemented between Tokyo ACC/Fukuoka ACC and Incheon ACC in 2010.		Japan and USA conducting testing AIDC over AMHS and cutover date is 5 May 2017.

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
	Singapore AMHS/FTBP over CRV was put into operation in December 2020. **Beijing/China** AMHS/FTBP over CRV test was all completed in March 2021. It will put into operation after TMC is signed **Taipei** Plan for AMHS/FTBP over CRV IOT in July 2021 POT in 1Q 2022 Incheon/Korea Plan for AMHS/FTBP over CRV IOT in 4Q 2021		Implemented between Fukuoka and Incheon since June 2009. AIDC implemented between Fukuoka ACC/Naha ACC and Taibei ACC implemented. AIDC between Fukuoka ACC and Shanghai ACC under negotiation.		
KIRIBATI	Connection with Nadi using UA/AMHS implemented in 2015.				
LAO PDR	- ATN BIS Router and AMHS Implemented with Bangkok and Phnom Penh. - AFTN used with Hanoi and Kunming. - For Yangon we have no direct link the connection is used via Bangkok.	THALES	- Vientiane ACC AIDC used for coordination between Bangkok and Phnom Penh ACCs since 2020. - Operation trials are on going with Kunming,	THALES which is able to support ICD Version 2.	

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			Hanoi and Yangon ACCs.		
MALAYSIA	ATN BIS Router completed 2007. AMHS for Malaysia – Singapore implemented in March 2020. AMHS for Malaysia – Thailand implemented in Dec 2019.	FREQUENTIS	**Kuala Lumpur ACC and Bangkok ACC** AIDC technical test between Kuala Lumpur ACC and Bangkok ACC conducted since November 2016 (ABI/EST/ACP/LAM/LRM/CDN/REJ/TOC/AOC). The operational trial commenced in August 2019 (EST/ACP/LAM/LRM). The operational implementation commenced on 14th March 2020 (EST/ACP/LAM/LRM). **Kuala Lumpur ACC and Chennai OCC** AIDC technical test between Kuala Lumpur	SELEX which is able to support ICD Version 3.	

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			ACC and Chennai OCC conducted since 31st July 2013. The operational trial implemented in phases from September 2016 (ABI/EST/MAC/LAM/LRM/ACP). Review on the CDN message implementation conducted in August 2017. SOP signed 26 April, 2017. The MOU signed on March 2020. The operational implementation commenced on 1st April 2020 (ABI/EST/ ACP/LAM/LRM/CDN/REJ/MAC). The operational trial for TOC/AOC started on 1st July until 1st August 2020.		

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			The operational implementation for TOC/AOC commenced on 1st January 2021. The updated LOA signed on 26th May 2021. **Kuala Lumpur ACC and Singapore ACC** AIDC technical test between Kuala Lumpur ACC and Singapore ACC conducted since April 2015 (ABI/EST/ ACP/LAM/LRM/CDN/REJ). The operational trial started on September 2018 (EST/ACP/LAM/ LRM). The operational implementation commenced on 1st November 2019 (EST/ ACP/LAM/LRM).		

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			Kuala Lumpur ACC and Ho Chi Minh ACC AIDC technical test between Kuala Lumpur ACC and Ho Chi Minh ACC To Be Discussed (TBD). **Kuala Lumpur ACC and Jakarta ACC** AIDC technical test between Kuala Lumpur ACC and Jakarta ACC TBD. **Kota Kinabalu ACC and Manila ACC** AIDC Technical Test 1 between Kota Kinabalu ACC and Manila ACC started on 21 – 22nd May 2019 (ABI / EST / ACP / LAM / LRM / TOC / AOC / MAC). Technical Test 2 was conducted on 21 – 22nd October 2019 (ABI / EST / ACP / LAM / LRM / TOC / AOC / MAC).		

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			Upcoming AIDC Technical Test between Kota Kinabalu ACC and Manila ACC to be conducted in Q32021 **Kota Kinabalu ACC and Ujung Pandang ACC** AIDC Technical Test 1 between Kota Kinabalu ACC and Ujung Pandang ACC started on 7 – 8th August 2019 (ABI / EST / ACP / CDN / LAM / LRM / REJ / MAC). Technical Test 2 was conducted on 23 – 24th October 2019 (ABI / EST / ACP / LAM / LRM / TOC / AOC / MAC). Technical Test 3 was conducted on 11th March 2020 (EST / ACP / LAM / LRM). Upcoming AIDC Technical Test between Kota Kinabalu ACC and		

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			Ujung Pandang ACC to be conducted in Q32021 **<u>Kota Kinabalu ACC and Jakarta ACC</u>** AIDC Technical Test between Kota Kinabalu ACC with Jakarta ACC is to be discussed. **<u>Kota Kinabalu ACC and Singapore ACC</u>** AIDC Technical Test between Kota Kinabalu ACC and Singapore ACC started on 22nd September 2015 (ABI / EST / ACP / CDN / LAM / LRM / REJ / MAC). AIDC Technical Test 1 was conducted on 18 – 19th November 2019 (ABI / EST / ACP / CDN / LAM / LRM / REJ / MAC). Technical Test 2 was conducted on 16th		

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			January 2020 (EST / ACP / LAM / LRM). AIDC Operational Trial started since 16th November 2020 and to be extended until 30th June 2021. Agreement on Operational Implementation has been materialized on 3rd June 2021. Operational Implementation is agreed to be conducted on 1st July 2021 (EST / ACP / LAM / LRM) **Kuching ACC and Singapore ACC** AIDC Technical Test (First and Second) between Kuching ACC and Singapore ACC was conducted both on 11 November 2015 and 24-25 November 2015 (ABI, EST, LAM, CDN, ACP, REJ, and LRM). However, it was discontinued until November 2019.		

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			The AIDC Technical Test (Third and Fourth) was conducted both on 20-21 November 2019 and 14 January 2020 (ABI, EST, LAM, CDN, ACP, REJ, and LRM) AIDC Operational Trial was started on 20 July until 18 October 2020. Then it was continuing until 31 January 2021. Agreement on Operational Implementation has been materialized on 12 January 2021 via videoconference. The operational implementation was on 1 February 2021. The AIDC messages included for exchange are EST, LAM, LRM and ACP.		

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			<u>Kuching ACC and Jakarta ACC</u> AIDC between Kuching ACC and Jakarta ACC TBD.		
MALDIVES	In the process of replacing the existing operational AFTN system by AMHS. It is expected to complete the installation before the end of 2019. With the new AMHS, it is planned to establish a new IP connection between an additional neighboring ATSU as the current link is an X.25 connection between Colombo. Also will look for the possibility of implementing the CRV network to use with AMHS and AIDC during the same phase.		Connection established with all the adjacent ATSUs. Interoperability tests successfully completed in 2017. LOA signed for operational trials between Mumbai, Chennai, and Trivandrum. Operational trials were also successful with these ATSUs, while several issues were resolved from both ends. Ready to sign LOA with Melbourne and is expected during the 2nd quarter of 2019. Trials with Colombo had few issues, which	SELEX which is able to support ICD Version 3.	

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			Colombo is working to resolve it on their end with the automation system supplier. Connections between all 5 ATSUs are turned ON in the ATS automation system to conduct pre-notified operational trials.		
MARSHALL ISLANDS					
MICRONESIA (EDERATED STATES OF)					
Chuuk					
Kosrae					
Pohnpei					
Yap					
MONGOLIA	AMHS/AFTN gateway implemented 2012. ATNBIS router implemented in 2014.	COMSOFT	ATM automation system supports both AIDC and OLDI.	INDRA Aircon 2100 supporting AIDC ICD Version 2.	

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
	ATN and AMHS IOT with China was completed in May 2018. Plan for commissioning after POT completion in 2019.		Coordinating with Russia on OLDI connection in target date 2016. Coordinating with China on AIDC connection between Beijing/Ulaanbaatar technical trials in progress. Planned date of testing in 2019.		
MYANMAR	AMHS including AFTN/AMHS gateway implemented in Nov 2011. Connection with Thailand implemented in 4Q2016. Planned for AMHS connection with Beijing. Target date TBC.	THALES	AIDC connection pre-operation test with Thailand conducted in 4Q2017 and Target date of implementation 4Q2020; AIDC testing with Chennai, Kolkata and Vientiane conducted in 2020. Myanmar improved ATS Surveillance Coverage at coordination point with China and will start AIDC test again with Kunming ACC in 2020.	THALES Automation system (Topsky ATC) supports APAC AIDC ICD Ver. 2.	AMHS including AFTN/AMHS gateway implemented in Nov 2011. Connection with Thailand implemented in 4Q2016. Planned for AMHS connection with Beijing. Target date TBC.
NAURU					

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
NEPAL	AFTN/AMHS Gateway implemented in 2012. AMHS implemented with India since June 2014. AFTN connection with China. Plan to test AMHS connection soon.	COMSOFT	Nepal uses custom built ATM system from NEC. Some issues regarding ICD need to be resolved in order to proceed ahead with AIDC testing with India and China.		
NEW CALEDONIA	New router and AMHS commissioned December 2016	COMSOFT			
NEW ZEALAND	AMHS connection with the USA over CRV was implemented in April 2019. AMHS connection to Australia over CRV is scheduled for June 2019.	COMSOFT	AIDC implemented between New Zealand, Australia, Fiji, Tahiti, Chile and USA.	Supported the Basic 5 message set. ATM systems are LEIDOS and ADACEL	
PAKISTAN	ATN/AMHS connections with Mumbai and Kuwait since 2015 and 2018 respectively. AMHS connection with Beijing, Kabul, Tehran and Muscat will be provided after up gradation of existing AMHS at Karachi which is already in progress.	Existing COMSOFT After up gradation ISD	Implemented between Karachi and Lahore ACCs. Lahore/Delhi ACC AIDC trials are being carried out which started in March 2021 (Phase-1), Karachi/Mumbai &	ATM system from Indra AIRCON 2100 version-2 in Lahore and Karachi ACC, Si-ATM version-3 in Islamabad ACC	Existing ATM system are likely to be upgraded in Lahore and Karachi ACC.

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			Karachi/Ahmedabad are planned in Phase-2. After modification of Lahore/Karachi FIRs boundaries, trials between Karachi/Delhi ACC are not required.		
PAPUA NEW GUINEA	Currently AFTN over IP. AMHS implementation is planned for after successful implementation of CRV this year. AMHS implementation planned for 2020.	COMSOFT is the supplier of PNG AFTN/AMHS system	AIDC using AFTN operational with Australia, testing/trial with Oakland (USA) started late last year and in progress. AIDC implementation with Indonesia to happen after CRV implementation this year.	New ATM System from Thales (TopSky-ATC) implemented and operational now supports AIDC V3.	
PHILIPPINES	ATN/AMHS Boundary Intermediate System was installed at the new Manila CNS/ATM Center; • Site Acceptance, Oct. 2015 • Commissioned & operational, March 2018	**Frequentis - Comsoft**	AIDC implementation status/update over AMHS with the following FIR's;	THALES which is able to support ICD Version 2.	The New ATN/AMHS of Manila CNS/ATM center has been in domestic operations since March 2018. And with the

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
	AMHS implementation over CRV with; • **HONG KONG** - May 2019 • **TAIPEI** - Sept. 2019 • **SINGAPORE** - Dec. 2020 • **OAKLAND** - April 2021		**HONG KONG** – Implemented, May 2019 **SINGAPORE** – Implemented, December 2020 **TAIPEI** – Implemented, December 2019 **UJUNG PANDANG** – Implemented, December 2020 via **BBIS** **HO CHI MINH** - Awaiting OPS trial. Technical Test conducted on June 15-16, 2021. **KOTA KINABALU** – Next progress AIDC test to be scheduled, target 3Q2021		implementation of CRV, AMHS connection has been implemented with the following adjacent FIR's; **-HONG KONG** **-TAIPEI** **-SINGAPORE** **-OAKLAND**

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
			OAKLAND – 1st test to be scheduled, target 3Q2021		
REPUBLIC OF KOREA	Plan to upgrade AMHS support IWXXM from 2023 over CRV Frequentice 1) AMHS/CRV IOT with China and Japan in 4Q of 2021 2) AMHS/CRV POT with China and Japan in 4Q 2022 3) Cutover to AMHS/CRV with Chi na and Japan in Q1 2023 after POT 4) Implementation of AMHS/CRV with Japan Q1 2023	FREQUENTIS	AIDC implemented between ACC and Fukuoka ATMC in 2010 AIDC between Incheon and Dalian implemented in Nov. 2016.	Rockheed Martin System	
SINGAPORE	AMHS implemented with: 1) AMHS circuit with India put into operational use in Mar 2011. 2) AMHS circuit with UK put into operational use in Mar 2012. 3) AMHS circuit with Thailand put into operational use in Dec 2014. 4) AMHS circuit with Australia put into operational use in Oct 2016. 5) AMHS circuit with Indonesia put into operational use in Feb 2018.	FREQUENTIS COMSOFT	1) Operational with Ho Chi Minh implemented Jul 2014. 2) Kuala Lumpur operational trial started since Sep 2018 and is implemented Nov 2019.	THALES supports ICD Version 3 since December 2018	

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
	6) AMHS circuit with Malaysia put into operational in Mar 2020. 7) AMHS circuit with Japan put into operational in Dec 2020. 8) AMHS circuit with Philippines put into operational in Dec 2020. Inter-Operability Test (IOT) with Vietnam started in 2019. IOT with Sri Lanka, Bahrain and Brunei to be confirmed.		3) Implemented with Kuching ATCC in Feb 2021. 4) Operational trial ongoing with Kota Kinabalu ATCC since Nov 2020 and implementation date on 1st July 2021. 5) Manila operational trial started in Feb 2019. Implementation Nov 2019. 6) Technical trials with Jakarta ACC will be initiated once the Jakarta ACC ATMS renewal is completed.		
SRI LANKA	ATN BIS Router Planned for 2013. IP based AMHS implemented by Oct. 2017. - Mumbai tested May 2017 operational planned for Q4 2017; - Singapore testing in Q4 2017 operational for 2018;	IDS	Trials with Male planned for in 3Q2019. Trial with Chennai on-going. Plan for implementation in 2018	INTELCAN which is able to support ICD Version 3.	

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
	- Male testing and operational date TBD.		and with Melbourne plan for 1Q2018.		
THAILAND	BBIS/BIS Routers already implemented. AMHS has been implemented since July 2011. Connection with Bangladesh, Bhutan, Cambodia, China, India, Lao PDR, Myanmar, Singapore, Hong Kong China, and Malaysia implemented. Bangkok -Viet Nam Circuit · IOT Test: Done · POT Test: Planned for end of 3Q2021 Bangkok - Rome Circuit · IOT Test: Planned for 3Q2021 Connection with SITA (SITA AMHS Gateway inter-connections) implemented. · POT Test: Planned for end of 4Q2021	AEROTHAI's AMHS System	The implementation with · Malaysia has done since 14th March 2020 · Lao PDR has done since 14th July 2020 · Cambodia has done on 22nd February 2021 In addition, it is planned to implement AIDC with Myanmar.	THALES which supports AIDC feature, APAC AIDC ICD V.3.	

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
TONGA	AMHS planned for 2008. The provider is linked to the New Zealand AFTN				CPDLC and ADS-C is not considered for lower airspace
UNITED STATES	- Australia - Fiji - New Zealand - Japan - Philippines - Papua New Guinea (2021) - Indonesia (2022) - Russia (Planned)	IN-HOUSE	- Fiji, Japan, New Zealand - Tahiti (via New Zealand), - Papua New Guinea via Australia (Direct planned for 2021) - Philippines (2021) - Indonesia via Australia (Direct planned for 2022) - Russian Federation (pending joining CRV)	IN-HOUSE which is able to support APAC and NAT ICDs currently Version 2.	
VANUATU					

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
VIET NAM	AMHS (basic) implemented from 4Q/2018. Plan AMHS extended from Q4 2022 IOT with Singapore from 10/2019 to 8/2020 IOT with Hong Kong 12/2019 IOT with Thailand 6/2020, POT 8/2020.	IN-HOUSE	Operational between Ho Chi Minh and Singapore since July 2014. Operational trial for additional messages sets on-goning. Technical testing between Ho Chi Minh with Philippines on going Technical testing with Cambodia already done; Technical testing between Hanoi and Vientiane, Lao. PDR. already done with Malaysia TBC For operation trial TBC. Operation trial between Ho Chi Minh and Hanoi ongoing.	Support ICD Version 1.0 with THALES at Ho Chi Minh ATM system. Support ICD Version 3.0 with Selex at Hanoi ATM System.	

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AMHS Vendors Selected	AIDC	ATM System selected to support AIDC and Associated ICD (Implementation Status of the Basic 5 message set supported)	Remarks
Wallis and Futuna (FRANCE)	AMHS implementation planned for end of 2017			COMSOFT	

– – – – – – – – – – – – –

CRV IMPLEMENTATION TABLE

State/ Administration	Intended date for CRV cut-over	Applications targeted	Migration scheme	Prerequisites/ dependencies
Australia	Contract in May2018 and service readiness in 3Q 2018	AFTN, ADS-B, AMHS, Voice With: **Australia** February,2019(AMHS/AIDC), March,2019(Voice) **Fiji** March,2019 (AMHS June 2019/AIDC, Voice completed April) **New Zealand,** February, 2019 (AMHS June 2019, AFTN May 2019/AIDC), March, 2019 (Voice April 2019 completed) **Indonesia** 4Q2019 (TBC) (AMHS/AIDC, Voice, ADS-B); **PNG** 4Q2019(TBC), (AMHS/AIDC, Voice) **Singapore** 2Q2019 TBC (AMHS/AIDC, Voice); **South Africa TBC** 3Q2019 TBC (AMHS/AIDC, Voice); **Japan** would be end of 2019.	staged approach	Termination of current COM contract
Bhutan	Contract signed on Oct 2019. CRV installed successfully in Dec 2021. CRV P2P Test between Paro-Mumbai & Paro-Bangkok to be done once India and Thailand join CRV	AMHS first and Voice & ADS-B will follow up after AMHS.		Dependent on India and Thailand for utilization of CRV network.

State/ Administration	Intended date for CRV cut-over	Applications targeted	Migration scheme	Prerequisites/ dependencies
Cambodia	As early as convenient, dependent on neighboring countries			Internal decision making
China	Contract signed on 21 June 2020.	Applications targeted: Data(AMHS) With: Hong Kong 3Q2020; Japan 4Q2020; Thailand TBD; India TBD. Republic of Korea 4Q2020 ATFM test with Japan and ROK at Sep 2020 over CRV	staged approach	
DemocraticPeople's Republic of Korea	Contract in 3Q2018 and service readiness in 4Q2018	AFTN and VoIP		
Hong Kong, China	Contract signed on 6 April 2018. Connection was installed successfully in June 2018.	**With Manila** CRV-Voice put into operation in August 2018 CRV-AMHS put into operation in May 2019 **With Taibei** CRV-AMHS put into operation in May 2020 **With Fukuoka** CRV-AMHS put into operation in September 2020 **With Beijing** CRV - AMHS POT in March and operation in April 2021	staged approach	Need to coordinate with relevant CAAs/ANSPs in joining CRV in a harmonized manner, etc.

State/ Administration	Intended date for CRV cut-over	Applications targeted	Migration scheme	Prerequisites/ dependencies
		Bangkok and Hochiminh Subject to their readiness		
Macao, China	Service readiness in Q4 2021	To be confirmed	Staged approach	Migration from X.25 to IPS
Fiji	Contract in May 2018 and service readiness in 3Q 2018.	Data (AMHS) and VoIP With: Australia ATS voice April 2019 completed, AMHS completed in July 2019, NZ ATS voice completed April 2019 and USA ATS voice completed in March 2019 and AMHS completed in April 2019.	Staged approach	CBA, safety case
France (New Caledonia and French Polynesia)	2023 is target for DNSA to sign contract subject to internal security assessment (done).	ATS Voice, AMHS with Fiji & AIDC, AMHS with USA, AIDC/AMHS with NZ.		CBA, cost must be affordable *Wallis and Futuna: no dedicated connection to CRV*
India	Contract for CRV implementation with M/s PCCW in India will be signed in 3Q of 2021 and CRV Service will be ready in 4Q of 2021.	AFTN/AMHS,ADS-B,AIDC,ATS Voice	staged approach	Internal Administrative approvals & safety case

State/ Administration	Intended date for CRV cut-over	Applications targeted	Migration scheme	Prerequisites/ dependencies
Indonesia	Contract in 3Q2021 and service readiness in 4Q2021.	AFTN, AMHS, ADS-B and voice		CBA completed
Japan	Contract signed in Nov.2017 and service readiness in1Q 2018for Fukuoka	Data first with: Hong Kong completed 3Q2020 USA completed 1Q2019 Singapore completed 4Q2020 China completed 1Q2021 Voice Plan with: USA 2Q2021 Daegu and Incheon (R.O.K) started in1Q2021	staged approach	
Malaysia	Contract to be signed 4Q 2020 and service readiness in 1Q 2021	AFTN, AMHS, ADS-B and ATS voice	staged approach	New ATC centre operational in 2021 Contract issue with the new ATC main contractor. COM Project is part of the main contract.
Myanmar	Contract will be signed 4Q2020.	AFTN/AMHS, AIDC, ADS-B and voice	staged approach	One of counterparts join in
Nepal	Nepal intends to join CRV on staged approach with AMHS data connectivity as first priority and intends to sign the contract with PCCW within 2020.			

State/ Administration	Intended date for CRV cut-over	Applications targeted	Migration scheme	Prerequisites/ dependencies
New Zealand	Contract signed in July 2018 and service implemented December 2018	Australia Voice Completed March 2019 and AMHS June 2019 Completed USA Voice Completed March 2019 and AMHS March 2019 Completed Fiji Voice Completed April 2019 French Polynesia AMHS and Voice Chile AMHS (SAM regional network REDDIG)	Awaiting French Polynesia joining. Awaiting outcome of inter-regional network connectivity discussion. For Chile	CBA attractive if all counterparts join in.
Philippines	Contract signed in March 2018 and service readiness in 2Q2018	Completed: with **HONG KONG** AIDC - 2Q2019; AMHS - 2Q2019; Voice - 3Q2018. with **TAIPEI** AIDC 4Q2019; AMHS 3Q2019; Voice 1Q 2019. with **SINGAPORE** AIDC – 4Q2019; AMHS –4Q2020; Voice – 1Q2020. with **USA** AMHS – 2Q2021; Voice – 4Q2019;	staged approach	Success transition to the New ATM centre in 4Q2018

State/ Administration	Intended date for CRV cut-over	Applications targeted	Migration scheme	Prerequisites/ dependencies
		with **INDONESIA** AIDC – 4Q2020.		
Republic of Korea	Contract in 3Q 2019 and service readiness in 4Q 2019	Completed: with Japan Voice –March 2021 Planned; With Japan Voice additional lines-from 2022 to 2023 AMHS-4Q 2022 With China Data(AMHS)-4Q 2022	staged approach	
Singapore	Contract signed in May 2019 and service readiness in Dec 2019	Data (AMHS over IP) with: Australia Dec 2020 (completed); Japan Nov 2020 (completed); and Philippines Dec 2020 (completed);and Malaysia Q3 2021. Voice with: Philippines Mar 2020 (completed).	Staged approach	**Singapore**
Sri Lanka	As soon as CRV is available	AMHS connectivity with Mumbai, Singapore and Male. Direct Speech facilities with Chennai, Trivendrum, Mumbai, Male, Jakarta, Melbourne, Singapore	Phased approach with the implementation of CRV	CBA

State/ Administration	Intended date for CRV cut-over	Applications targeted	Migration scheme	Prerequisites/ dependencies
Thailand	Contract in 3Q2021 and service readiness in 1Q2022	Data first Then voice, subject to safety case: China 1Q2022 Hong Kong 1Q2022; Singapore 1Q2022; India 2022.	Staged approach	
United States	Contract in January 2018	1) AMHS with Australia Fiji Japan Philippines New Zealand Papua New Guinea (2021) Indonesia (2022) 2) AIDC with Fiji Japan New Zealand Papua New Guinea (Direct planned 2021) Tahiti (via New Zealand) Indonesia (Direct planned 2022) Russia (when join CRV) 3) VoIP with Fiji Japan Philippines New Zealand Papua New Guinea (direct planned 2021) Indonesia (2022) Russia (when join CRV)	Staged approach	

State/ Administration	Intended date for CRV cut-over	Applications targeted	Migration scheme	Prerequisites/ dependencies
Viet Nam	To be confirmed later (After discussed with PCCW Global)			

_ _ _ _ _ _ _ _ _ _ _ _ _

AMHS Reediness Report for Supporting IWXXM Traffic

No.	States/Administration	Name of State (Administration)/name of BBIS/BIS location where AMHS is installed:	AFTN/AMHS transition date/schedule	Readiness Status of AMHS for supporting File Transfer Body Part (FTBP), the Interpersonal Message (IPM) Heading Extension (IHE) to support for exchanging IWXXM reports of a maximum size of 4MB and FTBP of maximum 2MB:	Capacity status of the operational AFS links to support the exchange of the required meteorological information in both IWXXM GML form and TAC form:
1	**Australia**	Airservices - Brisbane	Completed. AMHS exchange in place with USA, Fiji, New Zealand, Singapore and South Africa. AFTN still in place with Indonesia and PNG, migration to AMHS based on pending readiness both partners Several Pacific island nations connecting via FCO CADAS ATS Terminal, currently over AFTN. Airservices plans to migrate to AMHS P3 CADAS but will need to provide user training. All domestic users and data originators still on AFTN, no desire by external partners to migrate to AMHS, awaiting SWIM instead.	Full compliance and support since Nov 202	Airservices has contracted a 2.0Mbps bandwidth using CRV Package C+ for Voice & AMHS services. Bandwidth on the leased line with South Africa / Johannesburg is also 2Mbps.
2	**China**	Beijing	AMHS deployed in 2008 which was upgraded to support ATN/IPS in 2013 and upgraded to support exchanging IWXXM in 2020.	support	CRV bandwidth is 3M. Minimally 64kbps for each AMHS connection..
3	**Hong Kong China**	Hong Kong China	December 2009	Support	2MB for CRV and 64kbps for IPLCs
4	**Fiji**	Fiji Airport/Air Traffic Management Centre	Completed. In June 2019, Fiji completed the transition of ATN BBIS to IPS for the AMHS service from Nadi to Salt Lake, USA & Brisbane, Australia over the CRV network. The local end User still operates on AFTN terminal and is converted to AMHS over the AFTN/AMHS Gateway.	The Comsoft AMHS System supports File Transfer Body Part (FTBP). Our system has the capability of exchanging IWXXM reports of a maximum size of 4MB and FTBP of maximum.	Nadi has contracted a 1.0Mbps bandwidth using CRV Package C+ for Voice & AMHS services. The total bandwidth usage for voice and data is 768K from the total 1.0Mbps. The bandwidth for AMHS is 64Kbps each to Brisbane & Salt Lake Center. It is noted in the ACSICG/7 WP04 presented by USA that 64Kbps is the minimum recommended required bandwidth for AMHS to exchange FTBP for IWXXM.
5	**India**	AAI/Mumbai Airport	AMHS is in operation since 2011. India is in the process of tendering for replacement of existing AMHS system . The Tender action stands delayed due to COVID pandemic.	Presently India is not able to exchange the required 4 MB messages and 2 MB FTBP attachments.	Indian Meteorological Department is in the process of upgradation of HPC & DB to support IWXXM.
6	**Japan**	Japan/Fukuoka	ATN BBIS router and AMHS installed at 2000.	Already support exchange of IWXXM messages based on FTBP in August 2015.	AFS links over CRV is a Package A, Bandwidth 2M.

No.	States/Administration	Name of State (Administration)/name of BBIS/BIS location where AMHS is installed:	AFTN/AMHS transition date/schedule	Readiness Status of AMHS for supporting File Transfer Body Part (FTBP), the Interpersonal Message (IPM) Heading Extension (IHE) to support for exchanging IWXXM reports of a maximum size of 4MB and FTBP of maximum 2MB:	Capacity status of the operational AFS links to support the exchange of the required meteorological information in both IWXXM GML form and TAC form:
			Connection tests with USA 2000 - 2004 and put into operational use in 2005 and over CRV in February 2019. Put into AMHS operation with Hong- Kong and Singapore in 2021. AMHS implementation with China in 2021 , Korea and Taipei in 2022.	It is possible to send , receive and transfer up to 2GB for the contents such as FTBP,IPM and IHE in AMHS,and the size of IWXXM suported system by Japan Meteorological Agency is 2MB	
7	**Macao China**	Macao China	Q4/2009	Q3/2021	To be determined
8	**Philippines**	Philippines/ATMC Manila	Completed March 2018	Can support IHE and FTBP maximum 1MB (tested with Taipei on 13-May-20)	1MB Philippines has contracted 2Mbps bandwidth using CRV package “A” voice and data services.
9	**Republic of Korea**	Gimpo international airport	ATN/AMHS with China put into operational use in June, 2011. AMHS implementation with China and Japan over CRV will be in 4Q, 2022.	AMHS implementation for supporting FTBP and IHE will be in 4Q, 2022.	AFS links over CRV is a Package A, Bandwidth 2M.
10	**Singapore**	Singapore	March 2011	Yes	2MB for CRV and minimally 64kbps for IPLCs
11	**Thailand**	Thailand	BBIS/BIS Routers already implemented. AMHS has been implemented since July 2011. Connection with Bangladesh, Bhutan, Cambodia, China, India, Lao PDR, Myanmar, Singapore, Hong Kong China, and Malaysia implemented. Connection with SITA (SITA AMHS Gateway inter-connections) implemented. **Bangkok - Vietnam Circuit** IOT Test : Done POT Test: Planned for end of 3Q2021 **Bangkok - Rome Circuit** IOT Test: Planned for 3Q2021 POT Test: Planned for 4Q2021	Completed, the IWXXM exchange has been implemented since November 2020.	The capacity of links readied to support in both form.
12	**USA**	Federal Aviation Administration	Q4, 2020	Yes. FAA AMHS has FTBP capability. National Weather Service (NWS) projected to implement IWXXM by Q3, 2021	Yes. 2MB bandwidth over CRV

Project	Task	Regional Priority	Planned Start	Planned completion	Dependencies	Leader	Contributors	F2F/Webconf/email/portal	Comment
AMHS Implementation Registration	Continue coordination with members and other regions to maintain the AMC		On-Going	On-Going		Thailand	All states/Administrations		On-going
Support AIDC implementation	Support Implementation of AIDC including PAN Regional AIDC ICD		2015	2021			States with priorities identified		On-going
Monitoring the SWIM implementation and work of APAC SWIM Task Force	Demonstrate capability of CRV to support SWIM and evaluate the impacts on network bandwidth to incorporate AMHS service.		2016	2021		Hong Kong China, Singapore and Thailand	IATA as reporter to SWIM TF		On-going
	Coordinate SWIM implementation and transition from existing environment to SWIM and confirm role of CRV (SWIM over CRV - role has been confirmed in 2019)		2017	2020					Completed
CRV-OG	Oversight CRV operations and migration of applications		2016	2021					On-going
AMHS Support IWXXM requirement 2020	Implement AMHS FTBP to meet the requirement of IWXXM including the basic AMHS plus FTBP sub-set of extended AMHS as defined in Doc9880. (Requirment for implementation is 5 November 2020) and monitor the possible compression soution following the ICAO guidelines for IWXXM implementation		2017	2020		All States/Administrations			On-going
AFTN/ATSMHS Routing Directory and coordination with AMC	Update to the Directory and prepare a draft new Edition of the Directory		2018	on going		All States/Administrations			Completed
CRV Operations Manual	Develop first draft of CRV Operations manual		2020	2020		CRV OG co-chair, New Zealand, USA, Singapore	Thailand		Completed
Suggested Implications to Cybersecurity and Associated Requirements for CRV Operations	i) The Meeting requested the ICAO Secretariat to inform and follow-up about the different requirements defined **in Section 3 in Flimsy01 of ACSICG/8** with different CNS Contributory bodies for their simultaneous and timely implementation. ii) CRV OG Chairs to note various requirements defined in Section 3 and initiate action to prepare strategies for contracting other services on CRV for future potential needs.		2021	On-Going		i) ICAO Secretariat ii) CRV OG Chairs			On-going
Interconnection of Regional Networks	ICAO Secretariat to take necessary action to discuss the interconnection of various regional networks at higher level.		2021	On-Going		ICAO Secretariat			On-going
Upgrade/Downgrade CRV Circuits Subscribed	ICAO Secretariat to take necessary action to discuss this issue with CRV OG as States should have option to upgrade/downgrade the circuits based on the need.		2021	2021		ICAO Secretariat, CRV OG			On-going
AMHS Routing Update due to CRV Post Implementation Issues in Bhutan	All six member States (Bhutan, India, Thailand, Singapore, Australia, and New Zealand) to create an Ad-hoc group with support of the ICAO Secretariat to further discuss about implementation of Option 2.		2021	2021		Bhutan, India, Thailand, Singapore, Australia, and New Zealand, ICAO			On-going

Completed Task and Actions items as of ACSICG/7meeting listed below:

Project	Task	Regional Priority	Planned Start	Planned completion	Dependencies	Leader	Contributors	F2F/Webconf/email/portal	Comment
COM Strategies	Revise Strategy for implementation of Communications Systems to support ATM operations in APAC		2016	2017 Further updates in 2018		Australia	New Zealand, and USA		COMPLETED
CRV Project (under the TOR of CRV Task Force)	MSA/DOA		2015	2015					Completed
	Cost Benefit Analysis		2014	2015					Completed
	Users requirements (including performance and safety requirements)		2014	2015					Completed
	RFI		2014	2015					Completed
	Sealed Tender		2014	2016					Completed
	Develop/agree on CRV Design (including an IPv6 address plan)			2016					Completed
	Implementation plan			2018					Initial plan done
	Set up CRV OG			2016					Established 12/16
Support ATFM Implementation using FIXM over CRV	Support development of ATFM IP ICD including coordiantion on the use of CRV to support ATFM FIXM (IP ICD developed by ACSICG has been provided to ATFM Group which is considered completed)		2015	2018		Australia			Completed
Support transition of ATC voice service over IP	support transition to voice over IP (Done through CRV OG/5 Meeting's recommendation)		2015	2019					Completed
Update AMS and Datalink Strategies	Review and update AMS and Datalink Strategies (task given by CNS SG/23 Meeting)		2019	2020/Completed					
AMHS Gateway Implementation	Implement AMHS transition including migration of concerned connections to SITA Type X mid 17 and updating APAC AMHS Naming Plan		2015	2019		Singapore, Thailand and Australia	All states/Administrations		Implemented

LIST OF PARTICIPANTS

	STATE/NAME		TITLE/ORGANIZATION	TEL/FAX/E-MAIL
1.	**AUSTRALIA (2)**			
	1.	Ms. Brenda Buwu	Senior Network Engineer Airservices Australia	brenda.buwu@airservicesaustralia.com;
	2.	Mr. Pierre Kemmers	AIS Business Manager Airservices Australia	pierre.kemmers@airservicesaustralia.com;
2.	**BHUTAN (2)**			
	3.	Mr. Karma Gayley	CNS Officer Bhutan Civil Aviation Authority	kgayley@bcaa.gov.bt;
	4.	Mrs. Devi M. Adhikari	Senior Communication Officer Department of Air Transport	dmadhikari@doat.gov.bt;
3.	**CHINA (5)**			
	5.	Ms. Jie Pan	Assistant of CNS Division Civil Aviation Administration of China (CAAC)	panjie@caac.gov.cn;
	6.	Mr. Wang Tianyu	CNS Division Assistance of ATMB Air Traffic Management Bureau	wangtianyu@atmb.net.cn
	7.	Mr. Cao Siming	Engineer Civil Aviation Telecom Co., Ltd.	caosiming@catc.net.cn;
	8.	Mr. Huang Zheng	Operation Manager Civil Aviation Telecom Co., Ltd.	huangzheng@catc.net.cn;
	9.	Mr. Tang Yanfeng	Engineer Civil Aviation Air Traffic Control Technology Equipment Development Co., Ltd	tangyanfeng@tedc-atc.com
4.	**HONG KONG, CHINA (7)**			

	STATE/NAME		TITLE/ORGANIZATION	TEL/FAX/E-MAIL
	10.	Mr. Joseph Ho	Senior Electronics Engineer Civil Aviation Department Hong Kong, China	jcyho@cad.gov.hk;
	11.	Mr. Arthur Lau	Electronics Engineer Civil Aviation Department Hong Kong, China	akhlau@cad.gov.hk;
	12.	Mr. Gene Kwok	Electronics Engineer Civil Aviation Department Hong Kong, China	gwhkwok@cad.gov.hk;
	13.	Mr. Wallace Ng	Assistant Electronics Engineer Civil Aviation Department Hong Kong, China	wkwng@cad.gov.hk;
	14.	Mr. Alex Li	Electronics Engineer Civil Aviation Department Hong Kong, China	ahtli@cad.gov.hk;
	15.	Ms. Silvia Mak	Senior Aeronautical Communications Supervisor Civil Aviation Department Hong Kong, China	wymak@cad.gov.hk;
	16.	Ms. Agnes Ka	Aeronautical Communications Supervisor Civil Aviation Department Hong Kong, China	ywka@cad.gov.hk;
5.		**MACAO, CHINA (5)**		
	17.	Mr. Lo Veng Tong, Freeman	Senior Safety Officer Civil Aviation Authority of Macao, China	freemanlo@aacm..gov.mo;
	18.	Mr. Pun Sio Kuong, Samson	Safety Officer Civil Aviation Authority of Macao, China	samsonpun@aacm.gov.mo;
	19.	Ms. Brendah Choi	Head of AIC Service Macau International Airport Co., Ltd.	brendahchoi@aod.macau-airport.com;
	20.	Ms. Pricilla Cheong	Adviser to Senior Head of ATS Division Macau International Airport Co., Ltd.	pricillacheong@aod.macau-airport.com;

	STATE/NAME		TITLE/ORGANIZATION	TEL/FAX/E-MAIL
	21.	Mr. Lau Chi Hei, Hayes	IT & CNS Engineer Macau International Airport Co., Ltd.	hayeslau@aod.macau-airport.com;
6.		**FIJI (6)**		
	22.	Ms. Sereima Bolanavatu	ANS Inspector CNS Civil Aviation Authority of Fiji	sereima.bolanavatu@caaf.org.fj;
	23.	Mr. Kelepi Dainaki	Manager Air Navigation Engineering Services Fiji Airport Limited	KelepiD@fijiairports.com.fj;
	24.	Mr. Shivam Naicker	Senior Aeronautical Technical Officer - SATO Fiji Airport Limited	ShivamN@fijiairports.com.fj;
	25.	Mr. Sakiusa Vacakautadra	Team Leader Safety, Standards & Training ANES Fiji Airport Limited	SakiusaV@fijiairports.com.fj
	26.	Mr. Amitesh Gounder	Aeronautical Technical Officer - ATO Fiji Airport Limited	AmiteshG@fijiairports.com.fj;
	27.	Mr. Ramend	Senior Aeronautical Technical Officer - CNS/ATM & APT Systems Fiji Airport Limited	ramendral@fijiairports.com.fj
7.		**INDIA (10)**		
	28.	Mrs. Ajay Kapur	General Manager (CNS – COM) Airports Authority of India	akkapur@aai.aero;
	29.	Mr. Sanjay Kumar Maharatha	Joint General Manager (CNS) Airports Authority of India	skmaharatha@aai.aero;
	30.	Mr. Hemant M. Ramchandani	Joint General Manager (CNS), Mumbai Airport Airports Authority of India	hemantr@aai.aero;

		STATE/NAME	TITLE/ORGANIZATION	TEL/FAX/E-MAIL
	31.	Mr. Arvind Singh Yadav	Joint General Manager (CNS) Airports Authority of India	asyadav@aai.aero;
	32.	Mrs. Punithavathy Charles	Assistant General Manager (Communication) Airports Authority of India	spunitha@aai.aero;
	33.	Mr. Bhupendra Singh Dhapola	AGM (COM) Airports Authority of India	bsdhapola@aai.aero;
	34.	Mrs. Latha Balakrishnan	Assistant General Manager (Communication), Chennai Airport Airports Authority of India	lathabk@aai.aero;
	35.	Mrs. Kiran S. Kale	Assistant General Manager (CNS), Mumbai Airport Airports Authority of India	kirankale@aai.aero;
	36.	Mr. Manoj Kumar	Senior Manager (CNS), IGI Airport Airports Authority of India	manojkum@aai.aero;
	37.	Mr. Sudhakar Kumar	Manager (CNS), Kolkata Airport Airports Authority of India	sudhakar@aai.aero;
8.		**INDONESIA (2)**		
	38.	Mr. Waya Fadini	Air Navigation Inspector Directorate General of Civil Aviation	waya_fadini@dephub.go.id;
	39.	Mr. Eka Doni Prasetya	Jr. Manager Centralized FPL Services AirNav Indonesia	raekadoni14@gmail.com;
9.		**JAPAN (4)**		
	40.	Mr. Kenji Sekitani	Special Assistant to the Director Japan Civil Aviation Bureau	sekitani-k02mm@mlit.go.jp;

	STATE/NAME		TITLE/ORGANIZATION	TEL/FAX/E-MAIL
	41.	Mr. Hideaki Murakata	Operations and Flight Inspection Division Japan Civil Aviation Bureau	murakata-h446b@mlit.go.jp;
	42.	Mr. Sato Takuya	Aeronautical Information/Communication Japan Civil Aviation Bureau	satou-t07b5@mlit.go.jp;
	43.	Mr. Shigeyuki Mizuguchi	System Section Japan Civil Aviation Bureau	mizuguchi-s23y@mlit.go.jp;
10.		**MALAYSIA (3)**		
	44.	Mr. Sahrol Nizal Ab Rashid	Principal Assistant Director Civil Aviation Authority of Malaysia	sahrol@caam.gov.my;
	45.	Mr. Ahmad Syahidan Bin Abu Bakar	Principal Assistant Director Civil Aviation Authority of Malaysia	syahidan@caam.gov.my;
	46.	Mr. Syahroni Chek Rus	Assistant Director (CNS Unit) Civil Aviation Authority of Malaysia	syahroni@caam.gov.my;
11.		**NEPAL (4)**		
	47.	Mr. Pravin Neupane	Deputy Director Civil Aviation Authority of Nepal	pravinneupane@gmail.com; pravin.neupane@caanepal.gov.np;
	48.	Ms. Reenu Mool	Deputy Director Civil Aviation Authority of Nepal	rmool@hotmail.com;
	49.	Mr. Manohar Rajbhandari	Deputy Director Civil Aviation Authority of Nepal	manohar.rajbhandari@gmail.com;
	50.	Mr. Suresh Prasad Sah	Deputy Director Civil Aviation Authority of Nepal	suresh@tiairport.com.np;
12.		**NEW ZEALAND (1)**		

	STATE/NAME		TITLE/ORGANIZATION	TEL/FAX/E-MAIL
	51.	Mr. Vaughan Hickford	Team Leader Network Design Airways New Zealand	vaughan.hickford@airways.co.nz;
13.		**PAKISTAN (6)**		
	52.	Mr. Sohail Ahmed	Senior Assistant Director Pakistan Civil Aviation Authority	Sohail_ahmed@caapakistan.com.pk;
	53.	Mr. Mazhar Ali	Senior Joint Director (Communication) Pakistan Civil Aviation Authority	mazhar.ali@caapakistan.com.pk;
	54.	Mr. Shamsuddin Hakro	Senior Joint Director (Communication Operations) Pakistan Civil Aviation Authority	shamsuddin.hakro@caapakistan.com.pk;
	55.	Mr. Shahid Hussain	Senior Joint Director (Communication Operations) Pakistan Civil Aviation Authority	shahid.hussain@caapakistan.com.pk;
	56.	Mr. Syed Munir Mahmood	Senior Joint Director CNS Pakistan Civil Aviation Authority	muneer.mehmood@caapakistan.com.pk;
	57.	Mr. Muhammad Sana Ullah	Assistant Director (Communication Operations) Pakistan Civil Aviation Authority	sana.ullah@caapakistan.com.pk;
	58.	Mr. Muhammad Adnan	Assistant Director (Communication) Pakistan Civil Aviation Authority	muhammadadnan@caapakistan.com.pk;
14.		**PHILIPPINES (4)**		
	59.	Ms. Jesseelyn P. Heje,	ATMO V/FIC, MADCC Air Traffic Service Civil Aviation Authority of the Philippines	ats_madcc@caap.gov.ph; jellane27@yahoo.com;
	60.	Ms. Mary Lyn C. Santamaria	ATMO V/Asst. FIC, MADCC Air Traffic Service Civil Aviation Authority of the Philippines	santamariamarylyn@yahoo.com;

	STATE/NAME		TITLE/ORGANIZATION	TEL/FAX/E-MAIL
	61.	Mr. Gilmar D. Tiro,	CNS Systems Supervisor Air Navigation Service Civil Aviation Authority of the Philippines	gilmar.tiro@gmail.com;
	62.	Mr. Florante B. Banaria,	CNSS Officer IV Air Navigation Service Civil Aviation Authority of the Philippines	florante_bb@yahoo.com;
15.		**REPUBLIC OF KOREA (8)**		
	63.	Mr. Kyung joon, Jang	Assistant Director Air Navigation Facilities Division Civil Aviation Office Ministry of Land, Infrastructure and Transport	skyjjan@korea.kr;
	64.	Mr. Seong ho, Lee	Assistant Director AIS division Seoul Regional Office of Aviation Ministry of Land, Infrastructure and Transport	doldol21@korea.kr;
	65.	Mr. Min gu, Shin	Assistant Director CNS division Seoul Regional Office of Aviation Ministry of Land, Infrastructure and Transport	starshin91@korea.kr;
	66.	Mr. Young-kwang Cho	Senior Manager Incheon International Airport	ykchoi@airport.kr;
	67.	Mr. Eunkyeol Jo	Manager Incheon International Airport	Joeg2001@airport.kr;
	68.	Mr. Won Joong, Kim	Manager Korea Airports Corporation	togran1684@airport.co.kr;

	STATE/NAME		TITLE/ORGANIZATION	TEL/FAX/E-MAIL
	69.	Mr. Gi won, Yoon	Manager Korea Airports Corporation	gwyoon@airport.co.kr;
	70.	Mr. Tae soo, Choi	Manager Korea Airports Corporation	tschoi82@airport.co.kr;
16.		**SINGAPORE (5)**		
	71.	Mr. Yeo Cheng Nam	Consultant (Aeronautical Telecommunications & Engineering) Civil Aviation Authority of Singapore	yeo_cheng_nam@caas.gov.sg;
	72.	Mr. Joe Chua	Senior Chief (Systems Planning & Development / Chief (Information Management & Flight Procedure Design) Civil Aviation Authority of Singapore	joe_chua@caas.gov.sg;
	73.	Mr. Joel Ng Chief	Chief (Systems Planning) Civil Aviation Authority of Singapore	joel_ng@caas.gov.sg;
	74.	Mr. Augustine Lau	Senior Engineer (Communications) Civil Aviation Authority of Singapore	augustine_lau@caas.gov.sg;
	75.	Mr. Zachary Seah	Engineer (Communications Civil Aviation Authority of Singapore)	zachary_seah@caas.gov.sg;
17.		**SRI LANKA (6)**		
	76.	Eng. Jananath Konara Rathninda	Acting Head of Electronics & Air Navigation Engineering Airport & Aviation Services (Sri Lanka) Ltd.	jananath.eane@airport.lk;
	77.	Mr. Hakmana Witharanage Upulsiri	Manager Aeronautical Communication Airport & Aviation Services (Sri Lanka) Ltd.	upulsiri.ans@airport.lk;

	STATE/NAME		TITLE/ORGANIZATION	TEL/FAX/E-MAIL
	78.	Mr. Antony Dinesh	Manager Aero Com Airport & Aviation Services (Sri Lanka) Ltd	dinesh.ans@airport.lk;
	79.	Ms. Mihiri Yapa Pahalage	Senior electronics engineer Airport and aviation services (Sri Lanka) ltd.	mihi.yapa@gmail.com;
	80.	Mr. Vidura Thammitage	Senior Electronics Engineer Airport and Aviation Services (Sri Lanka) Ltd.	vidura.eane@airport.lk;
	81.	Mr. Chandana Maddumabandara	Electronics Engineer Airport and Aviation Services (Sri Lanka) Ltd.	chandanam.eane@airport.lk;
18.	**THAILAND (14)**			
	82.	Mr. Chavalit Ithiapa	ANS Officer Civil Aviation Authority of Thailand	chavalit.i@caat.or.th;
	83.	Mr. Nattaporn Pornsawat	ANS Officer Civil Aviation Authority of Thailand	nattaporn.p@caat.or.th;
	84.	Mr. Pattraporn Thanachai	Aeronautical Chart Officer Civil Aviation Authority of Thailand	pattraporn.t@caat.or.th;
	85.	Mr. Tanabodee Promsorn	Aeronautical Information Publication Officer Civil Aviation Authority of Thailand	tanabodee@caat.or.th;
	86.	Ms. Silawan Songanusorn	Aeronautical Information Officer Civil Aviation Authority of Thailand	silawan.s@caat.or.th;
	87.	Mrs. Parichat Thongkleang	Head of Aeronautical Chart Civil Aviation Authority of Thailand	parichat.t@caat.or.th;
	88.	Mr. Chonlawit Banphawattanarak	Chief, Policy and Strategy Management Bureau (Group for Organization Development) Aeronautical Radio of Thailand Ltd.	chonlawit.ba@aerothai.co.th;

	STATE/NAME		TITLE/ORGANIZATION	TEL/FAX/E-MAIL
	89.	Mr. Dhivatbodi Sivajdhanachoti	Strategic Planning Assistant Manager (Engineering) Aeronautical Radio of Thailand Ltd.	dhivatbodi.si@aerothai.co.th;
	90.	Mr. Pramuk Rungrojaree	Air Traffic Engineering Manager Aeronautical Radio of Thailand Ltd.	pramuk.ru@aerothai.co.th;
	91.	Mr. Sutthisan Thansuwanwong	Air Traffic Engineering Manager Aeronautical Radio of Thailand Ltd.	sutthisan.th@aerothai.co.th;
	92.	Mr. Wanchai Rattanasing	Aeronautical Information Manager Aeronautical Radio of Thailand Ltd.	wanchai.ra@aerothai.co.th;
	93.	Ms. Kanisa Jaemit	Senior Air Traffic Systems Engineer Aeronautical Radio of Thailand Ltd.	kanisa.ja@aerothai.co.th;
	94.	Mr. Warut Chirayupong	Senior Chief of Lean Operations & Fuel Efficiency Thai Airways Operations Public Co., Ltd.	warut.c@thaiairways.com;
	95.	Mr. Kornkanok Shutiphan	Operations Engineer of Lean Operations & Fuel Efficiency Thai Airways Operations Public Co., Ltd.	kornkanok.s@thaiairways.com;
19.		**USA (3)**		
	96.	Mr. Michael Watkins	Senior Air Traffic Representative, Asia Pacific Federal Aviation Administration Air Traffic Organization, System Operations	michael.w.watkins@faa.gov;
	97.	Mr. Hoang Tran	International Telecommunications Lead Federal Aviation Administration ATO, Program Management Organization	hoang.tran@faa.gov;
	98.	Mr. Nigel Simmons	Senior Principal Engineer (FAA Support) FAA International Telecommunication Service Federal Aviation Administration	Nigel.CTR.Simmons@faa.gov;

	STATE/NAME		TITLE/ORGANIZATION	TEL/FAX/E-MAIL
20.	**VIET NAM 5)**			
	99.	Mr. Vu Ngoc Tuan	CNS Official, Air Navigation Department Civil Aviation Authority of Viet Nam	vungoctuan@caa.gov.vn;
	100.	Mr. Hong Son Vu	Deputy Director of MIRATS Viet Nam Air Traffic Management Corporation (VATM)	sonvuhong@vatm.vn;
	101.	Mr. Nguyen Hong Hiep	IT Specialist Viet Nam Air Traffic Management Corporation (VATM)	nguyenhonghiepbk@vatm.vn;
	102.	Mr. Hoang An Do	R&D Deputy Manager ATTECH	andh@attech.com.vn;
	103.	Mr. Nghia Trinh	Deputy Manager of Technical and Quality Management Department ATTECH	nghiatv@attech.com.vn;
21.	**IATA (3)**			
	104.	Mr. John Moore	Assistant Director, Safety & Flight Operations, ASPAC International Air Transport Association (IATA)	moorej@iata.org;
	105.	Mr. Rameses Dela Cruz	ATC Affairs – Manager, Operation Support IATA/Cebu Pacific Air	Rameses.DelaCruz@cebupacificair.com;
	106.	Mr. Toru Namba	Manager IATA/Japan Airlines	namba.qe4q@jal.com;
22.	**IFALPA (1)**			
	107.	SFO Somrak Sachorfar	First Officer Pilot Association, THAIPA	rakgongyoo@gmail.com;
23.	**IFATCA (1)**			

	STATE/NAME		TITLE/ORGANIZATION	TEL/FAX/E-MAIL
	108.	Mr. Anthony Ang	Executive Vice- President Asia Pacific Region International Federation of Air Traffic Controllers' Associations (IFATCA)	anthony.ang@ifatca.org;
24.		**FREQUENTIS (3)**		
	109.	Mr. Uwe Kurpat	BU MHS Manager Frequentis Comsoft GmbH	uwe.kurpat@frequentis.com;
	110.	Mr. Hans-Jõrg Merkle	Systems Architect Frequentis Comsoft GmbH	Hans-Joerg.MERKLE@frequentis.com;
	111.	Mr. Thomas Petschner	Head of Services Management Frequentis Comsoft GmbH	thomas.petschner@frequentis.com;
25.		**PCCW GLOBAL (3)**		
	112.	Mr. Benny Cheng	Assistant Vice President PCCW Global	benny.hf.cheng@pccw.com;
	113.	Mr. Bono Ng	Business Development Manager PCCW Global	bcng@pccwglobal.com;
	114.	Mr. David, Hao Wang	Product Development Manager PCCW Global	dhwang@pccwglobal.com;
26.		**ICAO (6)**		
	115.	Mr. Luo Yi	Regional Officer CNS International Civil Aviation Organization Asia and Pacific Office	yluo@icao.int;
	116.	Mr. Peter Dunda	Regional Officer MET International Civil Aviation Organization Asia and Pacific Office	pdunda@icao.int;

	STATE/NAME		TITLE/ORGANIZATION	TEL/FAX/E-MAIL
	117.	Ms. Soniya Nibhani	Regional Officer ANS (CNS) Implementation International Civil Aviation Organization Asia and Pacific Office	snibhani@icao.int;
	118.	Mr. How Sze Lung, Derek	Associate CNS Officer International Civil Aviation Organization Asia and Pacific Office	show@icao.int;
	119.	Ms. Zhong Wenhan	Associate CNS Officer International Civil Aviation Organization Asia and Pacific Office	wzhong@icao.int
	120.	Ms. Bhabhinan Sirapongkosit	Programme Assistant CNS/MET/ENV International Civil Aviation Organization Asia and Pacific Office	bsirapongkosit@icao.int;

LIST OF WORKING AND INFORMATION PAPERS

WP/IP No.	Agenda Item	Subject	Presented by
		WORKING PAPERS	
WP/01	1	Provisional Agenda	Secretariat
WP/02	2	Review of Relevant Meetings	Secretariat
WP/03	3	Review of Outcomes of CRV OG/8 Meeting	Secretariat
WP/04	7	CRV Post Implementation Issues in Bhutan	Secretariat
WP/05	4	Review of Outcomes of APA TF/7 Meeting	Secretariat
WP/06	6	Review Work Programme for ACSICG	Secretariat
WP/07	5	Update the AMHS/ATN Implementation Status Table	Secretariat
WP/08	5.2	Summary on ICAO Actions to Facilitate IWXXM Exchange over AMHS in APAC Region	Secretariat
WP/09	5.2	Description of FAA AMHS SWIM Gateway and IWXXM Status	USA
WP/10	5.1	CAAP-FAA AMHS/AIDC Implementation and Routing changes	Philippines & USA
		INFORMATION PAPERS	
IP/01	1	Meeting Bulletin	Secretariat
IP/02	7	Update on ICAO APAC Regional Webinars	Secretariat
IP/03	5.1 & 5.2	Air traffic Service Message Handling Systems (AMHS) Readiness to Support ICAO Meteorological Information Exchange Model (IWXXM) in Australia	Australia
IP/04	4	Update AIDC Implementation Status	India
IP/05	5.1	ATN/AMHS/CRV Implementation Status in India	India
IP/06	5.2	Presentation of PCCW Network based IWXXM Translation and Exchange Services	PCCW Global & Fiji
IP/07	5	Relevant Outcomes from ICAO APAC MET/IE WG/19	Secretariat
IP/08	5.1	AMHS to SWIM Transition and Mixed Environment Operation Implementation	Fiji

WP/IP No.	Agenda Item	Subject	Presented by
IP/09	5.2	Singapore's Readiness Status of Air Traffic Service Message Handling System ("AMHS") to Support IWXXM Traffic & IWXXM Traffic Issues between APAC and Europe Regions	Singapore
IP/10	5	New AMHS System Upgrade and IWXXM Readyniess to Support IWXXM Data in Korea	Republic of Korea
IP/11	5.2	Fiji's Readiness Status of Air Traffic Service Message Handling System ("AMHS") to Support IWXXM Traffic	Fiji
IP/12	2	Update on SWIM Regional Coordination	IATA on behalf of APAC SWIM TF
		FLIMSY	
Flimsy 01	5	Implications of Cybersecurity and Associated Requirements for CRV Operations	FAA/USA

– – – – – – – – – – – – –