International Civil Aviation Organization

Seventh Meeting of the Common aeRonautical Virtual Private Network Operations Group (CRV OG/7)

Bangkok, Thailand, 20 – 22 January 2020

Agenda Item 9: Next meetings and any other business

PNG PROPOSE TO USE CRV FOR SPACE BASED ADS-B

(Present by PNG Air Services Limited and Aireon LLC (a member of ICCAIA))

SUMMARY

This paper presents the plan by PNG to receive Space based ADS-B via CRV and its benefits)

1. INTRODUCTION

1.1 PNG Air Services Limited (PNGASL) has contracted for the supply of Space Based ADS-B from Aireon LLC.

1.2 PNG Air Services Limited (PNGASL) is intending to contract for a CRV connection in early 2020 and use it for the following applications:

- AFTN/ AMHS
- Voice coordination with Australia, Indonesia, Oakland
- ADS-B data sharing with Australia & Indonesia
- AIDC with Australia, Indonesia, Oakland
- Space based ADS-B

However, PNGASL will initially use separate duplicated MPLS links to remove the risks of delay due to Aireon not being connected at this time.

1.3 One prime purpose of CRV is to reduce the need for point to point circuits, and to lower data communications costs for ANSPs. Aireon and PNG ASL believe that delivery of Space based ADS-B via CRV will achieve these objectives.

2. The Aireon Space Based ADS-B Service

2.1 Space based ADS-B is now fully operational. The service is being used by Canada and United Kingdom to separate aircraft in the Atlantic Ocean (using trial ASEPS procedures) and over continental Canadian airspace using 5 NM separation standards. Site acceptance tests have also been conducted in Singapore and India.

2.2 In June 2019 Aireon was officially approved by the European Union Aviation Safety Agency (EASA) as an **Air Navigation Service Provider (ANSP)** Organization to provide Air Traffic Management (ATM)/Air Navigation Service (ANS) surveillance services, to support the separation of aircraft. This authorizes Aireon as the first-ever certified provider of aircraft surveillance-as-a-service. A copy of the approval certificate is included below:

EASA

APPROVAL CERTIFICATE

REFERENCE EASA.AOA.TRD.010

Pursuant to Regulation (EU) 2018/1139 and Commission Regulation (EU) No 1035/2011 and subject to the conditions specified below, the European Union Aviation Safety Agency hereby certifies:

AIREON LLC
8484 Westpark Drive, Suite 300
22102 McLean, Virginia (VA)
United States of America (USA)

as an approved AIR NAVIGATION SERVICE PROVIDER (ANSP) ORGANISATION certified to provide ATM/ANS as listed in the attached 'Service Provision Conditions'.

CONDITIONS :

1. This approval is limited to the scope of providing Air Navigation Services as specified in the attached 'Service Provision Conditions', and
2. This approval requires compliance with the procedures and other arrangements specified in the Organisation Exposition, as presented in the Aireon Integrated Management System Manual reference AIR00169, in the latest revision, and
3. This approval is valid whilst the approved Air Navigation Service Provider organisation remains in compliance with the applicable common requirements, and the specific conditions identified for the services included in the Service Provision Conditions.
4. Subject to compliance with the foregoing conditions, this approval shall remain valid until:

31 December 2020

unless the approval is surrendered, superseded, suspended or revoked.

For the European Union Aviation Safety Agency,

Date of issue: 22 July 2019 **Manfred DIEROFF**

3. Space based ADS-B in PNG

3.1 In PNG, the current operational surveillance is one radar at Port Moresby Airport and one ADS-B ground station at Burns Peak. Some additional ground based ADS-B stations are under test or planned for remote airports. Approximate current operational surveillance coverage at FL200 is shown as shaded pink in Figure 1 below. The white line is the FIR boundary.

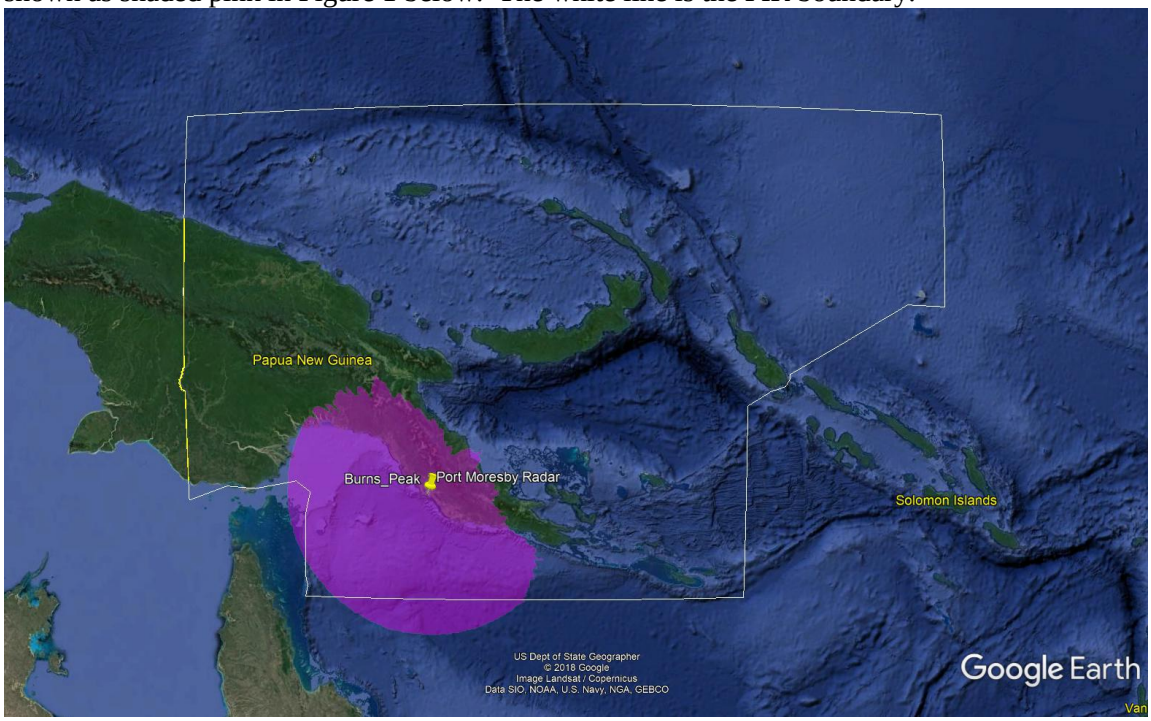

Figure 1 : Surveillance at FL200

3.2 Space Based ADS-B will provide ADS-B coverage over the complete PNG FIR, and also in the 100 NM outside the FIR to support FIR boundary safety as shown by the red polygon in Figure 2.

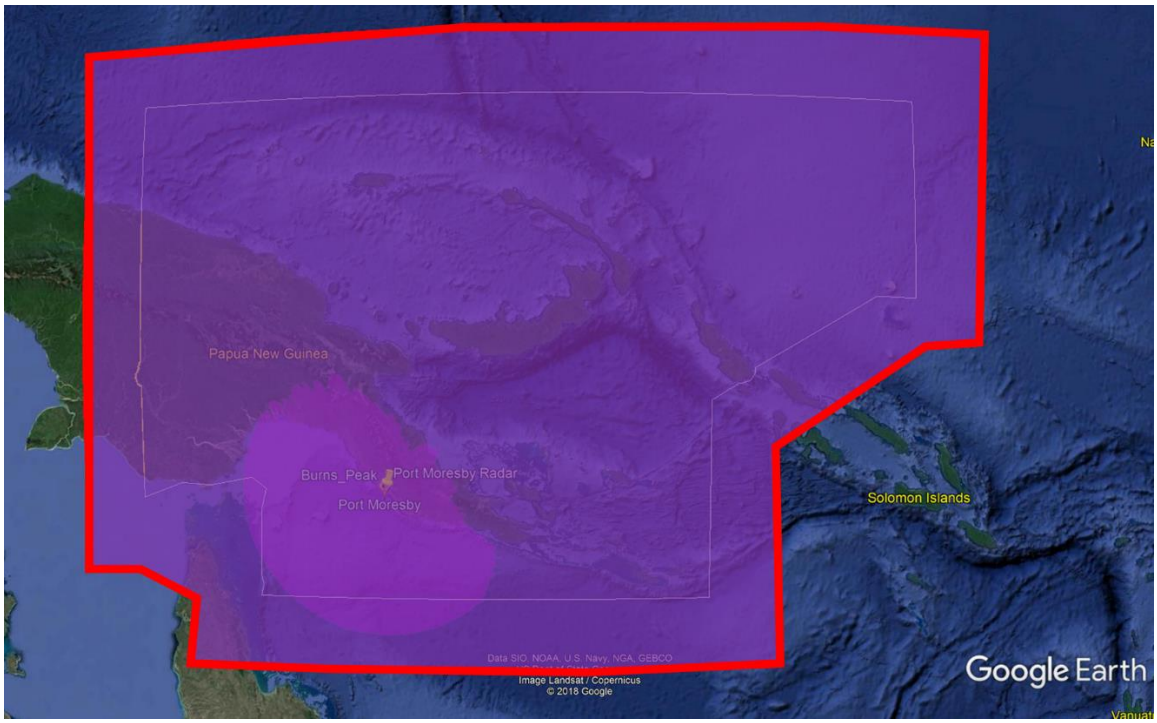

Figure 2 : Complete FIR coverage plus 100 NM

3.3. Space based ADS-B will operate in tandem with the existing radar and ADS-B ground stations. This deployment, in 2020 will significantly improve coverage, safety and efficiency within this airspace.

4. Data communication requirements for Space based ADS-B

4.1 Based on the traffic load in PNG, the bandwidth required will be less than 200 Kb/sec for the surveillance data itself. Occasional, lower priority remote management of the Service Delivery Point (SDP) equipment at the ANSP premises will also be required. It is expected that the initial 512Kb/sec lines of CRV will adequately support this application, noting that these lines can readily be increased to 2 Mb/sec.

4.2 The key communication performance characteristics for surveillance data are

- reliability/availability (especially minimized single points of failure). Typically, this requires two MPLS lines from different providers, both active, so that a single failure does not cause a failure longer than (say) 10 seconds – to avoid track drop. Alternatively, an ANSP may conclude that other surveillance backups are adequate to cover the loss of data on any “slow” (greater than 10 second) changeover

- Latency. The target for overall system latency from satellite reception of ADS-B till delivery to ATC is less than 2 seconds. The budget allocated to communication between USA and customer is in the order of 500 milliseconds.

5. Cost of Aireon connection to CRV

5.1 Aireon's business is not delivery of communication services, but rather the delivery of surveillance data. As a business, Aireon must reflect the cost of its communications into the contracts with customers.

If the costs of data communication to a customer are higher, then the Aireon contract price will be higher for that customer ,to include the initial and ongoing costs of the data connection between the Aireon and the ANSP.

5.2 If a significant number of customers use CRV for ADS-B data delivery, then the cost of the USA-CRV connection may decrease to the extent that it could be absorbed into the Aireon service rate globally

6. The financial benefits of using CRV in PNG for Space based ADS-B

6.1 It is acknowledged that the cost of MPLS connections varies significantly around the world and that detailed modelling is not possible without very specific details of each environment. Some locations can have costs exceeding 100% or more, compared to lower cost locations.

6.2 For this paper lets us assume that we consider only the recurring MPLS link costs, and assume that all MPLS links cost "X" dollars per annum.

6.3 No attempt is made to consider other CRV costs.

6.4 PNGASL can choose between two solutions as follows:

a) **SOLUTION A and cost**: Do not use CRV for surveillance

- Use duplicated MPLS lines for Space based ADS-B which includes the cost of 2 MPLS connections (USA to PNG) = 2 * "X" dollars

- Use CRV Package A[1] for AFTN/AHMS and Digital voice which includes the cost of 2 MPLS connections (CRV to PNG) Cost 2* "X" dollars)

This option will cost in the order of 4 * "X" for the MPLS component.

b) **SOLUTION B and cost**: A CRV Solution

- Use TWO CRV Package C [2]for AFTN/AHMS, Digital voice and Space based ADS-B which includes the cost of 2 MPLS connections (CRV to PNG) = Cost 2* "X")

[1] The PNG choice of two package C connections comes with one package C with MPLS and one package C with VSAT connection. VSAT connects to CRV POP in Hong Kong and MPLS connects to CRV POP in Sydney

[2] Space based ADS-B is normally setup such that the A and B multicast data are active at the same time. The use of two independent Package C allows this to occur.

- Plus pay an appropriate share of the connection between Aireon and CRV. Lets assume that only 2 ANSP connect via CRV, then this would be 2 MPLS lines between USA and CRV (ie Cost < [3]2*"X" / 2 users) = < 1 * "X".

6.5 The cost of the MPLS component of the solutions are:

SOLUTION A: Don't use CRV for Space based ADS-B	4 * "X" dollars
SOLUTION B: CRV **	3 * "X" dollars

This assumes that two Aireon customers use the CRV. If more ANSPs use the CRV then the benefits of using CRV will be larger.

6.6 An additional benefit (unquantified here) flows to PNGASL because the same CRV physical connection could be used to exchange ADS-B ground station data with both Australia and Indonesia. This is likely to remove the need for the existing point to point circuit between Australia & PNG.[4]

7. Approval for Aireon to connect

7.1 Aireon has no need to connect to CRV to deliver it's service. The service can be delivered on dual MPLS links. However our ANSP customers perceive that CRV will be a more cost effective method to receive surveillance data.

7.2 PNG is the first customer to request delivery of Space based ADS-B by CRV.

7.3 Aireon understands the need to protect the integrity of the CRV network. Aireon is an EASA approved ANSP itself.

7.4. Aireon as an EASA certified ANSP, together with PNG ASL intends to address all the requirements, as agreed in CRV OG/7 WP 9 to seek approval to connect to CRV.

PNG ASL requests that the CRV OG process their request to use CRV for Space based ADS-B as soon as the relevant information is provided.

8. ACTION BY THE MEETING

8.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matter as appropriate

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[3] A MPLS from USA-CRV is likely lower cost than "X" given the good infrastructure in USA
[4] This is a benefit of ADS-B on CRV rather than Space based ADS-B on CRV.