International Civil Aviation Organization
North American, Central American and Caribbean Office

WORKING PAPER

MEVA/TMG/34 — WP/08
10/06/19

Thirty Fourth MEVA Technical Management Group Meeting
(MEVA/TMG/34)
Miami, United States, 11 to 13 June 2019

Agenda Item 4: **MEVA Phase IV**

SPACE-BASED ADS-B PROGRESS UPDATE

(Presented by AIREON)

EXECUTIVE SUMMARY	
This working paper presents the progress in the implementation of Space-Based ADS-B and outcomes for the deployment in Curacao using MEVA infrastructure.	
Action:	Suggested actions are listed in Section 4.
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency
References:	• Thirty third MEVA Technical Management Group Meeting (MEVA/TMG/33), Willemstad, Curaçao, 29 to 31 May 2018

1. Introduction

1.1 In 2009, AIREON identified the opportunity to solve one of the main problems of aviation: the inability to track and monitor aircraft real-time anywhere in the world.

1.2 With the partnership of NAV CANADA, ENAV, NAVIAIR, UK NATS, IAA and IRIDIUM, the plan to set up ADS-B receivers in the 66 satellites of the IRDIUM NEXT constellation was carried out and the constellation is now complete, since the 11th of January 2019, and the Space-Based ADS-B service has started operations around the globe in April.

1.3 Major ANSPs have believed in the AIREON project and have signed partnerships for the implementation of the satellite-delivered ADS-B application in airspace under their responsibilities.

1.4 In the following Sections, this WP presents the operational status of the implementation of the space-based ADS-B Service globally and in the Caribbean, discussing the technical aspects of the implementation in Curacao, Aireon's first customer in this region, using the MEVA network infrastructure.

2. Discussion

2.1 *Global implementation and usage of space-based ADS-B*

2.1.1 NAV CANADA and UK NATS are the first Air Navigation Service Providers (ANSP) to deploy Space-Based ADS-B for ATS surveillance in the oceanic and en-route environments. The referred providers have incorporated Space-Based ADS-B in flights in the oceanic airspace (North Atlantic) and using reduced longitudinal separations of 14 NM or 17 NM, plus 5 NM opposite direction, using CPDLC for communication.

2.1.2 With regard to continental usage, NAV CANADA has also incorporated Space-Based ADS-B using a 5 NM standard in airspace where there is already surveillance coverage and VHF communication. This is in the Edmonton FIR in Northern Canada.

2.1.3 Moreover, NAV CANADA will be able to use the AIREON data to expedite and identify position information in possible search and rescue incidents in Northern Canada.

2.1.4 This first deployment by NAV CANADA and UK NATS sets the standard and will act as a guide to all nations in deploying this state-of-the-art air traffic surveillance technology.

2.1.5 Besides, NAV CANADA and UK NATS project a 76% reduction in collision risk over the NAT corridor, a figure that was endorsed by the International Civil Aviation Organization (ICAO).

2.1.6 Other implementations are undergoing, and Aireon’s launch customers, ISAVIA, ENAV, IAA, Naviair, ASECNA, Seychelles CAA, Singapore CAAS and ATNS from South Africa will be operational by the end of 2019.

2.2 *Technical Implementation in Curacao*

2.2.1 Curacao’s DC-ANSP is Aireon’s launch customer of space-based ADS-B in the Caribbean region. For its implementation, Curacao identified the need to use MEVA, as one of the telecommunications channels to connect the service to its facilities.

2.2.2 MEVA has become the communication infrastructure to support current and future aeronautical applications among its Member States and to interconnect with the South American (SAM) Aeronautical Telecommunication Network (ATN), called REDDIG.

2.2.3 AIREON and the MEVA provider, Frequentis assessed the feasibility to transport surveillance ADS-B data to Curacao and during TMG/33 meeting, Member States approved the use of the MEVA Infrastructure as one of the telecommunication links to support the transmission of Space-Based ADS-B services, between AIREON Processing and Distribution Center (APD) to Curacao;s DC-ANSP and to any other member State that will use space-based ADS-B data in the future. The approved architecture is shown in Figure 1.

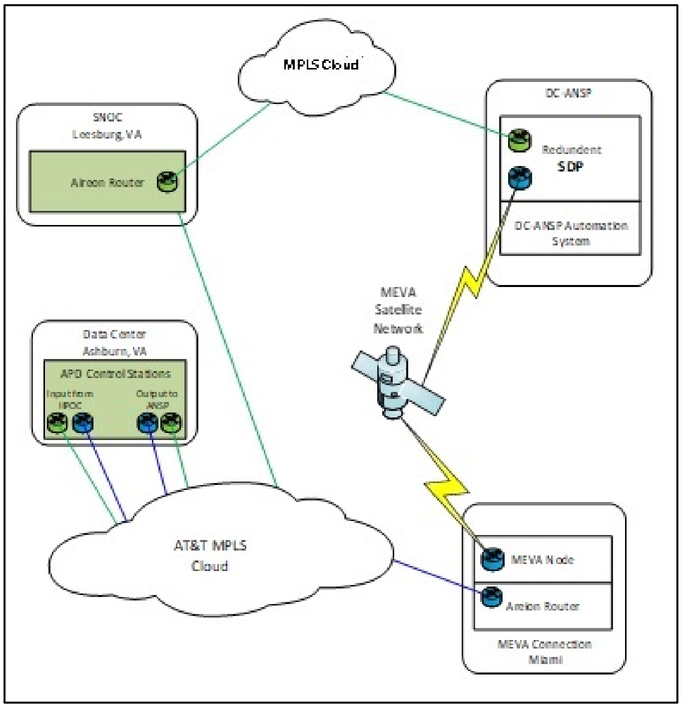

Figure 1: Curacao SDP Network Architecture

2.2.4 The primary link is an AT&T MPLS line that connects the 'A' side Service Delivery Point (SDP) in Curacao to the Aireon Processing Distribution (APD). The secondary link will utilize the MEVA network to connect the 'B' side SDP in Curacao to the AIREON Data Gateway via the MEVA node in Miami. See Figure 1: Curacao SDP Network Architecture

2.2.5 Aireon established the 'A' side connection in Curacao during the week of May 27th , The integration entailed activating Aireon data delivery through the AT&T MPLS line, converting ASTERIX data to a message format that will be accepted by Curacao's Automation platform, and validating target update and positional accuracy in the TCNF FIR. Aireon, in partnership with Curacao, successfully integrated Space-Based ADS-B data on their test platform on 30 May 2019. See Figure 2 for a screenshot of Space Based ADS-B on a DC-ANSP's automation platform.

Figure 2: Curacao Raytheon AutoTrac Test Platform

2.2.6 The estimated bandwidth requirements for MEVA members were disclosed during the ICAO TMG33 meeting in 2018. Upon successfully integrating Curacao SDP data in 2019, Aireon can now validate previous estimations. Aireon collected a subset of data in May 2019 for bandwidth analysis and determined the results are consistent with previously disclosed estimations. The peak traffic bandwidth for the Curacao FIR over a 24hr period is ~ 56kbps. It is important to note the bandwidth calculations are derived from all ASTERIX messages being sent to the Service Delivery Point, including the “CAT253 – Aireon Constellation TLE Reports” which accounts for the preponderance of the bandwidth loads. See Figure 3 – Wireshark Network Bandwidth for an aggregate view of Curacao’s bandwidth data

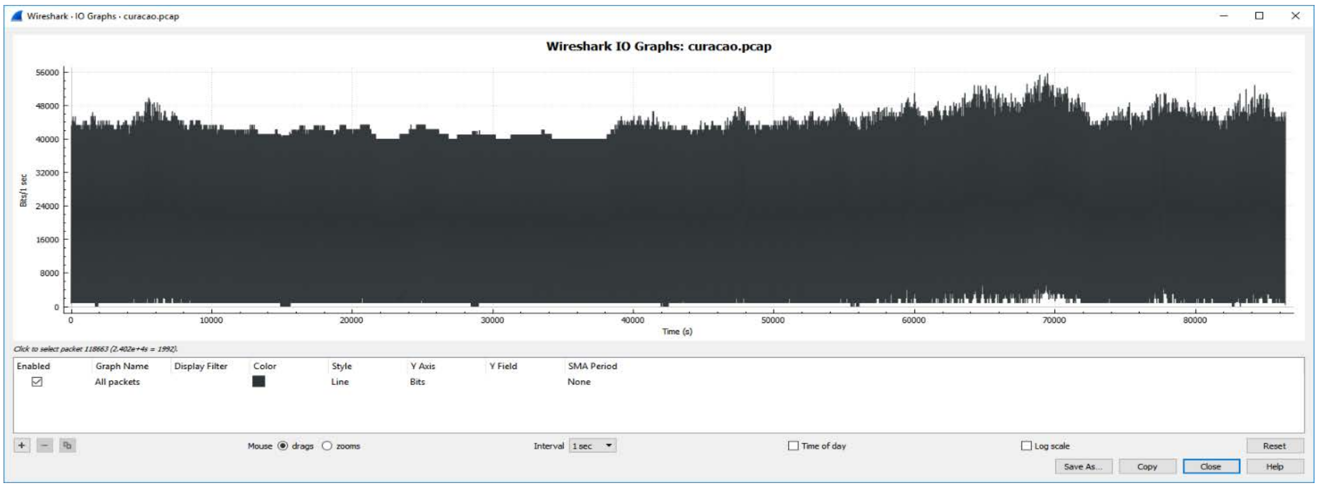

Figure 3: Curacao Network Bandwidth (24Hrs)

2.2.7 Aireon is on track to activate data delivery via the MEVA network to the Curacao SDP. During the first quarter of 2019, Aireon partnered with Frequentis to finalize the engineering architecture required to support service delivery via MEVA. To date, Aireon has completed all prerequisites for a successful activation including router and circuit installation in the Miami teleport facility, end to end network continuity, and SDP integration with MEVA components. Aireon is scheduled to enable service delivery via MEVA on 13 June 2019.

2.2.8 Additional activities in Curacao to finalize operational readiness are:

a) Activate data delivery services on the MEVA MPLS Line
b) Configure bandwidth restriction on the MEVA line (i.e., max IP traffic = 57kpbs)
c) Conduct end-to-end system evaluation
d) Develop test procedures and complete In-Service Acceptance Test (ISAT)
e) System certification for DC-ANSP
f) Commence operational phase and Aireon Service Delivery.

2.2.9 As with the implementation in Curacao, the usage of MEVA could represent an advantage to the member States for the deployment of Space-Based ADS-B service in the NACC Region.

3. Conclusion

3.1 Space-Based ADS-B is already incorporated by NATS UK and NAV CANADA in their respective airspaces.

3.2 Start of operations with space-based ADS-B in Curacao is expected for IVQ2019, using MEVA infrastructure as its back up connection line.

3.3 Other States, from the NACC Region, might have technical, operational and financial advantages with the use of MEVA for the implementation of Space-Based ADS-B services.

4. Suggested Actions

4.1 The Meeting is invited to:

a) Take note of the content of this WP;
b) Analyze a possible regional implementation of Space-Based ADS-B with the use of MEVA; and
c) Discuss any other matter it may deem appropriate.

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APPENDIX
ESTIMATED BANDWIDTH REQUIREMENTS FOR MEVA MEMBER STATES

The table below shows the estimated air traffic bandwidth requirements for each member state within their respective FIR. The estimations are based on historic target data and Aireon traffic density models.

		CAT021		CAT025		CAT238		CAT253		Total	
FIR Name	FIR	Mean	Max	Mean	Max	Mean	Max	Mean	Max	Mean	Max
Havana	MUFH	13	30	0	1	0	17	6	32	19	80
Mexico	MMFR	37	69	0	1	0	39	6	32	43	141
Tegucigalpa/Toncontin	MHTG	18	34	0	1	0	32	6	32	24	99
Kingston	MKJK	8	23	0	1	0	17	6	32	14	73
**** Curacao**	**TNCF**	**6**	**17**	**0**	**1**	**0**	**16**	**6**	**32**	**12**	**66**
Port-au-Prince	MTEG	1	9	0	1	0	15	6	32	7	57
Santo Domingo	MDCS	5	15	0	1	0	15	6	32	11	63
San Juan	TJZS	11	27	0	1	0	18	6	32	17	78
Bogota	SKED	25	51	0	1	0	22	6	32	31	106
Piarco	TTZP	9	23	0	1	0	29	6	32	15	85
Total (kbps)	**Total**	**133**	**298**	**0**	**10**	**0**	**220**	**60**	**320**	**193**	**848**

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