INTERNATIONAL CIVIL AVIATION ORGANIZATION

Seventh Meeting of the APIRG Airspace and Aerodrome Operations Sub-Group (AAO/SG7)

Nairobi, Kenya, 12 - 16 August 2024

Agenda Item 6: Activities to be coordinated with the RASG/AFI SST

6D2. ADS-B HEIGHT MONITORING IMPLEMENTATION

(Presented by ARMA)

SUMMARY
ADS-B Height Monitoring System (AHMS) use ADS-B receivers to obtain geometric height data from ADS-B equipped aircraft. The use of this method requires the aircraft to be ADS-B equipped and for the aircraft to fly in a region where ADS-B monitoring is performed.
REFRENCE(S): **ICAO Doc 9937** **ICAO Doc 9574** **ICAO Doc 9161** **ICAO Doc 9750** **Annex 10 – Aeronautical telecommunications,** **Annex 11 – Air Traffic Services** **DOC 4444 – PANS /ATM**
Related ICAO Strategic Objective(s):

1. INTRODUCTION

1.1 With the endorsement of ADSB Height Monitoring methodology by the ICAO Separation and Airspace Safety Panel (SASP), ADS-B data can be used for calculating the Altimetry System Error (ASE) which is a measure of the height-keeping performance of an aircraft. It is an ICAO requirement that aircraft operating in RVSM airspace must undergo periodic monitoring on height-keeping performance.

1.2 The ICAO Separation and Airspace Safety Panel (SASP) first considered the use of geometric height data from ADS-B systems in 2001. While further consideration was given to this issue by SASP in the intervening years, activity was started in earnest following work after significant progress was made with test flights conducted by the United States FAA in 2008 and early 2009 which demonstrated that aircraft geometric height data obtained from ADS-B is sufficient for estimating aircraft Altimetry System Error (ASE).

2. DISCUSSION

2.1 Implementation of Automatic Dependent Surveillance in Broadcast Mandate (ADS-B) in the AFI region, is based on conclusion 5/11 of the RASG-AFI/5 meeting and conclusion 22/40 of APIRG/22 on the continental survey to be carried out to support the decision for the mandate of ADS-B out 1090 Mhz Extended Squitter (ES).

2.2 An appropriate ADS-B designator shall be entered in item 10 of the flight plan to indicate that the flight is capable of transmitting ADS-B messages. These are defined in ICAO DOC 4444 as follows:

B1 ADS-B “out” capability using 1090 MHz extended squitter

B2 ADS-B “out” and “in” capability using 1090 MHz extended squitter

U1 ADS-B “out” capability using UAT

U2 ADS-B “out” and “in” capability using UAT

V1 ADS-B “out” capability using VDL Mode 4

V2 ADS-B “out” and “in” capability using VDL Mode 4

2.3 ARMA conducted a feasibility trial with the FAA using South Africa’s(ATNS) ADS-B Space Based data from Aireon and the trial was successful. The trial produced 5 minutes segments samples that could calculates Altimetry System Error. The program assessed all altitudes between FL170 and FL660. In this case we identified 44,494 5-minute samples from 1632 aircraft. The lowest flight level was FL180 and the highest was FL470 however we sampled using data from FL290-FL410 for height keeping checks.

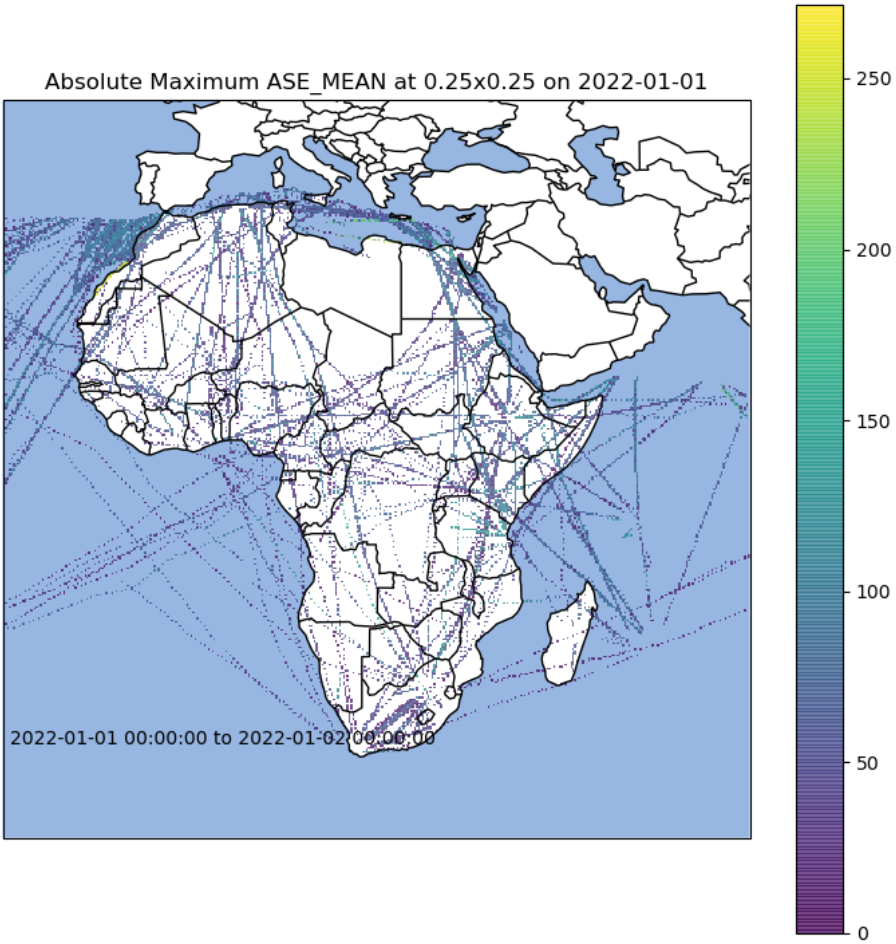
2.4 The total number of samples within RVSM was 42,501. Here are just a few of the samples of the output file:

PINDEX	MODE_S	FLIGHT_ID	MSRMT_DATE	MSRMT_TIME	ASE_MEAN	SPEED	NIC	REL_HEADING
40752	AE5B68	BRNCO71	1/1/2022	12:19.2	19.81	309.29	9	-146.55
23551	04015B	ETH154	1/1/2022	31:04.3	70.27	336.36	8	5.56
28501	0A008B	DAH6472	1/1/2022	30:07.2	1.6	354.79	8	-16.82
30554	42463A	AFL422	1/1/2022	43:43.6	50	341.46	8	-158.84
40304	04003B	ETH811	1/1/2022	45:09.1	39.89	346.52	8	40.5
40723	0A0051	DTH1315	1/1/2022	54:32.7	119.37	334.53	8	104.53
41075	00A60D	ZSOKA	1/1/2022	10:00.5	54.61	277.29	8	36.21
4524	501D0A	NUA0533	1/1/2022	24:06.5	51.81	424.86	8	-84.46

2.5 NIC (Navigational Integrity Category) Subfield used to specify the containment radius integrity associated with horizontal position data. Altimetry System Error calculation require for the NIC >8.

2.6 The sampled area using ADS-B Spaced based Data provided by South

Africa(ATNS).



3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) The meeting is invited to:
b) review and discuss the contents of this working paper;
c) encourage States to publish the adopted ADS-B Mandate for RVSM operators within their designated airspaces.
d) States and aircraft operators to ensure that all aircraft operating within the AFI RVSM airspace are equipped with ADS-B 1090MHz Extended Squitter aircraft transponder as per mandate adoptions; and
e) South Africa (ATNS) to conduct a Cost Benefit Analysis for use of Space Based ADS-B data for the implementation ADS-B RVSM height keeping checks over the AFI Region.

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