INTERNATIONAL CIVIL AVIATION ORGANIZATION

Second Meeting of the Africa - Indian Ocean Aviation System Planning and Implementation Group (AASPG/2)
Livingstone, Zambia, 2 - 6 November 2026

Agenda item 4: Implementation of safety and air navigation goals, targets and indicators, including priorities set in the Regional Aviation Safety and Air Navigation Plans

ADS-B Mandate and height keeping Monitoring in AFI RVSM Airspace

(Presented by the Secretariat)

SUMMARY
This working paper presents the result of the ADS-B carriage rate in the AFI region in response to APIRG/22 Conclusion 22/40 and APIRG/27 & RASG/10 Conclusion 6/10 relating respectively to ADS-B mandate and to the safe implementation of resilient ADS-B operations in the AFI RVSM airspace. The action by the Meeting is in **paragraph 3**
REFERENCE(S): • AASPG Procedural Handbook • Reports of APIRG and AASPG meetings • Aireon ADS-B data 2022-2025
Related ICAO Strategic goal(s): A- Every Flight is Safe and Secure C- Aviation Delivers Seamless, Accessible, and Reliable Mobility for All

1. INTRODUCTION

1.1 APIRG/22 through Conclusion 22/40 urged States and aircraft operators to ensure that all aircraft operating within the AFI RVSM airspace are equipped with ADS-B Transponder Extended Squitter 1090 by June 2023; and all aircraft operating within the AFI region airspace be equipped with ADS-B Transponder Extended Squitter 1090 by January 2025.

1.2 During APIRG/27, ARMA submitted its proposal to use ADS-B data to perform height monitoring in the AFI RVSM airspace by calculating the Altimetry System Error using ADS-B as data source. 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.

1.3 At the joint APIRG/27 & RASG AFI/10, the African Airlines Association (AFRAA) and the International Air Transport Association (IATA) presented a joint paper on the developments on the loss of GNSS signals and the challenges faced by African air operators in retrofitting

their non-ADS B aircraft to meet the requirements of APIRG Conclusion 22/40 related to the mandate of implementation of the use of ADS-B OUT.

1.4 The Joint session of APIRG/27 & RASG-AFI/10 tasked a Study group, composed of AAO and IIM Sub-Groups Secretariats and relevant Project Team Coordinators (PTCs), ARMA, IATA, AFRAA, ASECNA and ATNS to gather and analyze data on the level of equipage of the aircraft fleet operating in the AFI region, as well as the availability and reliability of GNSS signal as support required for the implementation of the ADS-B in the AFI region; and to review and submit to the AASPG, proposal for requirement for the mandatory carriage of ADS-B for Non-ADS-B equipped aircraft operating in the AFI Airspace, pending the outcomes of the data gathering and analysis.

2. DISCUSSION

ADS B Carriage Rate

2.1. The Study Group tasked by the APIRG/27 & RASG-AFI/10 meeting did not provide a status report at AASPG/1 due to lack of data and analysis. A meeting conducted in the sideline of AASPG/1 by the Study group proposed that the Secretariat carry out the task of collecting data on ADS-B carriage rate in the AFI region with emphasis on regional fleet ADS-B capability.

2.2. The Secretariat undertook data collection task from various reliable sources including space-based ADS-B service providers such as Aireon as well as data provided by some AFI Area Control Centers (ACC). The data included period from 2022 to 2025 and encompass all ADS-B flight hours traced between FL180 and FL660 in all AFI FIRs. Leveraging specific FIR characteristics, these raw data were converted to ADS-B traffic movements to enable its consistent use for the analysis.

2.3. The estimation of ADS-B carriage rate requires both ADS-B data and the overall traffic movement in specific airspace and timeframe. It should be noted that the use of ADS-B data as a standalone input cannot support the estimation of ADS-B carriage rate in the region. Traffic movement statistics from 2022 to 2025 were therefore collected and processed from various FIRs to complete the analysis.

2.4. Not all FIRs provided traffic data to enable a comprehensive assessment of ADS-B carriage rate. However, FIRs which provided their traffic data account for 60% of regional air traffic in upper airspace (FL245-FL660). Based on the data from these FIRs and analysis conducted, the average ADS-B carriage rate for the traffic assessed was estimated at **86%**. ADS-B and traffic movement analysis are presented as **Attachment A** to this paper.

2.5. While the average ADS-B mandate, rate estimated at 86%, may appear operationally satisfactory for ATM operations, APIRG conclusion 22/40 item (b) set the decision-making threshold for ADS-B carriage rate at 90%; therefore, the target rate is still 4% short.

2.6. From a global perspective, most airspace improvement initiatives adopt the performance-based principle which sets criteria to be met by any aircraft to take advantage of the privileges provided by improved ATM. In the AFI region, several airspace projects such as Free route airspace (FRA), User preferred route (UPR) and reduction of longitudinal separation (AFI 30/10), have established clear implementation principles including sets of criteria to be met by aircraft. ADS-B appeared as one of the main criteria in all these projects. These improvement projects will therefore allow appropriately equipped aircraft to benefit from advanced operational capabilities, while ensuring that non-equipped aircraft can continue to be accommodated through applicable conventional services, subject to operational requirements.

Use of ADS-B in RVSM height keeping monitoring

2.7. During AAO/SG7, the AFI Regional Monitoring Agency (ARMA) demonstrated the safety and operational benefit offered by the use of ADS-B for height keeping monitoring. It was noted that height keeping monitoring through ADS-B provides high data accuracy and reliability and was more cost effective for the RMA as it required less operational expenditure as compared to the conventional method using the Enhanced Generation 2 GPS Monitoring Unit (E2GMU).

2.8. The use of ADS-B for height keeping monitoring requires aircraft to be equipped with this feature to enable data recording and assessment. As for the ADS-B mandate, air operators of the AFI region raised the issue of anticipated cost for retrofitting and requested that the conventional method of height keeping be maintained.

GNSS Radio Frequency Interference (GNSS RFI)

2.9. The use of ADS-B in flight operations and ATM is subject to operational risks such as GNSS RFI. In application of the APIRG/27 & RASG-10 conclusion 6/10, data collection on GNSS RFI in the AFI region was conducted both through online sources and reports provided by States.

2.10. Based on information available to the Secretariat – collected by EASA and States in the region- , reported GNSS RFI occurrences remain limited in the AFI region. In 2024 and 2025, cases of GNSS RFI were reported in various areas in the AFI region including FIRs in central Africa as well as in the horn of Africa. In 2026, GNSS RFI events remain persistent in Asmara and Mogadishu FIRs. However, the information available to the Secretariat did not identify reported GNSS RFI events resulting in significant impact on flight operations and air traffic management including height keeping in RVSM airspace.

2.11. ANSPs and air operators are expected to develop contingency procedures to manage events of loss of GNSS signal including reversion to conventional ground-based navigational facilities. In addition, ARMA has implemented data quality assurance process which can be applied to ADS-B data.

Way forward

2.12. Given the challenges faced by air operators of the AFI region in meeting the ADS-B mandate coupled with the performance-based approach adopted in key airspace projects which intrinsically dictate the requirement for CNS infrastructure, it may be considered relevant to switch from the ADS-B prescriptive regional approach to specific project requirements approach.

2.13. The ADS-B carriage rate in the AFI region is reasonably high, however its use for RVSM height keeping monitoring requires consideration of safety risks related to GNSS. Some mitigating measures must be adopted to ensure data consistency, reliability, integrity and availability while conducting ADS-B based height keeping monitoring. Criteria such as the Navigation Integrity Category (NIC) as well as GNSS RFI event occurrences frequency in FIRs can be used to determine the quality of data used for height keeping monitoring.

2.14. As an interim measure, both the Enhanced Generation 2 GPS Monitoring Unit (E2GMU) and ADS-B can be used by ARMA to calculate the Altimetry System Error (ASE) in AFI. However, the collection of height keeping data based on E2GMU may be done on a cost recovery basis to be incurred by the aircraft operator.

2.15. Aircraft operators should provide ARMA, in a timely manner, with the list of aircraft in their fleet requiring RVSM height-keeping monitoring using E2GMU.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) Take note of the information provided in this paper;

b) Review and adopt the proposed Conclusion on the use of ADS-B in AFI airspace operations

c) ;

d) review and adopt the proposed conclusion from the ninth meeting of AAO Sub-Group (WP4A paragraph 2.88) on the enhancement of the RVSM height keeping monitoring; and

e) Provide additional guidance as deemed necessary.

AASPG/2 Conclusion 2/XX: Use of ADS-B in AFI airspace operations					
Why:	*That, to enable the use of ADS-B in AFI airspace operations, while maintaining the acceptable level of safety*				
What:	*a) The requirement for ADS-B use in air traffic management must be based on specific airspace improvement concept of operations. This conclusion supersedes APIRG/22 Conclusion 22/40 on the Mandate for ADS-B Transponder Extended Squitter 1090 equipage in the AFI region.* *b) States to update their AIP publications relating to ADS-B operational requirements for all airspace improvement concepts.*				
Who:	*a) AASPG/2* *b) States*				
When:	*a) 6 November 2026* *b) 30 July 2027*				
Implementation follow-up					
Follow-up required	Yes ☒ No ☐	Metrics	**Metric 1:** Number/percentage of airspace improvement initiatives for which ADS-B equipage and operational requirements have been defined and published .	Means to collect data	Secretariat report to AASPG

ATTACHMENT A – ADS-B CARRIAGE RATE IN AFI

FIR												
	2022			2023			2024			2025		
	ADS B	Total Mvt	Rate	ADS B	Total Mvt	Rate	ADS B	Total Mvt	Rate	ADS B	Total Mvt	Rate
Accra FIR	59964	75695	79%	73009	80443	91%	76156	81224	94%	77272	83164	93%
Addis Ababa FIR	105264			150864			183631	214901	85%	187421	222900	84%
Antananarivo FIR	17529			20315			20710			21587		
Asmara FIR	13718			32501			40899			25426		
Beira FIR	11507			13912			12968			13607		
Brazzaville FIR	25211			31399			33893			33071		
Cape Town FIR	21907			28084			30308			34903		
Dakar FIR-Terrestrial	35476			42719			45730			51073		
Dakar FIR-Oceanic	18477			21712			23109			25799		
Dar Es Salaam FIR	24177			28593			29464			31488		
Entebbe FIR	27099	35320	77%	36190	46168	78%	37782	48144	78%	40905	48644	84%
Gaborone FIR	17730			22790			23509			26960		
Harare FIR	17079			22058			24401			38427		
Johannesburg FIR	47718			59410			65049			75523		
Johannesburg Oceanic FIR	1240			2477			3082			3291		
Kano FIR	65119	82482	79%	62769	85602	73%	65443	82331	79%	77195	88469	87%
Kigali FIR	4179			4257			3697			2966		
Kinshasa FIR	20452	22964	89%	27176	30995	88%	28098	30986	91%	26971	31000	87%
Lilongwe FIR	16868			20336			22600			22685		
Luanda FIR	10287			14156			13835			13623		
Lusaka FIR	15432			19746			20322			21008		
Mauritius FIR	4408			6511			7464			8059		
Mogadishu FIR	67284			84239			70432			69810		

Nairobi FIR	57199			69841			76299			82316		
N'Djamena FIR	16709			17404			19351			22181		
Niamey FIR	48330			56598	61035	93%	61144	67437	91%	59528	70964	84%
Roberts FIR	8211			7190			7751			8749		
Sal FIR	20282			22925			24533			27468		
Seychelles FIR	16124	19016	85%	18284	21077	87%	20313	21797	93%	20593	25377	81%
Windhoek FIR	16599	20565	81%	20002	23048	87%	20153	23406	86%	21664	25165	86%
TOTAL PER YEAR	**831579**			**1037467**			**1112126**			**1171568**		**86%**