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**INTERNATIONAL
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ASBU Implementation Challenges in the AFI Region

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Africa–Indian Ocean Region: Scale & Context

48

Member States

AFI Region

~500

International Routes

across AFI airspace

31

FIRs

ESAF : 22 WACAF: 9

Regional Characteristics

- The ICAO AFI region is mapped through 31 FIRs
- One of the largest ICAO regions by geographic area
- Significant diversity in state capabilities and resources
- Many states categorized as Least Developed Countries (LDCs)
- Critical international air routes connecting continents

Implementation Context

- ICAO AASPG oversees regional planning and implementation
- Rapid air traffic growth outpacing infrastructure upgrades
- High dependence on international aid and technical assistance
- Language and regulatory heterogeneity across states

Overview of Major Implementation Challenges



1. Financial & Economic Constraints

Limited aviation budgets, lack of dedicated funding mechanisms, and competing national priorities



2. Technical Infrastructure Gaps

Outdated CNS/ATM equipment, inadequate ground infrastructure, and poor maintenance capability



3. Human Resource Limitations

Shortage of trained aviation professionals, brain drain, and limited training institutions



4. Connectivity & Communication

Poor data link coverage, inadequate satellite communication infrastructure and ground network reliability



5. Regulatory & Governance Issues

Fragmented national regulatory frameworks, slow legislative reform, and weak enforcement capacity



6. Coordination & Political Will

Weak inter-state coordination, lack of political commitment, and inconsistent prioritization

Financial & Economic Constraints

Core Financial Barriers

High Capital Investment Required

Upgrading CNS/ATM systems, radar, and datalink infrastructure demands millions of dollars upfront: far beyond the budgets of many AFI states.

Low Aviation Revenue Generation

Many AFI states generate insufficient revenue from air navigation charges, route fees, and airport taxes to self-fund ASBU upgrades.

Competing National Priorities

Health, education, and infrastructure often take precedence over aviation technology investment in national budget allocations.

Lack of Dedicated Funding Mechanisms

Absence of ring-fenced aviation modernization funds, making aviation technology projects compete annually with other expenditures.

< 10%

of AFI states self-fund major CNS/ATM upgrades

Potential Solutions

- ICAO Safety Fund (SAFE)/No Country Left Behind Initiatives
- World Bank & AfDB aviation grants
- Regional cost-sharing arrangements
- Public-Private Partnerships (PPPs)
- Foreign Direct Investment in airports

Technical Infrastructure Gaps

Outdated CNS/ATM Equipment

Many AFI states still operate Voice HF/VHF communication systems and secondary surveillance radar (SSR) that predate modern ADS-B and ACAS requirements. Replacing aging equipment is costly and logistically complex.

Unreliable Power Supply

Erratic national power grids threaten the continuity of ANS. Many facilities lack adequate backup power, causing service interruptions incompatible with modern CNS/ATM requirements.

Poor Data Connectivity

Ground-to-ground data network infrastructure for AIDC, AMHS, and SWIM is underdeveloped across the region, hindering the interconnectivity that ASBU require.

Limited ADS-B Coverage

ADS-B ground infrastructure is incomplete across large parts of the AFI region, creating surveillance gaps especially over oceanic and remote continental airspace critical for Block upgrades.

Maintenance & Spare Parts Deficit

Limited local maintenance capacity and long supply chains for spare parts result in extended equipment downtime. Many states lack the technical expertise to maintain modern systems domestically.

Cybersecurity Vulnerabilities

As aviation systems transition to digital and networked architectures, many AFI states lack cybersecurity frameworks, personnel, and tools to protect critical aviation infrastructure.

Human Resource & Capacity Limitations



Shortage of Skilled Personnel

- Acute shortage of qualified technical personnel
- Insufficient safety oversight inspectors



Brain Drain & Retention

- Qualified professionals emigrate to better-paying regions
- Private airlines recruit trained ATCs away from ANSPs
- Low public sector aviation salaries deter qualified candidates
- Limited career progression within national ANSPs
- Trained personnel lost to international organizations



Training & Education Gaps

- Few ICAO-approved aviation training centers in AFI
- High cost of international training programs
- Language barriers for Aviation training
- Outdated training curricula not aligned with ASBU content
- Limited e-learning or distance training infrastructure

Regulatory & Governance Challenges

A

Weak National Regulatory Frameworks

Many AFI states lack comprehensive ANSP legislation or have outdated aviation laws that do not accommodate modern CNS/ATM and ASBU-aligned performance-based operations.

B

Inadequate Safety Oversight Capacity

ICAO Universal Safety Oversight Audit Programme (USOAP) findings show persistent deficiencies in safety oversight capabilities across many AFI states, undermining confidence in ASBU implementation quality.

C

Slow Regulatory Reform Processes

Legislative and regulatory amendments required for PBN, ADS-B mandates, and datalink adoption face prolonged parliamentary or ministerial approval processes, delaying timely ASBU adoption.

D

Absence of Independent ANSPs

In several AFI states, ANSPs remain embedded within government ministries, lacking the operational independence, commercial orientation, and accountability structures needed for efficient modernization.

Inter-State Coordination

Coordination Failures

Fragmented Airspace Management

Adjacent states implement ASBU modules at different rates, creating incompatible airspace management practices at FIR boundaries.

Bilateral ATS Agreement Gaps

Many AFI states lack up-to-date bilateral Letters of Agreement (LOAs) for ATC coordination, creating safety risks at sector boundaries.

Weak Political Commitment

Without high-level government buy-in, ASBU implementation plans stall at technical levels and fail to secure the necessary national resources.

APIRG/AASPG Mandate Implementation

Recommendations from APIRG/AASPG meetings are inconsistently transposed into national action plans, with limited follow-up accountability mechanisms.

Connectivity Barriers

Connectivity Barriers

AFTN/AMHS Network Deficiencies

The AFTN and its digital successor AMHS are unreliable in many AFI states, hindering the exchange of flight plan and meteorological data.

Satellite Coverage Limitations

While VSAT and satellite links have improved, remote areas and oceanic routes still suffer from limited and expensive satellite communications for both ATC and airline operations.

Digital Divide

Uneven broadband infrastructure across AFI means states cannot equally participate in SWIM or SWIM frameworks envisioned in Block 1 and beyond.

Internet-Based ATS Services

Emerging internet-based aviation communication services require reliable terrestrial backbone networks that many AFI states currently cannot guarantee.

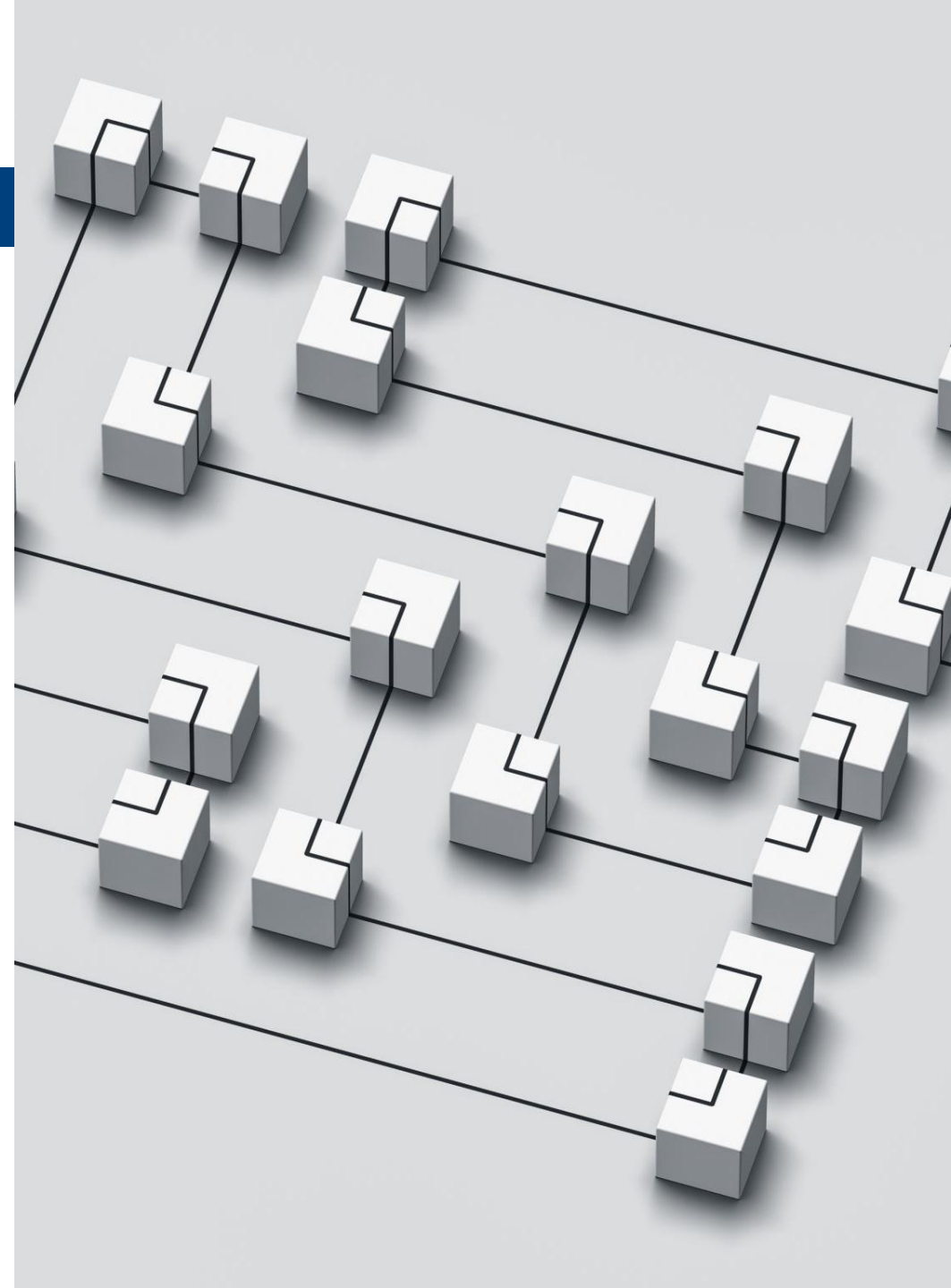
Strategic level Challenges

1

Access to GANP and ASBU material in all ICAO official languages.

2

Difficulty of aligning national air navigation plans with a GANP that evolves faster than national regulatory, procurement, and implementation cycles.



Case Studies: AFI State Challenges

West Africa

ADS-B Implementation Delays

Several West African states committed to ADS-B mandates under the AFI ADS-B Implementation Plan but faced equipment procurement delays due to foreign currency shortages and prolonged tender processes.

Key Lesson: Joint procurement through ASECNA demonstrated cost savings but required complex multilateral agreements.

Central Africa

ATS Route Restructuring

Airspace restructuring projects required for Free Route Airspace (FRA) implementation have stalled due to disagreements over changes to FIR boundaries and associated revenue sharing.

Key Lesson: Political resolution at ministerial level proved necessary before technical work could proceed.

East Africa

PBN Approach Procedure Backlogs

States implementing PBN approaches (RNP AR, LPV) encountered significant backlogs due to insufficient flight procedure design specialists and the high cost of flight validation aircraft.

Key Lesson: Regional cooperation for flight procedure design has helped but remains insufficient.

Island States

Oceanic Surveillance Gaps

Small island states in the Indian Ocean struggle to maintain ADS-C and ACARS surveillance coverage on oceanic routes due to the cost of satellite-based communication contracts.

Key Lesson: ICAO SAFE funding and donor partnerships have been essential for these states.

Strategies to Overcome ASBU Implementation Barriers

01

Strengthen Regional Cooperation

Formalize sub-regional ASBU implementation groups. Establish joint procurement consortia and airspace redesign task forces across FIR boundaries.

02

Dedicated Funding Mechanisms

Establish national ASBU implementation funds. Engage World Bank, AfDB, and bilateral donors early. Pursue ICAO CDI project support for critical upgrades.

03

Invest in Human Capital

Establish or strengthen national aviation training centers. Partner with ICAO TRAINAIR PLUS. Create competitive ANSP compensation packages to reduce brain drain.

04

Accelerate Regulatory Reform

Fast-track aviation legislation amendment. Harmonize African aviation regulations under a common framework.

05

Leverage Technology & Partnerships

Form partnerships with equipment manufacturers for local maintenance training and capacity transfer.

06

Accountability & Monitoring

Implement robust ASBU dashboards at national and regional level. Establish clear KPIs and report progress to AASPG.

Thank You

