



**INTERNATIONAL CIVIL AVIATION ORGANIZATION**  
**AFI Aeronautical Surveillance Implementation Task Force**  
**(AS/I /TF/2)**  
**(Dakar, Senegal, 22 to 24 June 2011)**

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**Agenda Item 6 : ADS-B 1090 ES transponder capable mandatory carriage in AFI**

(Note presented by Industry: Thales)

Summary

This note presents a proposal aiming at benefiting as soon as possible from the ADS-B technology by recommending some dates for ADS-B capable transponder mandatory carriage in AFI Region

**1. Introduction**

There is a lack of surveillance capability in many FIRs of the AFI region. The AFI region expect to implement around 2015 PBN standards and 30 by 30 Nm minimal separations for the FIRs where the traffic does not justify lower separation minima.

To comply with these 30 x 30 separation minima, ICAO has demonstrated that the ADS-C is sufficient (for the surveillance domain).

Even though most of the ATM systems are ADS-C capable, the aircraft equipage is not sufficient and will be not complete, talking into account the cost of installation and operation of ADS-C.

The ADS-B represents a more promising technology that could replace the ADS-C on the continental airspaces where the radar or WAM systems are not cost effective.

This note wants to present the constraints and advantages of both ADS systems and justify a phased ADS-B mandatory carriage.

**2. Discussions**

**2.1 ADS-C**

To comply with the miscellaneous recommendations of the APIRG meetings since the end of the nineties, most of the Air Navigation Services Providers have implemented ADS-C functionalities (as well as CPDLC) based on FANS1/A and ACARS protocol.

The main benefits of ADS-C are;

- Only ICAO standardized available surveillance capability over oceanic/desertic area
- It allows separation reductions, compatible with PBN
- It can have a direct coupling with FDP and controllers benefits from safety nets
- Support dynamic re-routing (DARP) and flextracks
- Additional functions are embedded such as;
  - Aircraft intent
  - Weather information

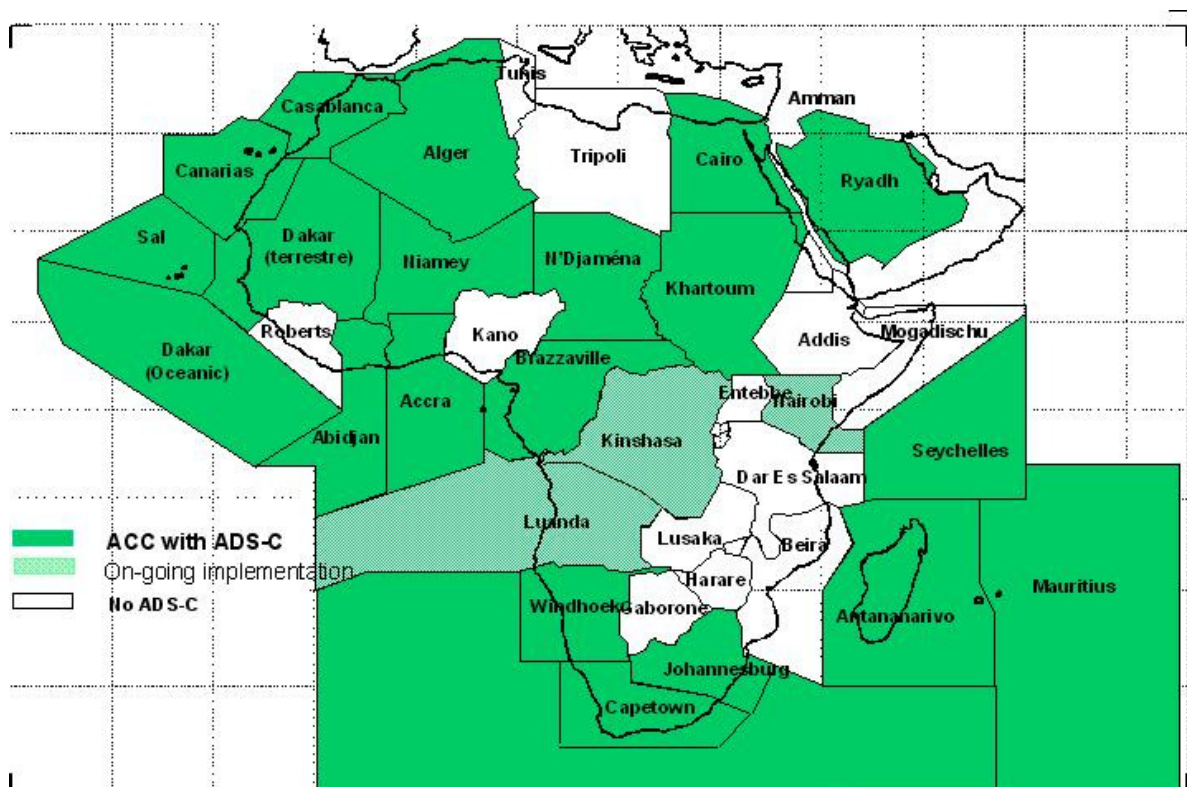
The main drawbacks are:

- The FANS1/A ADS-C reports based upon not ICAO standardized protocol (ACARS)
- It has a limited VDL-A coverage in AFI region
- Only Main carriers are Satcom equipped=> regional A/C
- Aircraft equipage is limited to major
- It has not a standard response time (95% of messages are delivered in 120s)
- Accuracy does not allow terminal operations
- Cost of communications is important
- It is a point to point link, thus there is no situation awareness capability.

The following drawing shows the ADS-C capable ATM system and the covered FIRs.

Many ANSP which do not have implemented ADS-C on continental areas benefit from a solid radar coverage, mainly South Africa, Egypt, Kenya, Ghana, Botswana, Libya, Morocco, Tunisia and Uganda.

But, apart the EUR-SAM corridor and flights departing/leaving South Africa from/to Asia, the use of the ADS-C function is underused in most of the continental AFI FIRs.



## 2.2 ADS-B

The ADS-B is a ICAO standardized, already used operationally, in some cases in the same environment (Australia) as in the AFI region.

The ADS-B main benefits are the following:

- Accuracy like GPS (same quality independent of range to ground station)
- Coverage like a secondary radar
- High update rate (2 positions/second, 2 velocity/second)
- Intent available (level-off altitude, next waypoint, etc.)
- Low ground equipment cost
- Low infrastructure requirements
- Low lifecycle cost

The main ADS-B drawbacks:

- Requires Equipped Aircraft
- Requires validation – no measurement by itself (hence “dependent surveillance”)

To date, a few African Air Navigation Services Providers are or expect to implement quickly ADS-B ground stations, mainly;

- Ethiopia,
- La Reunion (France),
- Morocco,
- Democratic Republic of Congo,
- Roberts FIR

Other Air Navigation Services Providers have medium to long terms ADS-B projects, notably;

- ASECNA,
- Seychelles,
- Tanzania,
- Botswana,
- Mozambique,
- Malawi,
- Zimbabwe,

ADS-B requires a dedicated avionics. To date, only 30% to 40% of the aircraft flying in AFI Region are ADS-B capable and almost 70 % if one considers only the aircraft flying in upper airspace.

Europe imposes Enhanced Mode-S (EHS) since 2007 for some European States. This mandate explains why more than 80% of the aircraft flying from/to Europe are ADS-B capable.

The history shows that a minimum period of 7 years is necessary, once a mandatory carriage is issued before getting more than 95% of aircraft equipped.

In order than the AFI Region benefits from this available surveillance capability, it is important that this sub-group studies ADS-B 1090ES transponder mandatory carriage circulars.

### 3. Action by the meeting

Considering that;

- The percentage of ADS-C equipped aircraft is not sufficient and will not never be 100%.
- IATA is in favor of ADS-B
- Already, 70 % of the IATA aircraft are ADS-B equipped
- That Europe is recommending that all the aircraft be ADS-B capable in 2015
- That ADS-B can ensure better performances and at lower cost than ADS-C

In order to accelerate the use of ADS-B, the meeting is invited to:

- a) recommend the mandatory carriage of ADS-B 1090 ES capable transponder for the **1st January 2018** for all the aircraft flying in upper airspace
- b) recommend the mandatory carriage of ADS-B 1090 ES capable transponder for the **1st January 2021** for all the IFR aircraft in lower airspace
- c) until the availability of the ADS-B, study and implement existing solutions such as radar and Wide Area Multilateration (WAM) systems.
- d) Recommend that ATM system be able to process and display the data coming from these surveillance systems.