IMPROVING AIRSPACE SURVEILLANCE WITH ADS-B

Surveillance requirements in ASECNA areas

ASECNA Trial in Antananario FIR

SUMMARY

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2. **ADS-B DEFINITION & BENEFITS**

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7. **SURVEILLANCE PROJECTS IN PROGRESS IN ASECNA AREA**

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INTRODUCTION

- ✓ The air traffic control method used in most of the ATS centres of the AFI Region is the control with procedures with or without means of surveillance.

- ✓ Without skills of visualisation, only this classic method can be used.

- ✓ Spacing between aircraft is mostly based altitude, distance, degrees even for overflying, arriving or departing aircraft.

- ✓ The means of surveillance with this method is mental by using strips.

INTRODUCTION

The method «air traffic procedures » is particularly penalizing for the users and the ATC :

- ✓ Spacing standards are not coherent with link with the new generation aircraft capability.
- ✓ Bing margin of error in the calculation of the flight data.
- ✓ Flight data from air or ground are indistinct.
- ✓ Spatial memorization and representation are mainly supported by ATC.
- ✓ Indistinctness of the localization of the aircraft in case of emergency, etc.

INTRODUCTION

With skills of visualisation, air traffic services are provided with more serene way. It allows :

- ✓ To visualise on screen the traffic using the airspace.

- ✓ To reduce spacing by using radar spacing type.

- ✓ To increase airspace capacity.

- ✓ To have more precision and reliability of the flight data.

INTRODUCTION

With skills of visualisation, air traffic services are provided with more serenity way. It allows :

- ✓ To provide aeronautical information more precise.

- ✓ Easy localization of aircraft for the alert service.

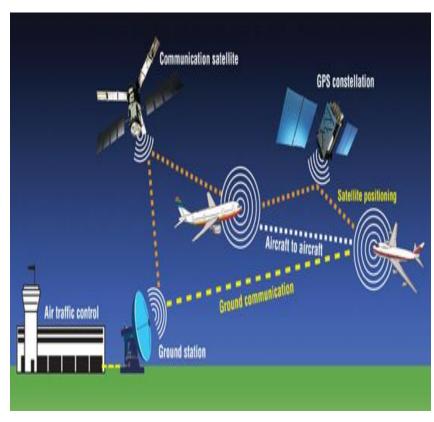- ✓ Flexibility in the field of navigation based on aircraft performance.

ADS-B DEFINITION

DEFINITION

- ✓ ADS-B (Automatic Dependent Surveillance-Broadcast) is a technique of surveillance by which the parameters of position, route, heading or of speed are transmitted via digital data link, in regular intervals, for ATC and crews.

- ✓ The transmitting aircraft ignore the destination made by its sending, the current and potential users of the data. The packages of information sent will be exploited or not by the users

BENEFITS

On ground (for ATC)

ADS-B is designed to ease Air Traffic Control (ATC) as the number of approaches grows, enhancing safety and increasing airport capacity.

In Air (for crews)

ADS-B provides information to enhance the pilots' traffic awareness, allowing more optimal flight levels leading to fuel savings.

ADS-B STATION

An ADS-B station consists of :

- o   an antenna
- o   a receiver
- o   A processing unit.

It can cover more than 200 NM in upper airspace.
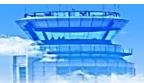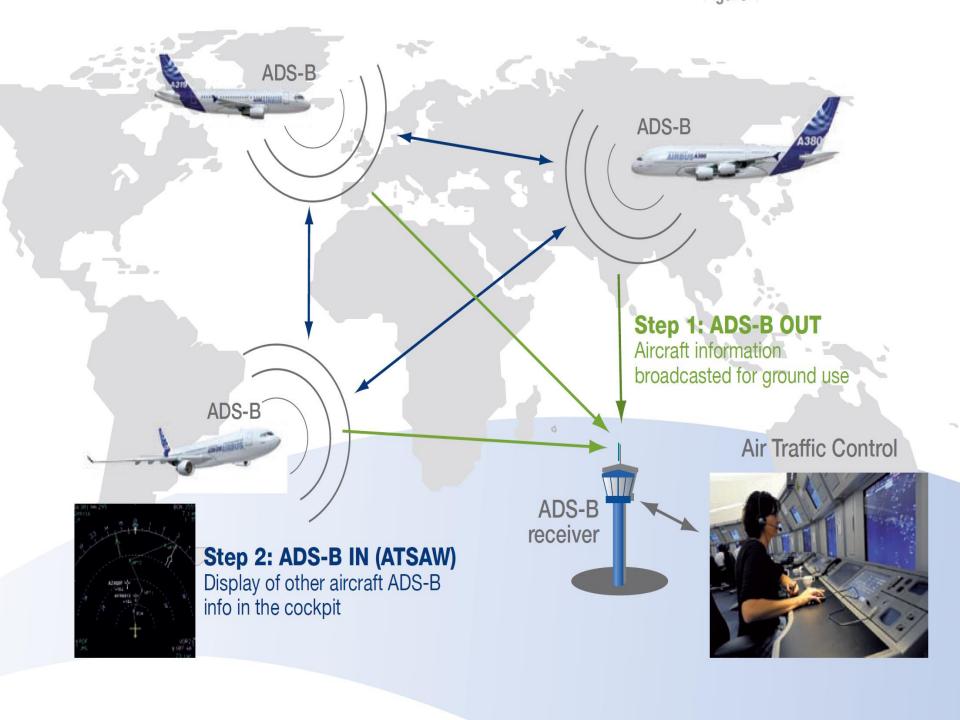
ADS-B OUT and ADS-B IN

ADS-B OUT and ADS-B IN

ADS-B is considered in two parts as :

1. ***ADS-B OUT*** provides means of automated aircraft parameter transmission between the aircraft and the ATC.

2. **ADS-B IN** provides automated aircraft parameter transmission between aircraft themselves.

ADS-B

ADS-B

ADS-B

Step 1: ADS-B OUT
Aircraft information
broadcasted for ground use

Air Traffic Control

ADS-B
receiver

Step 2: ADS-B IN (ATSAW)
Display of other aircraft ADS-B
info in the cockpit

ADS-B OUT and ADS-B IN

ADS-B OUT

✓ ADS-B OUT automatically transmits aircraft parameters from the aircraft to the ATC on ground.

✓ There is no need for the pilot's action and it conforms to AAC regulations on ADS-B OUT, for Non-Radar Airspace (NRA) operations.

✓ The capability must be declared in the FCOM (Flight Crew Operating Manual) and the FM (Flight Manual) shall be updated

ADS-B OUT and ADS-B IN

ADS-B IN

and... the ATSAW

The Airbus approach to ADS-B IN is named the Air Traffic Situational Awareness (ATSAW) which enables the reception of ADS-B information from other aircraft in its vicinity. As for the ADS-B OUT, the capability must also be declared in the FCOM and the FM updated

ATSAW is splited in two steps:
⇨*Step 2A: ATSAW operation in flight*
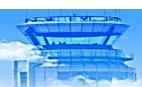⇨*Step 2B: ATSAW operation on ground*

ADS-B OUT and ADS-B IN

ADS-B IN

and... the ATSAW

⇨*Step 1: ATSAW operation in flight*

ATSAW

- ✓ Improves cooperation with ATC (better understanding of ATC instructions),
- ✓ Improves the detection of opportunities for flight level changes in standard separation for reduced fuel savings and a reduction of CO2 emissions,
- ✓ Improved efficiency on approach,
- ✓ Enhances identification and information on target aircraft,
- ✓ Increases runway capacity.

ADS-B OUT and ADS-B IN

ADS-B IN
and... the ATSAW

⇨ Step 1: ATSAW operation in flight

ATSAW with ITP
(In Trail Procedures)

- ✓ Enables more frequent altitude changes by temporarily reducing standard separation,

- ✓ Enables flying at the optimum flight level,

- ✓ Provides significant fuel savings

ADS-B OUT and ADS-B IN

ADS-B IN

and... the ATSAW

⇨*Step 2: ATSAW operation on ground*

✓ Enhanced situational awareness during surface operations

ADS-B OUT and ADS-B IN

ADS-B IN

and... the ATSAW

⇨ *Next → Step 3 : Sequencing and merging*

- ✓ The objective of the future step is to enable the flight crews to achieve and maintain automatically a given spacing with designated aircraft.

- ✓ The two principle manoeuvres are "*remain behind*" and "*merge behind*".

- ✓ The operational benefit will be the enhanced traffic regularity during the approach to airports with heavy traffic allowing increased airport capacity.

HOW DOES ADS-B WORK ?

HOW DOES ADS-B WORK ?

ADS-B OUT

It uses ATC transponders to transmit aircraft information to the ground, using the Mode S 1090 MHz Extended Squitter with a refresh rate of 0.5 seconds.

HOW DOES ADS-B WORK ?

ADS-B IN

- ✓ On aircraft, it is the TCAS computer that receives and treats the ADS-B information coming from ATC transponders of surrounding aircraft.

- ✓ The information is then displayed on the Navigation Display (ND).

- ✓ When ATSAW is activated and if the ADS-B information is available from aircraft in the vicinity, the following information are available for each pilot:

☞ Aircraft identification   ☞ Wake vortex category

☞ Absolute bearing/2D distance   ☞ Relative altitude/Absolute altitude

☞ Heading/Tracking   ☞ Ground speed & Vertical velocity

THE GREAT DEBATE :

IS ADS-B GOOD OR BAD?

ADS-B is an awkward phrase that was virtually unknown to pilots just a few years ago.

<u>Year 2020</u> : Deadline for equipping with ADS-B Out and In. Then:

- ✓ A slew of portable ADS-B receivers hit the market

- ✓ Pilots are starting to learn what this new system really entails. But not everyone likes what they see.

THE GREAT DEBATE: IS ADS-B GOOD OR BAD?

- ✓ Proponents argue that ADS-B moves the aviation community from an outdated, ground-based air traffic control system to a modern satellite-based system.

- ✓ ADS-B should improve airspace capacity, offer more direct routings and improve safety.

- ✓ ADS-B offers subscription-free weather and traffic to anyone with the proper equipment -and these benefits can be enjoyed now, before the entire program is in place.

- ✓ So while nobody likes to spend money, the benefits of ADS-B are significant for the relatively low cost of avionics.

THE GREAT DEBATE: IS ADS-B GOOD OR BAD?

- ✓ Opponents retort that ADS-B is years late and billions of dollars over budget.

- ✓ Even when it's completed, the requirement to have a panel-mounted ADS-B Out transponder in controlled airspace will force aircraft owners to spend money they don't have.

- ✓ Most of the benefits are for ATC and most of the expense falls on individual pilots. Many airplanes may simply be sold or abandoned, as owners leave aviation rather than pay for the upgrades.

- ✓ There's also a potential occurrence for ADS-B to be hacked by criminals.

THE GREAT DEBATE: IS ADS-B GOOD OR BAD?

What do you think?

- ✓ Is ADS-B a bright future that should be embraced by pilots?

- ✓ Or is it a needless expense that will drive more people out of aviation?

Ask yourself and decide as CAA, ANSP or User.

Some frequently asked questions on ABS B.

THE GREAT DEBATE: IS ADS-B GOOD OR BAD?

How will the new ADS-B Out rule affect ?

- ✓ On January 1, 2020, when operating in designated airspace (upper airspace) users must equip their long range fleet with ADS-B Out avionics that meet the performance requirements.

- ✓ Aircraft not complying with the requirements may be denied access to this airspace.

THE GREAT DEBATE: IS ADS-B GOOD OR BAD?

As users, when do we have to equip?

✓ The rule requires ADS-B Out performance by January 1, 2020, to operate in designated airspace. If you never fly into ADS-B-designated airspace, then there is no requirement to equip.

✓ The ADS-B ground infrastructure is being deployed now and will be fully deployed by 2018, so those who choose to equip early will realize benefits long before the ACC mandate.

WORKSHOP ADS-B

Dakar 22 - 24 July 2014

THE GREAT DEBATE: IS ADS-B GOOD OR BAD?

Will aircraft be able to fly in a non-transponder area without ADS-B?

For the most part, the ADS-B mandate covers the same airspace where transponders are required. However, to be sure of the regulatory requirements it is best to check ADS-B-designated airspace for transponder-designated airspace.

What is the difference between ADS-B Out and ADS-B In?

ADS-B Out is the ability to transmit a properly formatted ADS-B message from the aircraft to ground stations and to ADS-B-In-equipped aircraft. ADS-B In is the ability of an aircraft to receive information transmitted from ADS-B ground stations and from other aircraft. ADS-B In is not mandated by the ADS-B Out rule. If an operator chooses to voluntarily equip an aircraft with ADS-B In avionics, a compatible display is also necessary to see the information.

THE GREAT DEBATE: IS ADS-B GOOD OR BAD?

What are ADS-B In broadcast services?

- ✓ ADS-B In pilot cockpit advisory services consist of Flight Information Service-Broadcast (FIS-B) and Traffic Information Service-Broadcast (TIS-B). These are free services transmitted automatically to aircraft equipped to receive ADS-B In.

- ✓ FIS-B provides a broad range of textual/graphical weather products and other flight information to the general aviation community. FIS-B is only available on the 978MHz Universal Access Transceiver (UAT) equipment.

What are ADS-B In broadcast services?

✓ *FIS-B includes the following:*

☞ Aviation Routine Weather Reports (METARs)

☞ Non-Routine Aviation Weather Reports (SPECIs)

☞ Terminal Area Forecasts (TAFs) and their amendments

☞ Notice to Airmen (NOTAM) Distant and Flight Data Center

☞ Airmen's Meteorological Conditions (AIRMET)

☞ Significant Meteorological Conditions (SIGMET and SIGMET)

☞ Temporary Flight Restrictions (TFRs)

☞ Pilot Reports (AIREPS)

THE GREAT DEBATE: IS ADS-B GOOD OR BAD?

What are ADS-B In broadcast services?

- ✓ TIS-B is an advisory-only service available to both 1090ES and UAT equipment users.

- ✓ TIS-B increases pilots' situational awareness by providing traffic information on all transponder-based aircraft within the vicinity of the ADS-B In equipped aircraft receiving the data

ADS-B TRIAL IN INDIAN OCEAN
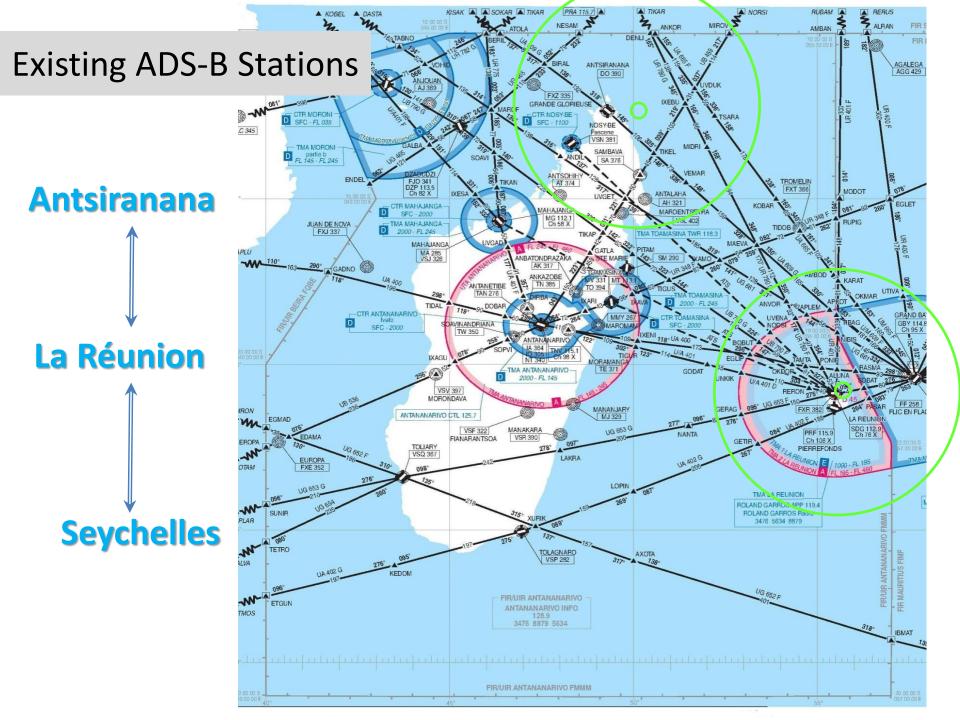
Antananarivo FIR

RECALL

The trail of ADS-B took place from 06 to 24 August 2012 in the North part of Antananarivo FIR with the neighbouring FIRs like Seychelles, Mauritius and La Reunion Centre.

- ✓ 06 to 13 May 2012: implementation of the ADS-B station at Antsiranana completing two others in Seychelles and La Reunion.

- ✓ On 18 May 2012: implementation in Tana ACC Room of the data display to visualise the traffic.

- ✓ With this screen, ATCos follow the air situation in the three ADS-B station.

- ✓ 10 to 27 July 2012: Integration of ADS B data in the ATM system of the Centre (EUROCAT-X V3.20).
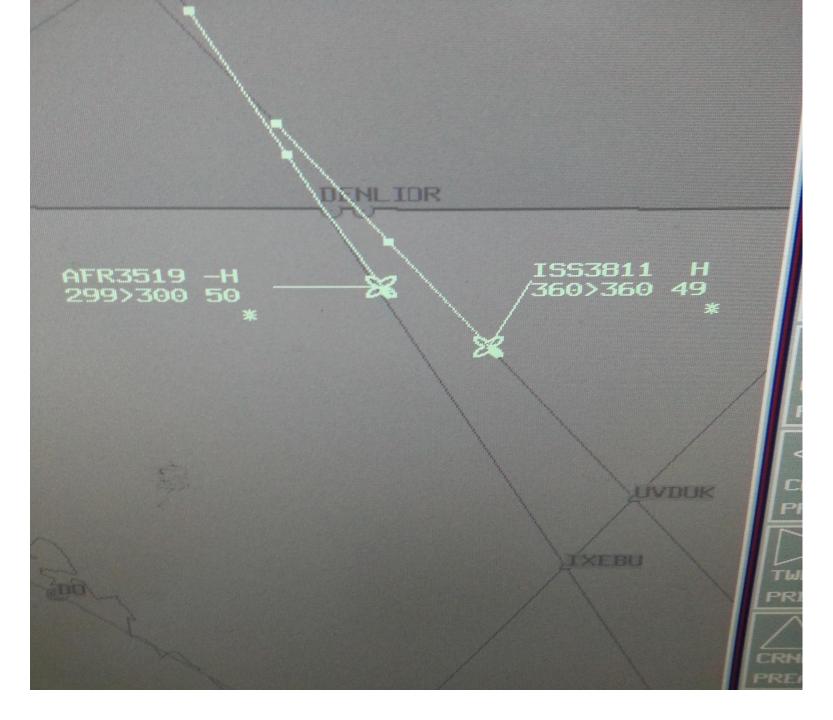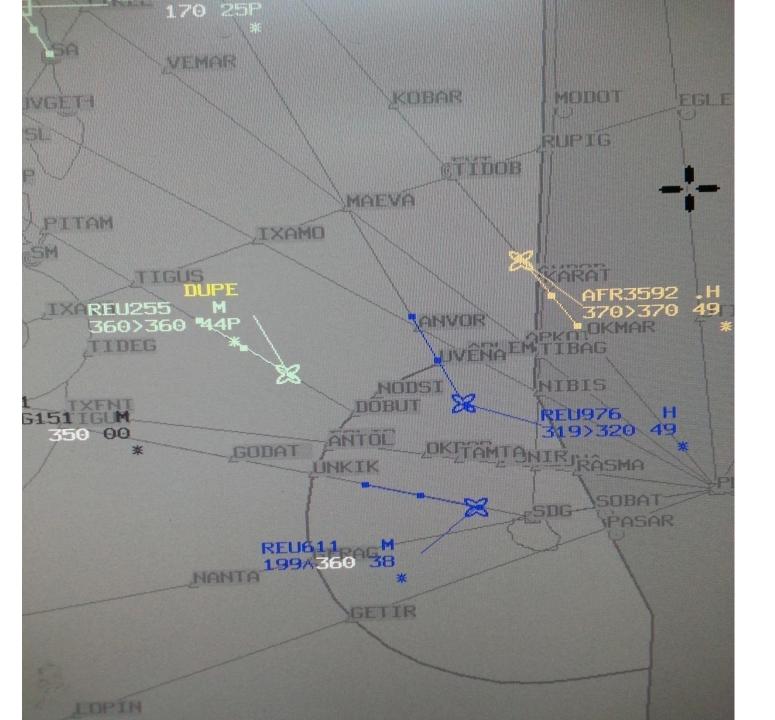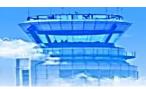
Existing ADS-B Stations

Antsiranana

La Réunion

Seychelles

ADS B track on EUROCAT display

DENLIDR

AFR3519 -H
299>300 50
          *

ISS3811   H
360>360 49
             *

UVDUK

IXEBU

DO

CR
PR

TW
PR

CRN
PRE

170 25P

VEMAR

KOBAR   MODOT   EGLE

JVGETH

SL   RUPIG

TIDOB

MAEVA

PITAM   IXAMO

SM

TIGUS   KARAT

DUPE

IXAREU255   M   AFR3592   .H
360>360 44P   370>370 49

TIDEG   OKMAR

ANVOR   APKN
UVENA   EM TIBAG

NODSI   NIBIS
TXFNT   DOBUT
G151 IGL M   REU976   H
350 00   ANTOL   319>320 49

GODAT   OKFTAMTANIR   RASMA
UNKIK

SDG   SOBAT
PASAR

REU611   M
199A 360   38

NANTA

GETIR

LOPIN

STATUS OF USING ADS B AT ANTANANARIVO

AGENCE POUR LA SÉCURITÉ DE LA NAVIGATION
AÉRIENNE EN AFRIQUE ET À MADAGASCAR

ASECNA

STATUS OF USING ADS B AT ANTANANARIVO

✓ The implementation of the ADS-B station at Antsiranana allows to cover several ATS routes in the north part. These routes link Europe and North-East of Africa with La Reunion, Mauritius, South Africa and Asia.

✓ This cover corresponds at least at 10 % of the total volume of the FIR.

✓ The traffic represents near 25 % of the traffic managed by the ACC.

✓ A data collection of the flights in this coverage area has been made for the period of 18 to August 2012. The results are the following.

ASECNA

AGENCE POUR LA SÉCURITÉ DE LA NAVIGATION AÉRIENNE EN AFRIQUE ET À MADAGASCAR

TRAFFIC DATA IN THE AREA FROM 18 TO 24 AUGUST 2012

231 flights have been registered in the period :

☞**162** have connected ADS-B only, that is **70 %** ;

☞**118 (51%)** have connected both ADS-B and ADS-C, it is mainly the new generation aircraft ;

☞**44 (19%)** have connected ADS-B and was not equipped with ADS-C ;

☞**72 (31%)** had no ADS-B connection and was not equipped with ADS-C ;

☞**31 (19%)** had power ADS-B connection, bad quality of NUC<5.

RESULTS

So, by taking as reference the ADS-C connection only, we noted 19% of additional traffic connected only ADS-B and the whole could be displayed on the same screen.
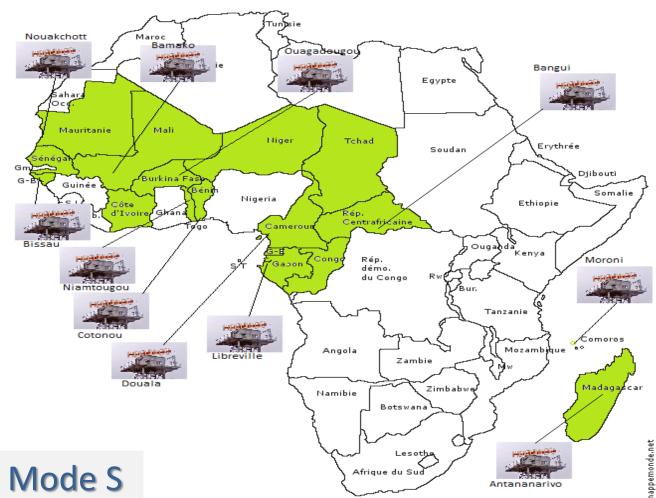
SURVEILLANCE PROJECTS IN PROGRESS IN ASECNA AREA
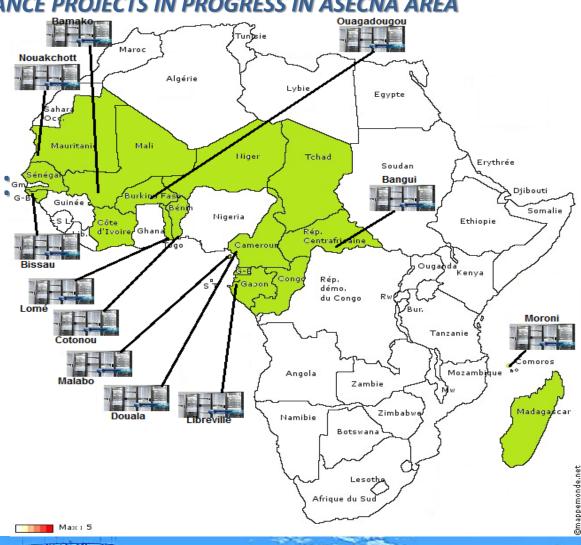
SURVEILLANCE PROJECTS IN PROGRESS IN ASECNA AREA

- ## 11 radars MSSR Mode S

AGENCE POUR LA SÉCURITÉ DE LA NAVIGATION
AÉRIENNE EN AFRIQUE ET À MADAGASCAR

SURVEILLANCE PROJECTS IN PROGRESS IN ASECNA AREA

- 12 systems by centre comprising :
  - Radar
  - ADS-B
  - ADS/CPDLC
  - MLAT

ASECNA

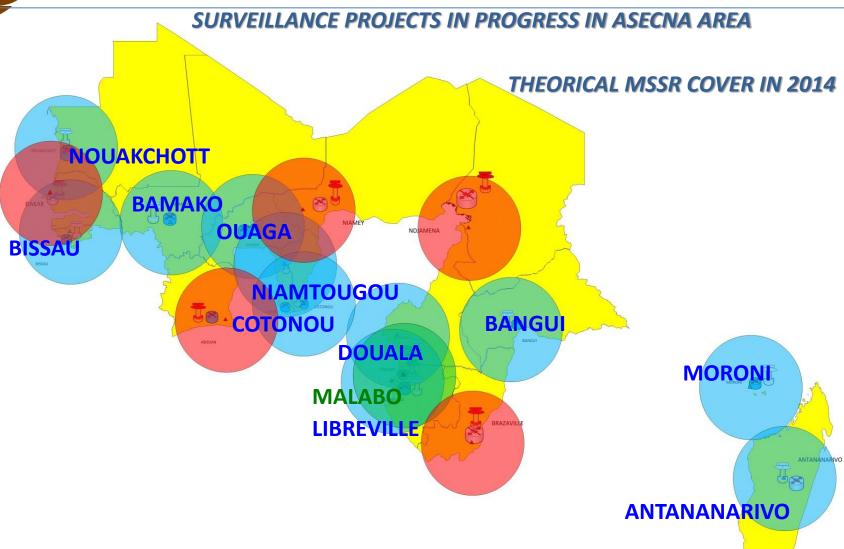AGENCE POUR LA SÉCURITÉ DE LA NAVIGATION AÉRIENNE EN AFRIQUE ET À MADAGASCAR

SURVEILLANCE PROJECTS IN PROGRESS IN ASECNA AREA

THEORICAL MSSR COVER IN 2014

NOUAKCHOTT

BAMAKO

OUAGA

BISSAU

NIAMTOUGOU

COTONOU

DOUALA

MALABO

LIBREVILLE

BANGUI

MORONI

ANTANANARIVO

CONCLUSION

1. Whilst the initial drivers (mainly SESAR and NextGen) are motivated by the need to maintain and where possible enhance safety standards, the commercial implications for operators are not forgotten.

2. The benefits from the Automatic Dependent Surveillance Broadcast (ADSB) are not only for Air Traffic Control (ATC), but also for the airlines, flight crew and passengers.

3. ADS-B OUT eases the flight crew and ATC workload, resulting in fuel and time savings thanks to more efficient approaches.

CONCLUSION

4. ADS-B IN presents additional opportunities for fuel and time savings, in particular by the utilization of 'In Trial Procedures' for long range flights in the oceanic airspace, maintaining safety.

5. ADS-B is in the early stages of a roadmap vision up to 2020 to be adopted by Vendors, ACC, ANSPs and Users.

6. Vendors will continue to develop new solutions to ease flight operations, thus contributing to reduce the congestion in future Air Traffic Management.

7. ASECNA is engaged in this way and the satisfaction of the experience in Antananarivo FIR brought us to decide to acquire the ADS-B for ATC operation before 2017.

THANK YOU FOR ATTENTION