INTERNATIONAL CIVIL AVIATION ORGANIZATION

Third Meeting of the APIRG Airspace and Aerodrome Operations Sub-Group (AAO/SG3), Virtual Meeting, 3 to 5 August 2020

Agenda Item 3: Planning and implementation (Projects and ASBUs Modules)

Implementation of ASBU Modules in ASECNA area

(Presented by ASECNA)

SUMMARY
This paper provides a report related to the implementation of AMHS, ATS Inter-facility Data Communication (AIDC) ADS-B in ASECNA area as well as between ASECNA centers and neighboring centers and the ongoing SBAS program within ASECNA MEMBERS STATES.
REFRENCE(S): - Global Air Navigation Plan (Doc 9750)
Related ICAO Strategic Objective(s): *A: Safety – Enhance global civil aviation safety.* *C: Environmental Protection – Minimize the adverse effect of global civil aviation on the environment.* *E: Efficiency: Enhance the efficiency of aviation operations.* *D: Continuity: Maintain the Continuity of aviation operation*

1. Introduction

1.1 In accordance to the global air navigation plan (GANP), the regional navigation plan and the Aviation System Block Upgrade (ASBU) concept, ASECNA planned projects to enhance safety and efficiency and ensure environmentally sustainable operations and globally interoperable services through use of appropriate technical installations.

1.2 Regional and interregional cooperation is required to take full advantage of the investment and the infrastructure provided to improve the quality of the services.

1.3 This working paper reports on the progress made in the implementation of various services including AMHS, AIDC, ADS-B, CPDLC.

2 Discussion

2.1 Infrastructure improvement

Appropriate CNS infrastructure is required to support the provision of ATM services and meet the capacity and efficiency requirements. For this purpose, ASECNA pursued to improve the CNS infrastructure including:

- ✓ Upgrade of the CAFSAT network nodes via the implementation of the phase I re-engineering to support full IP capability,
- ✓ Expansion and interconnexion of AFISNET to South America Region (SAM) with nodes in Recife, Cayenne and Trinidad and Tobago linking AFI and AFI regions,
- ✓ Interconnection and/ or interoperability of AFISNET with the AFI aeronautical VSAT networks (SADC-III, NAFISAT, CAFSAT, REDDIG…),
- ✓ Modernization of AFISNET (AFISNET/SITA Gateway).

Additional bilateral and multilateral cooperation initiatives are ongoing to sustain and improve the CNS infrastructures:

- ✓ Cooperation in the gulf of Guinea,
- ✓ AFI North West Area (ANWA) Cooperation,
- ✓ ASECNA/ATNS MoU,
- ✓ Satellite Network Management Committee,
- ✓ Cooperation in SAT area.

2.2 Progress in AMHS implementation

2.2.1 AMHS is the technology recommended by the International Civil Aviation Organization (ICAO) for the exchange of aeronautical messages between the Member States of the Organization, through the Communication Centers of the Fixed Aeronautical Service (SFA).

2.2.1 Since 2014 ASECNA started AMHS installation for the smooth implementation of ATS messaging in accordance with ICAO regional plan. Up today, AMHS systems are implemented and operational in ten (10) centers. Since 2017, AFS Circuits between ASECNA centers are operating in AMHS. Actions are ongoing to pursue AMHS connections with adjacent ACCc.

2.2.2 On June 25, 2020, after IOT and Pre-operational procedures and a very full coordination and cooperation between ASECNA and DECEA (Brasil) during COVID-19 period, the first connection in AMHS (ATS Message Handling System) technology between South America and Africa, was operationally activated

2.2.3 With the activation of the AMHS link with Dakar, in Senegal, using satellite connection of the AFISNET network from Recife and Dakar , DECEA and ASECNA guarantee the fluidity necessary for the processing of Flight Plans, Meteorology and Aeronautical Information messages between South America and Africa.The kink is operating successfully.

2.2.4 Currently, ASECNA is conducting a complementary AMHS project to equip the remaining centers with AMHS systems. The contract is signed by the end of 2019 and the project is going normally.

The status of AMHS implementation is provided in Appendix A.

2.3 AIDC implementation

2.3.1 Identified in the Aviation System Blocks Upgrades (ASBU) modules as one of the candidate functionality for the block zero elements/technologies, AIDC provides the datalink capability to enable timely exchange of aeronautical data between adjacent ATSUs during the notification, coordination and transfer phase of flight between different FIRs.

2.3.2 Very early ASECNA equipped the ACC with ATM Automation systems including AIDC capability coordination, which significantly reduces the workload of Air Traffic Controllers while impacting positively on safety.

2.3.3 AIDC have been established with the neighboring equipped FIRs of Antananarivo, Niamey, Ndjamena, Brazzaville. In 2015 AIDC operational test were successfully conducted between Dakar and Abidjan and reported at SAT20 meeting in Abidjan.

2.3.4 Since 2017, AIDC operational tests were conducted between ASECNA internal centers thanks to the

implementation surveillance and ATM automation project in eleven (11) additional centers. The tests were to other centers and after some technical challenges, the AIDC connection was successfully established between Abidjan and Accra, in March 2019 and upon validation tests.

2.3.5 In the framework of SAT coordination meetings as well as bilateral as multilateral initiatives, several AIDC connections trials are on going and will be completed soon, despite of the critical situations due to the COVID-19. This includes the connections:

- Johannesburg/Antananarivo, at an advanced coordination stage,
- Dakar/Recife with trials ongoing and AIDC message currently exchanged,
- Dakar/Cayenne with coordination on going

2.3.6 However, some challenges should be addressed to allow the seamless implementation of AIDC in the AFI region:

- Interoperability issue between centers with OLDI capability (Sal, Las Palmas, Casblanca, Algiers) and the AIDC centers,
- Coordination between the centers ;
- Operational and technical trainings.

Common test protocols including prerequisite check lists, test configuration development and test results templates

The status of AIDC implementation and Details of tests trials are provided in Appendix B

2.4 ADS-B Implementation

2.4.1 To improve air traffic management throughout its airspace, which covers large areas, parts of which are inhospitable regions: oceanic, desert, forest, etc., and which cannot be covered by ground-based surveillance means, ASECNA has chosen to implement space based automatic dependent surveillance broadcast ADS-B.Contract ASECNA/AIREON

2.4.2 In this framework the following main steps have been conducted

- Experimentation and assessment of conformity to the ADS-B requirements through Benchmarking, sensitization, safety studies, training, performance monitoring Operational implementation Center
- Tests and parameters assessment trough transport network (AFISNET) to validate key parameters (Latency, FOM, Bandwidth, probability of detection, update period…)
- Benchmarking to EASA to benefit from feedback from the AIREON certification and continuous surveillance process,
- Benchmarking to NAV CANADA to benefit from the experience in:
  - ✓ Operational use of ADS-B satellite technology in Canada, operational concept,
  - ✓ Safety studies before deployment (engineering, air traffic control, training); Controller training (HMI, simulations on reduced separations),
  - ✓ The monitoring system set up (monitor ADS-B satellite data and analyze any anomalies),
  - ✓ Technical capacities and requirements within the framework of the supply of the surveillance system: RCP, RSP and RNP,
  - ✓ Certification and approval procedures for the use of ADS-B data by satellite.
- Safety studies
- Pre-operational implementation since 1st January 2020

2.4.3 The ADS-B SB implementation provides a real operational benefit. The Survey of fleet equipage shows more than 95 % fleet equipped in oceanic airspace

- Pilots and air traffic controllers very happy;
- Fuel saving (environment):Pilot requesting direct routes

- ❖ Increase Safety,
- ❖ Enhance efficiency

The implementation planning is provided in appendix C

2.5 Status of SBAS implementation

2.5.1 ASECNA, main mission is to provide air navigation services within a Single Sky airspace of 16 million squared kilometres, corresponding to the airspace under the jurisdiction of its Member States and to oceanic airspace in central Atlantic Ocean, gulf of Guinea and Indian Ocean entrusted by the international community.

2.5.2 ASECNA is committed to the provision of SBAS services in its area of responsibility as per the resolutions taken by its Member States in 2005, and has initiated in 2011 an own SBAS programme which pursues the autonomous provision of L1 early services from the 2021/2022 time horizon for the benefit of its airspace users.

2.5.3 This programme aims also to contribute to the implementation of both Single African Sky and African Union Space Policy and Strategy, for which it constitutes a key enabler, and is developed within the framework of the bilateral cooperation on satellite navigation between the Agency and the European Union (EU), and more globally of the Africa-EU Strategic Partnership.

2.5.4 SBAS does not require the installation or maintenance of local ground-based navigation aids or landing systems and the provision of related staff, and is particularly adapted to the African operational environment, where remote and isolated regions are vast and numerous. The benefits of its introduction are expected to be much more important than in any other part of the world.

2.5.5 SBAS in ASECNA airspace is intended to enhance PBN and ADS-B operations for all phases of flight, from en-route down to approach, and thereby to increase significantly flight safety and efficiency. It will improve availability for all RNAV routes and flexibility for new and more efficient routes, and will provide an effective solution for CAT-I equivalent operations “everywhere every time”, especially in the very large number of runway ends, in international, regional and domestic airports, not served by precision approaches today. It will also enable to ensure service continuity during ILS maintenance and renewal periods and will overcome the known safety and operational performance limitations of LNAV/VNAV operations.

2.5.6 The signal-in-space will be compliant with corresponding SARPs from International Civil Aviation Organisation (ICAO) contained in ICAO Annex 10, Minimum Operational Performance Standards (MOPS) published by RTCA (Radio Technical Commission for Aeronautics) and EUROCAE (European Organisation for Civil Aviation Equipment), and the regulations of the Member States which will proceed to the required certification.

2.5.7 The services provision strategy is to meet user needs with an incremental approach in terms of coverage and performances, taking into account expendability towards the next generation of DFMC. ASECNA plan is to autonomously provide airspace users with L1 early services from 2024/2025 and DFMC services beyond 2028-2030.

2.5.8 The infrastructure is developed using EGNOS technology and assets. It will comprise a network of Navigation Reference Stations (NRS), Mission Control Centre(s) (MCC), Navigation Broadcast Stations located and owned by Nigcomsat(NBS), a SBAS wide area transport network, and a space segment. The GEO satellite used for this SBAS is the property of Nigeria (Nigcomsat)

2.5.9 ASECNA SBAS programme is fully-fledge initiative supported by its Member States which aims to improve significantly and sustainably flight safety and efficiency in the AFI region for the direct benefits of its airspace users from 2024-time horizon.

2.5.10 The A-SBAS architecture is provided in appendix D

3. Action by the meeting

The meeting is invited to:

a) note the information contained in this paper,

b) urges the concerned states to coordinate to expedite the implementation of the services above to overcome a seamless AFI Airspace

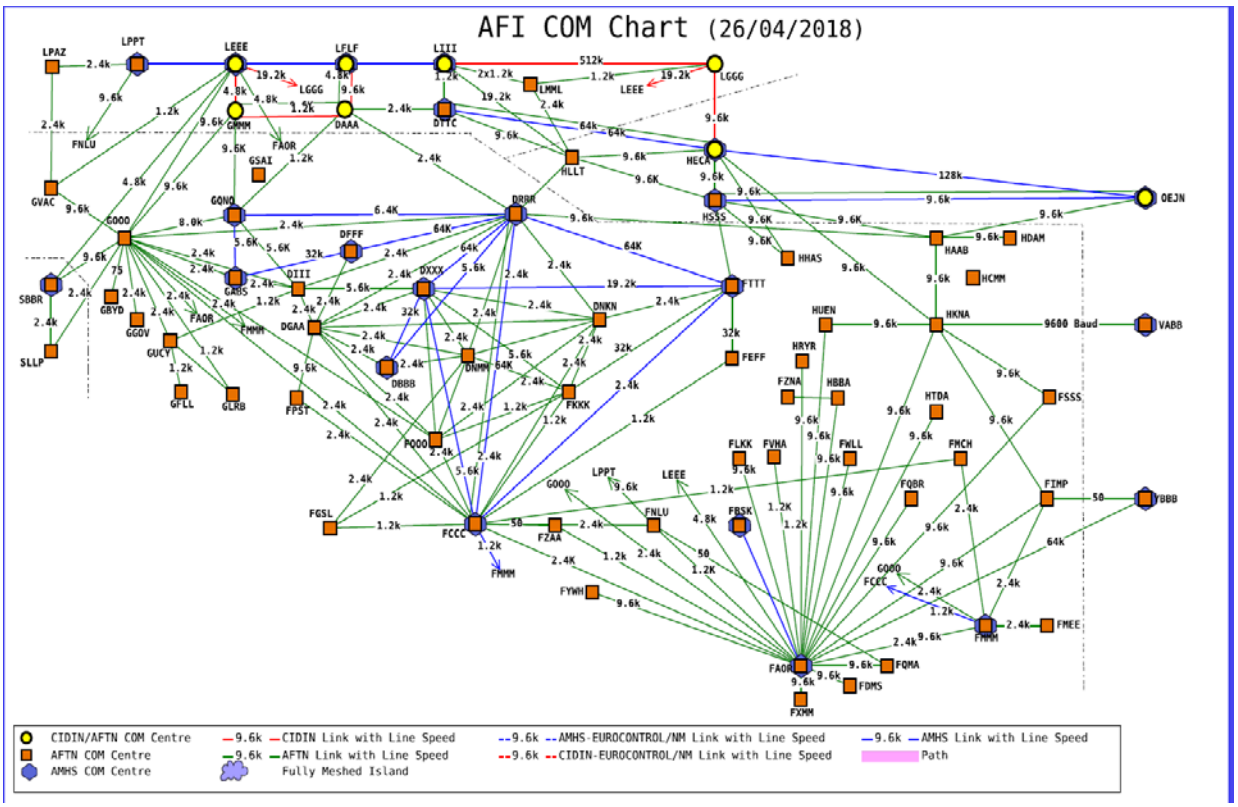
c) Strengthen cooperation among the ANSP for improvement of the aeronautical services.

Appendix A

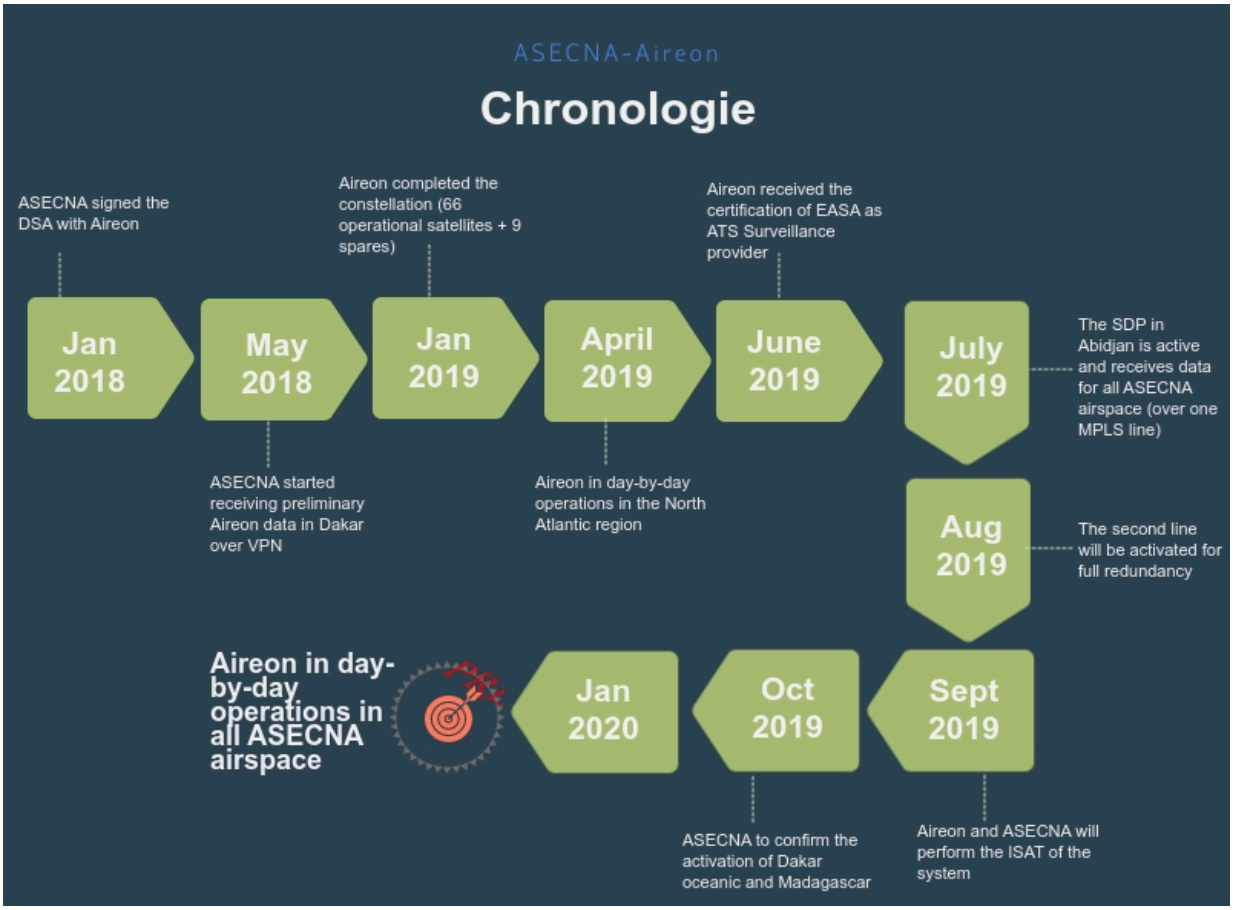
AMHS Implementation Status and registration on AMC site

Registration « AMHS Capabilities » on the AMC site

Location Name	Locations indicators	AMHS Capabilities	Registered /Remarks
Cotonou	DXXX	OK	26 July 2016
Lomé	DBBB	OK	26 July 2016
Ouagadougou	DFFF	OK	24 July 2017
Niamey	DRRR	OK	25 July 2017
Antananarivo	FMMM	OK	27 July 2017
Ndjamena	FTTT	OK	24 July 2017
Bamako	GABS	OK	26 July 2017
Nouakchott	GQNO	OK	25 July 2017
Brazzaville	FCCC	OK	26 July 2017
Dakar	GOOO	OK	26 July 2017
Abidjan	DIII	December 2020	Project on ongoing (Contract signed)
Douala	FKKK	December 2020	
Libreville	FOOO	December 2020	
Bangui	FEFF	December 2020	
Bissau	GGOV	December 2020	
Moroni	FMCH	December 2020	
Malabo	FGSL	December 2020	



Appendix C: SB -ADS-B implementation planning


ASECNA-Aireon
Chronologie
ASECNA signed the DSA with Aireon
Jan 2018
May 2018
ASECNA started receiving preliminary Aireon data in Dakar over VPN
Aireon completed the constellation (66 operational satellites + 9 spares)
Jan 2019
April 2019
Aireon in day-by-day operations in the North Atlantic region
Aireon received the certification of EASA as ATS Surveillance provider
June 2019
July 2019
The SDP in Abidjan is active and receives data for all ASECNA airspace (over one MPLS line)
Aug 2019
The second line will be activated for full redundancy
Sept 2019
Aireon and ASECNA will perform the ISAT of the system
Oct 2019
ASECNA to confirm the activation of Dakar oceanic and Madagascar
Jan 2020
Aireon in day-by-day operations in all ASECNA airspace

Appendix B

AIDC Implementation Status

ASECNA ATS Centers	Connection centers	AIDC Validation Planning	Comments
Abidjan	Roberts	-	ATM system upgrading ongoing in Roberts
	Luanda	Planned	Implementation planning to agree
	Accra	Mars 2019	AIDC test over AFTN, operational since March 2019.
	Atlántico	December 2019	Implementation planning to agree
Dakar	Roberts	-	ATM system upgrading ongoing in Roberts
	Las Palmas	-	Implementation planning to agree due to interoperability issue between OLDI and AIDC systems
	SAL	-	Implementation planning to agree due to interoperability issue between OLDI and AIDC systems
	Cayenne	planned	Trials on going
	Piarco	Planned	Implementation planning to agree
	Recife	Dec. 2020	Trials ongoing.
Brazzaville	Luanda	-	Trials to continue
Antananarivo	Johannesburg	December 2020	Trials on going
Niamey	Algiers	-	To be agreed (OLDI/AIDC interoperability issue)

Appendix D

ASECNA SBAS Architecture

- Navigation Reference Stations (NRS)
- 2 MCC (NPS/CCF)
- 2 NBS Navigation Broadcast Stations located and owned by Nigcomsat(NBS),
- 1 satellite GEO