



## **THIRTEENTH AIR NAVIGATION CONFERENCE**

**Montreal, Canada, 9 to 19 October 2018**

### **COMMITTEE A**

#### **Agenda Item 4: Implementing the global air navigation system and the role of planning and implementation regional groups (PIRGs)**

##### **4.3: Implementing ASBUs for performance improvement**

#### **ASECNA STRATEGY FOR ASBU MODULES IMPLEMENTATION**

(Presented by the Agency for Air Navigation Safety in Africa and Madagascar (ASECNA) on behalf of its Member States<sup>2</sup>)

#### **EXECUTIVE SUMMARY**

This information paper presents the status of implementation of the ASBU modules in ASECNA Member States and the implementation strategy adopted.

In particular, it describes the state of implementation of the Block 0 modules as well as the planning for the Block 1 modules as part of its five-year investment plan 2018-2022.

## **1. INTRODUCTION**

1.1 The Global Air Navigation Plan (GANP) and the Aviation System Block Upgrades (ASBU) methodology, provide a framework for future improvements in air navigation technologies and procedures, in a strategic consultative approach that combines specific global performance capabilities and on-time flexibility for the improvements associated with each component.

1.2 ASBU modules are structured in blocks and their implementation must be in accordance with the operational requirements of the region. The ASBU framework and the technology roadmap have been set to ensure that all conditions related to the planning of activities at national and regional levels are met.

1.3 The AFI Region has adopted and classified the eighteen modules of Block 0 for its implementation. Nine modules have priority 1 as they cover most AFI States. The remaining modules are priority 2, and apply only to specific States in the AFI region.

<sup>1</sup> English and French versions provided by ASECNA

<sup>2</sup> Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Equatorial Guinea, France, Gabon, Guinea-Bissau, Madagascar, Mali, Mauritania, Niger, Senegal, Togo

## 2. DISCUSSION

2.1 ASECNA is an air navigation service provider for eighteen States of AFI Region (West, Central and Indian Ocean). The implementation of air navigation service improvement programs, based on ASBU, requires strong political commitment in such an institutional environment. ASECNA's strategic orientation plan, containing the ATM strategic plan to 2030, approved by the Committee of Ministers in charge of Civil Aviation in Member States, is based on the GANP and AFI plan frameworks.

2.2 Projects related to the modules contained in block 0 of ASBU framework are integrated in successive investment plans of ASECNA since 2014 and appear in the actual investment plan for 2018-2022 period already adopted in July 2017 by the Committee of Ministers.

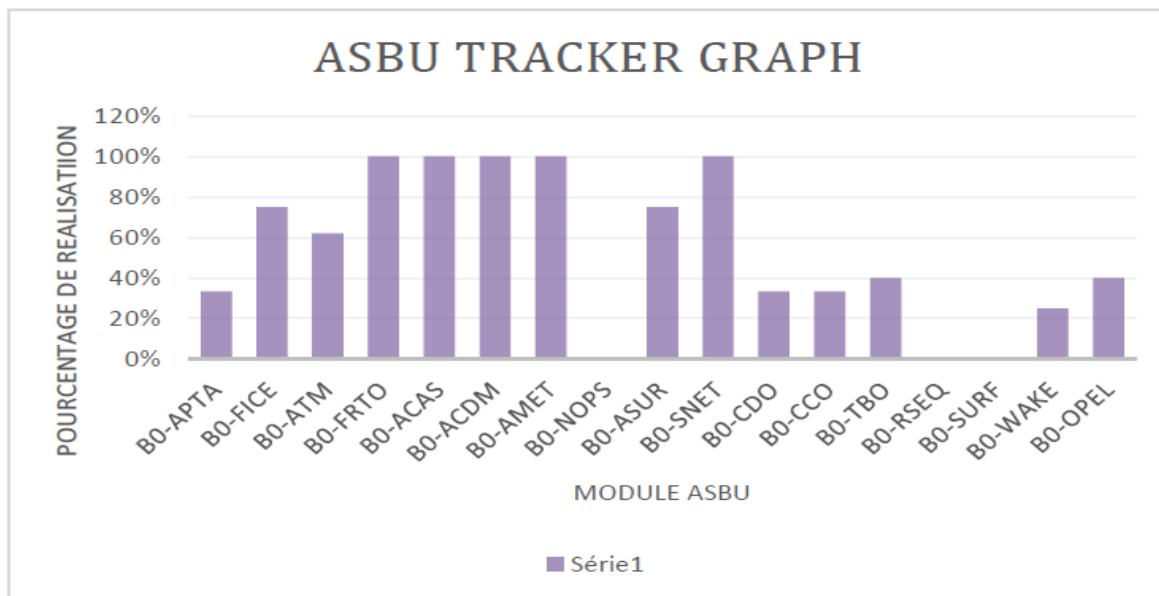
2.3 The ASBU Block 1 modules, considered relevant in the ASECNA Member States, were also planned as indicated in the table in Appendix B, but this planning may be adjusted according to the provisions of the AFI Region and the advancement of technology.

2.4 ASECNA, within the framework of the AFI Region, participated in the two workshops organized by ICAO on the implementation of the ASBU concept, including the discussions on key performance area in safety domain.

2.5 Among the eighteen modules of Block 0, twelve modules are selected in ASECNA Member States, then ranked in order of priority 1 and 2. Then, nine modules are classified in the priority 1 and the other three in priority 2.

2.6 The table in appendix A gives the state of implementation of the modules of block 0 at the level of Member States of ASECNA.

2.7 The ASBU tracker on the state of implementation of ASBU in ASECNA zone gives the graph below:



### 3. **CONCLUSION**

3.1 The Conference is invited to take note of the contents of this information paper as well as the implementation planning attached in Appendices A and B.

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## APPENDIX A

### ASBU BLOCK 0 MODULES IMPLEMENTATION PLAN FOR ASECNA

| Performance Improvement Areas (PIA)      | ASBU Block 0 Modules | Title of the Module                                                                                | Description of the module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Statut of implementation                                                                                                                                                                                                                                                                                                                                                                                                                | ASECNA dates |
|------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>PIA 1:<br/>AIRPORT<br/>OPERATIONS</b> | B0-APTA              | Optimization of approach procedures including vertical guidance                                    | The use of performance-based navigation (PBN) and ground-based augmentation system (GBAS) landing system (GLS) procedures will enhance the reliability and predictability of approaches to runways, thus increasing safety, accessibility and efficiency. This is possible through the application of basic global navigation satellite system (GNSS), Baro-vertical navigation (VNAV), satellite-based augmentation system (SBAS) and GLS. The flexibility inherent in PBN approach design can be exploited to increase runway capacity. | 80% of the 17 main airports of the Member States of ASECNA have SID / STAR procedures PBN RNP1.<br>All major airports in the Member States of ASECNA have APV procedures (Baro VNAV) except Bangui (Central African Republic) and N'Djamena (Chad) for which the validation of the safety study is in progress.<br>A GBAS project is in progress with an experimental phase at Dakar airport.<br>An SBAS ASECNA project is in progress. | 2018-2022    |
|                                          | B0-SURF              | Safety and efficiency of surface operations (A-SMGCS levels 1-2) and enhanced vision systems (EVS) | First levels of advanced-surface movement guidance and control systems (A-SMGCS) provides surveillance and alerting of movements of both aircraft and vehicles at the aerodrome, thus improving runway/aerodrome safety. Automatic dependent surveillance-broadcast (ADS-B) information is used when available (ADS-B APT). Enhanced vision systems (EVS) is used for low visibility operations                                                                                                                                           | <b>SMGCS</b><br>A-SMGCS systems already installed at the new airport Dakar-Diass and Nouakchott Oumtounsy                                                                                                                                                                                                                                                                                                                               | 2018-2022    |
| <b>PIA 2:</b>                            | B0-FICE              | Increased interoperability,                                                                        | To improve coordination between air traffic service units (ATSUs) by using ATS                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>AIDC, OLDI<br/>AFTN, AMHS</b>                                                                                                                                                                                                                                                                                                                                                                                                        | 2018-2022    |

| Performance Improvement Areas (PIA)            | ASBU Block 0 Modules | Title of the Module                                       | Description of the module                                                                                                                                                                                                                | Statut of implementation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ASECNA dates |
|------------------------------------------------|----------------------|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>GLOBALLY INTEROPERABLE SYSTEMS AND DATA</b> |                      | efficiency and capacity through ground-ground integration | interfacility data communication (AIDC) defined by ICAO's Manual of Air Traffic Services Data Link Applications (Doc 9694). An additional benefit is the improved efficiency of the transfer of communication in a data link environment | <p>The implementation includes the activation of AIDC functionality on ATM systems for 100% traffic coordination between ACC. ATM systems major airports in ASECNA Member States will be equipped with the AIDC functionality except Bangui Airport.. In summary the AIDC point:</p> <ul style="list-style-type: none"> <li>• Implementation of links: Antananarivo/Plaisance (Mauritius), Brazzaville/Khartoum (Sudan), Dakar/Abidjan, Niamey/N'Djamena, Niamey/Algiers, Ndjamen/Brazzaville, N'Djamena/Khartoum (Sudan), Ouagadougou/Niamey, Ouagadougou/Bamako, Ouagadougou/Abidjan, Niamey/Bamako, Niamey/Lomé and Niamey/Cotonou, Douala/Ndjamen, Lomé/Cotonou</li> <li>• Ongoing trials between Accra and Abidjan with the prospect of extension in Lomé, Cotonou, Niamey and Ouagadougou by the end of 2019</li> <li>• Ongoing trials between Dakar and Nouakchott, Dakar and Bamako</li> <li>• ATM systems at the 16 main airports of the ASECNA Member States, except Bangui Airport, are equipped with AIDC functionality.</li> <li>• Regional project to implement AIDC between ASECNA centers and NAMA (Nigeria), GCAA (GHANA), Roberts FIR and ATNS (SADC, NAFISAT), SAM, MID is in progress.</li> </ul> <p>AMHS is already implemented in Lomé,</p> |              |

| Performance Improvement Areas (PIA) | ASBU Block 0 Modules | Title of the Module                                                     | Description of the module                                                                                                                                                                                                                                                                                                                                                         | Statut of implementation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ASECNA dates |
|-------------------------------------|----------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
|                                     |                      |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                   | <p>Cotonou, Nouakchott, Niamey, Antananarivo, Brazzaville, Bamako, N'Djamena, Ouagadougou and Dakar.</p> <p>The implementation of AMHS in the rest of the COM centers of the 17 ASECNA Member States is planned for the end of 2019.</p> <p>The state of implementation of the required AMHS circuits is: Dakar: 4/12; Nouakchott: 1/1; Bamako: 1/1; Cotonou:1/2; Niamey: 4/8; N'Djamena: 2/2; Ouagadougou: 1/1; Brazzaville: 3/11; Antananarivo:1/4.</p> <p>Regional project to implement AMHS circuits between ASECNA centers and NAMA (Nigeria), GCAA (GHANA), Roberts FIR and ATNS (SADC, NAFISAT), SAM, MID, EUR is scheduled for end 2019.</p> |              |
|                                     | B0-DATM              | Service improvement through digital aeronautical information management | The initial introduction of digital processing and management of information from origination to publication through, aeronautical information service (AIS)/aeronautical information management (AIM) implementation, use of aeronautical exchange model (AIXM), migration to electronic aeronautical information publication (AIP) and better quality and availability of data. | <p><b>AIS/AIM related projects</b></p> <p>Implementation elements include:</p> <ul style="list-style-type: none"> <li>• AFTN / AMHS,</li> <li>• Migration from AIS to AIM: Operational exploitation of the AIXM 4.5 database and production of eAIP for 2018; Migration to the AIXM 5.1 version in 2019-2022.</li> <li>• QMS for AIM implemented. ISO 9001 V2015 certified in all Member States of ASECNA</li> <li>• WGS-84 campaign conducted periodically; latest campaign made in 2015 on ASECNA States airports.</li> </ul>                                                                                                                      | 2019-2022    |
|                                     | B0-AMET              | Meteorological information                                              | Global, regional and local meteorological information:                                                                                                                                                                                                                                                                                                                            | <p>Implementation elements include:</p> <ul style="list-style-type: none"> <li>• QMS for MET implemented. ISO 9001</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2019         |

| Performance Improvement Areas (PIA)                             | ASBU Block 0 Modules | Title of the Module                                        | Description of the module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Statut of implementation                                                                                                                                                                                                                                                                                                                       | ASECNA dates |
|-----------------------------------------------------------------|----------------------|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
|                                                                 |                      | supporting enhanced operational efficiency and safety      | <p>a. forecasts provided by world area forecast centres (WAFCs), volcanic ash advisory centres (VAACs) and tropical cyclone advisory centres (TCAC);</p> <p>b. aerodrome warnings to give concise information of meteorological conditions that could adversely affect all aircraft at an aerodrome, including wind shear; and</p> <p>c. SIGMETs to provide information on occurrence or expected occurrence of specific en-route weather phenomena which may affect the safety of aircraft operations and other operational meteorological (OPMET) information, including METAR/SPECI and TAF, to provide routine and special observations and forecasts of meteorological conditions occurring or expected to occur at the aerodrome.</p> <p>This information supports flexible airspace management, improved situational awareness and collaborative decision making, and dynamically-optimized flight trajectory planning. This module includes elements which should be viewed as a subset of all available meteorological information that can be used to support enhanced operational efficiency and safety</p> | <p>V2015 certified in all Member States of ASECNA</p> <ul style="list-style-type: none"> <li>• WAFS (use of new products: Turbulence, icing, CB).</li> <li>• Tropical cyclone monitoring planned for 2019.</li> <li>• Wind shear detection systems planned for 2019.</li> <li>• Thunderstorm and warning systems provided for 2019.</li> </ul> |              |
| <b>PIA 3:<br/>OPTIMUM<br/>CAPACITY AND<br/>FLEXIBLE FLIGHTS</b> | B0-FRTO              | Improved operations through enhanced en-route trajectories | To allow the use of airspace which would otherwise be segregated (i.e. special use airspace) along with flexible routing adjusted for specific traffic patterns. This will allow greater routing possibilities, reducing potential congestion on trunk routes and busy crossing points, resulting in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <p>Implementation elements include:</p> <ul style="list-style-type: none"> <li>• SSR and ADS -B</li> <li>• Strategic Partnership of the Indian Ocean to reduce emissions (INSPIRE) implemented in the FIR Antananarivo by ASIO ACG.</li> <li>• Preferential trajectories in the Oceanic FIR</li> </ul>                                         |              |

| Performance Improvement Areas (PIA) | ASBU Block 0 Modules | Title of the Module                                                     | Description of the module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Statut of implementation                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ASECNA dates |
|-------------------------------------|----------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
|                                     |                      |                                                                         | reduced flight lengths and fuel burn.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>Dakar to through the implementation of AORRA.</p> <ul style="list-style-type: none"> <li>Implementation of flexible routes in parts of Dakar FIR, Niamey FIR, Brazzaville FIR, Ndjamena FIR</li> <li>Strategic Plan for PBN implementation in coordination with the national PBN plans of the Member States is implemented.</li> <li>Implementation of CCO / CDO procedures for the accessibility of airports of Libreville, Ouagadougou, Abidjan and Dakar for 2018.</li> </ul> |              |
|                                     | B0-NOPS              | Improved flow performance through planning based on a network-wide view | Air traffic flow management (ATFM) is used to manage the flow of traffic in a way that minimizes delays and maximizes the use of the entire airspace. Collaborative ATFM can regulate traffic flows involving departure slots, smooth flows and manage rates of entry into airspace along traffic axes, manage arrival time at waypoints or flight information region (FIR)/sector boundaries and reroute traffic to avoid saturated areas. ATFM may also be used to address system disruptions including crisis caused by human or natural phenomena. | <p>The implementation elements include:</p> <ul style="list-style-type: none"> <li>the reorganization in the provision of navigation services,</li> <li>the determination of ATC capacity of ATS units including ATFM if necessary planned for 2019</li> </ul>                                                                                                                                                                                                                      | 2019-2022    |
|                                     | B0-ASUR              | Initial capability for ground surveillance                              | To provide initial capability for lower cost ground surveillance supported by new technologies such as ADS-B OUT and wide area multilateration (MLAT) systems. This capability will be expressed in various ATM services, e.g. traffic information, search and rescue and separation provision.                                                                                                                                                                                                                                                        | <p>Implementation elements include:</p> <ul style="list-style-type: none"> <li>- SSR and systems ATM densification implemented in 2017.</li> <li>- Coverage of airspace with ground based ADB-B surveillance means to complete radar coverage currently scheduled to be completed in 2018.</li> <li>- Satellite based ADS-B surveillance means to be implemented in the entire continental airspace from 2020 to cover the gap in</li> </ul>                                        | 2017-2020    |

| Performance Improvement Areas (PIA)      | ASBU Block 0 Modules | Title of the Module                                                                                | Description of the module                                                                                                                                                                                                                                                                                                                                                                                                   | Statut of implementation                                                                                                                                                                                                                                                                                                                                                         | ASECNA dates |
|------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
|                                          |                      |                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                             | continental remote area; Initial tests started in 2018                                                                                                                                                                                                                                                                                                                           |              |
|                                          | B0-SNET              | Increased effectiveness of ground-based safety nets                                                | To enable monitoring of flights while airborne to provide timely alerts to air traffic controllers of potential risks to flight safety. Alerts from short-term conflict alert (STCA), area proximity warnings (APW) and minimum safe altitude warnings (MSAW) are proposed. Ground-based safety nets make an essential contribution to safety and remain required as long as the operational concept remains human centred. | Implementation elements include: <ul style="list-style-type: none"> <li>- Automated safety nets on ground ATM systems are implemented based on short-term conflicts alerts and minimum safe altitude proximity warnings</li> <li>- all ACCs are equipped with automatic ATM systems (TOPSKY) with ADS-C / CPDLC, FDPS, FPASD, RDP, SDP Functions.</li> </ul>                     | 2017         |
| <b>PIA 4:<br/>EFFICIENT FLIGHT PATHS</b> | B0-CDO               | Improved flexibility and efficiency in descent profiles using continuous descent operations (CDOs) | To use performance-based airspace and arrival procedures allowing an aircraft to fly its optimum profile using continuous descent operations (CDOs). This will optimize throughput, allow fuel efficient descent profiles and increase capacity in terminal areas. The application of PBN enhances CDO.                                                                                                                     | Studies for CDO procedures are conducted for Dakar and Abidjan airports; But the procedures designed have not been validated yet.<br>As part of ICAO / ASECNA cooperation CDO procedures studies are underway or Libreville and Ouagadougou airports                                                                                                                             | 2022         |
|                                          | B0-TBO               | Improved safety and efficiency through the initial application of data link and SATVOICE en-route  | To implement a set of data link applications supporting surveillance and communications in air traffic services, which will lead to flexible routing, reduced separation and improved safety                                                                                                                                                                                                                                | SSR mode S systems, ADS-C / CPDLC implemented.<br>Preferred trajectories implemented both in continental and oceanic airspace.<br>HF / DL and VDL are planned in the investment plan 2018-2022.<br>D-VOLMET implementation process is in ongoing for Brazzaville and Antananarivo FIR and is scheduled for the end 2018.<br>D-ATIS are planned in the investment plan 2018-2022. | 2018-2022    |
|                                          | B0-CCO               | Improved flexibility and efficiency departure profiles – continuous climb                          | To implement continuous climb operations in conjunction with performance-based navigation (PBN) to provide opportunities to optimize throughput, improve flexibility,                                                                                                                                                                                                                                                       | Studies for CDO procedures are conducted for Dakar and Abidjan airports; But the procedures designed have not been validated yet.                                                                                                                                                                                                                                                | 2022         |

| Performance Improvement Areas (PIA) | ASBU Block 0 Modules | Title of the Module | Description of the module                                                                                                     | Statut of implementation                                                                                        | ASECNA dates |
|-------------------------------------|----------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------|
|                                     |                      | operations (CCO)    | enable fuel-efficient climb profiles, and increase capacity at congested terminal areas. The application of PBN enhances CDO. | As part of ICAO / ASECNA cooperation CDO procedures studies are underway or Libreville and Ouagadougou airports |              |

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## APPENDIX B

### IMPLEMENTATION PLAN OF ASBU BLOCK 1 BY 2024 IN ASECNA (CF. INVESTMENT PLAN)

| PERFORMANCE IMPROVEMENT AREA (PIA)                          | BLOC 1 MODULES | INVESTMENT PLAN (2018-2022) |      |      |      |      | NEXT PLAN |      |
|-------------------------------------------------------------|----------------|-----------------------------|------|------|------|------|-----------|------|
|                                                             |                | 2018                        | 2019 | 2020 | 2021 | 2022 | 2023      | 2024 |
| PIA 1 :<br>AIRPORT OPERATIONS                               | B1-APTA        |                             | ✓    | ✓    | ✓    | ✓    | ✓         | ✓    |
|                                                             | B1-WAKE        |                             | ✓    | ✓    | ✓    |      |           |      |
|                                                             | B1-RSEQ        |                             |      |      |      |      |           |      |
|                                                             | B1-SURF        |                             |      |      |      |      |           |      |
|                                                             | B1-ACDM        |                             | ✓    | ✓    | ✓    | ✓    |           |      |
|                                                             | B1-RATS        |                             |      |      | ✓    |      | ✓         | ✓    |
| PIA 2:<br>GLOBOLLY INTEROPERABLE<br>SYSTEMS AND DATA (SWIM) | B1-FICE        |                             | ✓    | ✓    | ✓    | ✓    |           |      |
|                                                             | B1-DATM        |                             | ✓    | ✓    | ✓    |      |           |      |
|                                                             | B1-SWIM        |                             |      | ✓    | ✓    | ✓    |           |      |
|                                                             | B1-AMET        |                             | ✓    | ✓    | ✓    | ✓    |           |      |
| PIA 3:<br>OPTIMUM CAPACITY ANSD<br>FLEXIBLE FLIGHT          | B1-FRTO        |                             | ✓    | ✓    | ✓    | ✓    | ✓         | ✓    |
|                                                             | B1-NOPS        |                             | ✓    | ✓    | ✓    | ✓    | ✓         | ✓    |
|                                                             | B1-ASEP        |                             | ✓    | ✓    | ✓    | ✓    | ✓         | ✓    |
|                                                             | B1-SNET        |                             | ✓    | ✓    | ✓    | ✓    | ✓         | ✓    |
| PIA 4:<br>EFFICIENT FLIGHT PATH                             | B1-CDO         |                             | ✓    | ✓    | ✓    | ✓    | ✓         | ✓    |
|                                                             | B1-TBO         |                             |      |      |      |      |           |      |

| PERFORMANCE<br>AREA (PIA) | IMPROVEMENT | BLOC 1 MODULES | INVESTMENT PLAN (2018-2022) |      |      |      |      | NEXT PLAN |      |
|---------------------------|-------------|----------------|-----------------------------|------|------|------|------|-----------|------|
|                           |             |                | 2018                        | 2019 | 2020 | 2021 | 2022 | 2023      | 2024 |
|                           |             | B1-RPAS        |                             |      |      | ✓    | ✓    | ✓         | ✓    |

— END —

