



## **ANGA, the African solution for safe navigation**

EGNOS Workshop '24

Dublin, 14 March 2024

# ANGA programme



## A VISION FOR AFRICA

**A satellite navigation solution  
developped and operated  
by Africa for Africa**

## GOALS FOR AFRICA

- **Prepare the future of Africa** in a growing competitive international environment, in which space services provision go beyond by essence the natural borders of States
- **Develop the positioning of Africa** in the worldwide value chain of satellite services provision
- Provide **high-added value satellite navigation services** for the benefit of the African economy
- Develop an **African-wide own infrastructure** and develop **African capacities for its exploitation**
- Use, adapt and improve **existing technologies**

# ANGA services



## Services roadmap

Step 0: Demonstration service (since 2020)

Step 1: L1 services (from 2028)

Step 2: DFMC services (beyond 2030)

SARPs compliance



- **Open Service (OS)** to be used by mass-market receivers for general purpose applications

- **Safety of Life service (SoL)** for safety-critical applications in civil aviation and other transport sectors

En-route/NPA

APV-I

CAT-I

DA/DH 250 ft

DA/DH 200 ft

- **Data Access Service (SDAS)** to provide solutions with enhanced performance for professional use

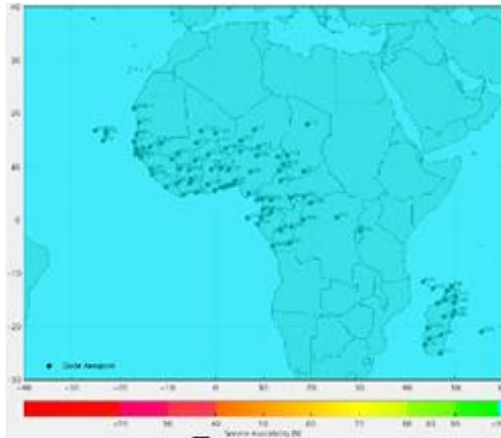


Service Provider identifier n°7

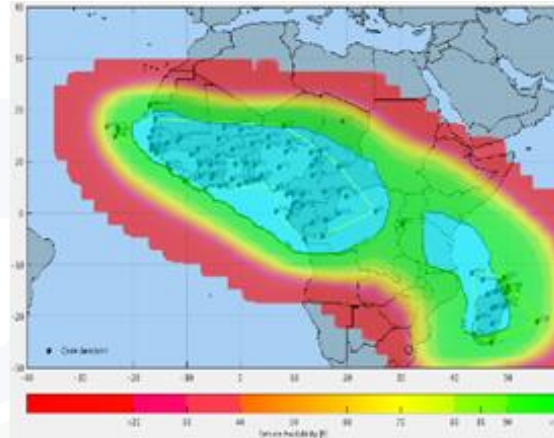


# ANGA services

2028

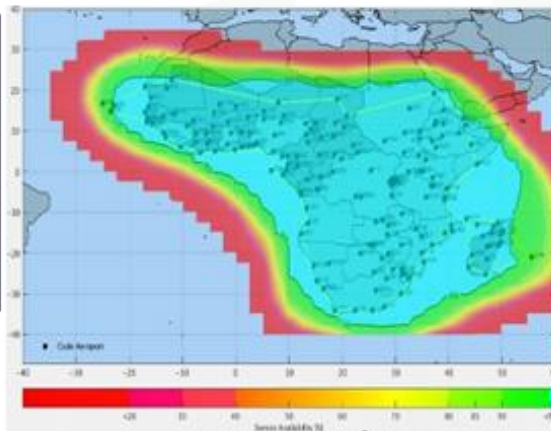


En-route



Approaches

Post-2030



Approaches

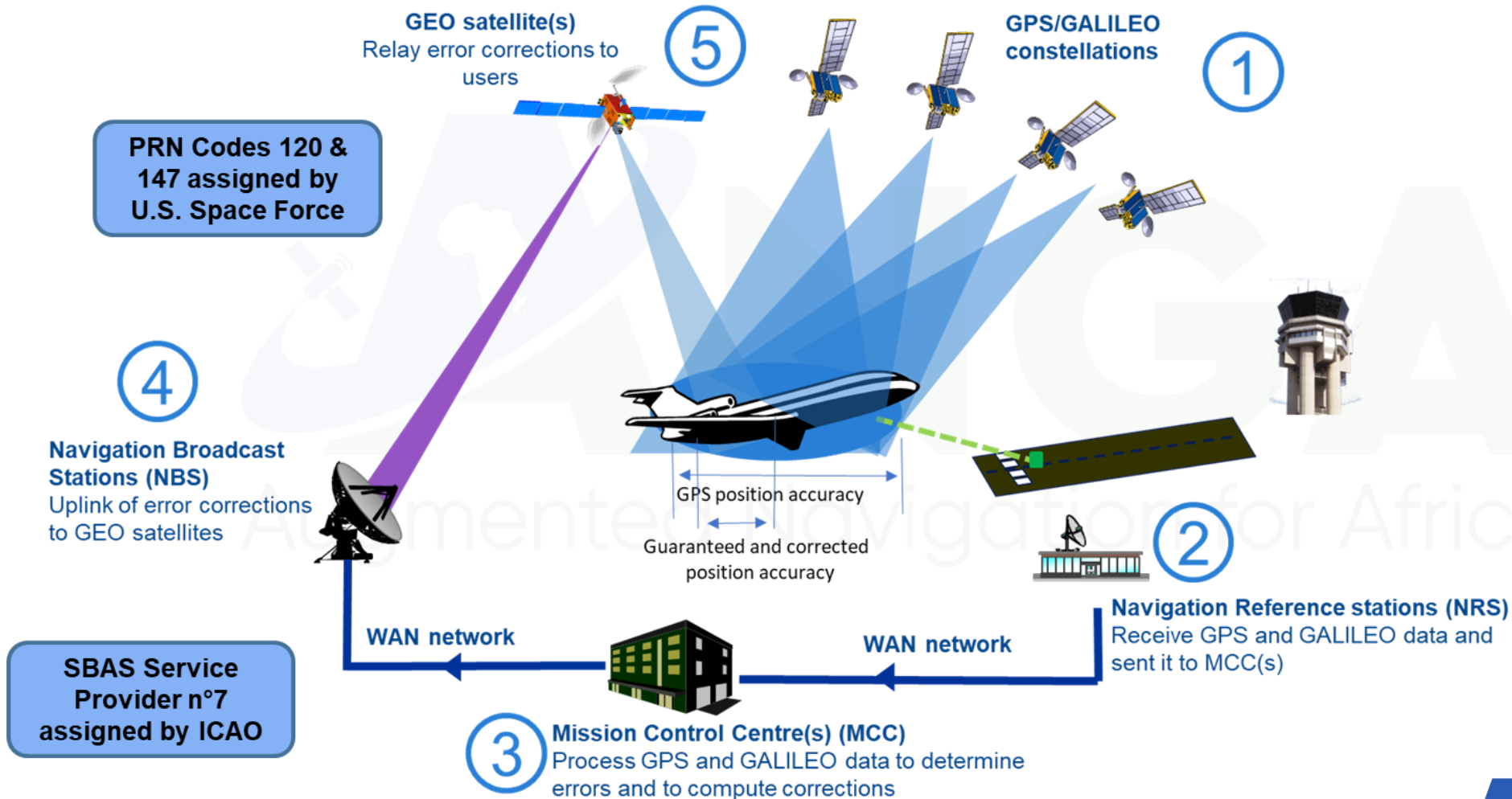
- Complement to existing navigation services

**CAT-I equivalent services**  
**« everywhere every time »**

- Existing conventional nav aids, including ILS, to be maintained with an evolution towards a Minimal Operating Network (MON) to support back-up operations in case of GNSS outages
- Consideration of on-going development of airborne EFVS capabilities as enabler of straight-in landing operations beyond CAT-I minima

**Towards a full and resilient navigation infrastructure supporting all weather operations**

# An African « indigenous » infrastructure



EGNOS-based technology

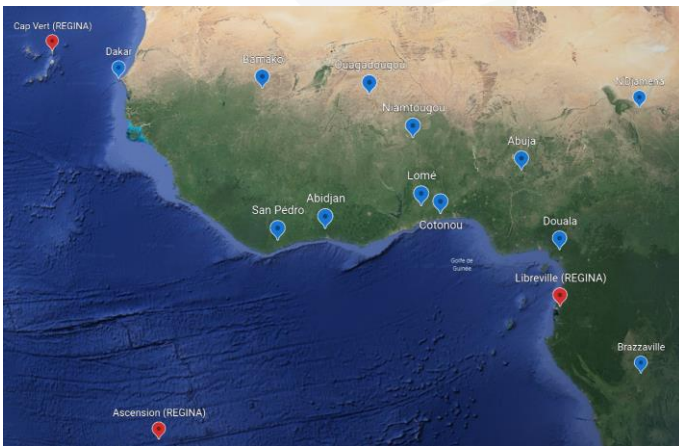
Use of Galileo constellation

Technical partners

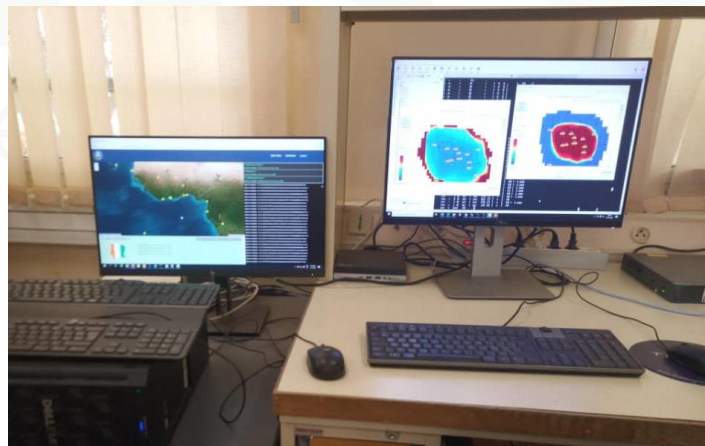


# ANGA test-bed

- Indigenous African test-bed
- First ever SBAS services provided in this part of the globe
- Full compliance with ICAO SARPs
- For test and field demonstrations purposes
- Cannot be used for safety critical application (SiS include MT0)



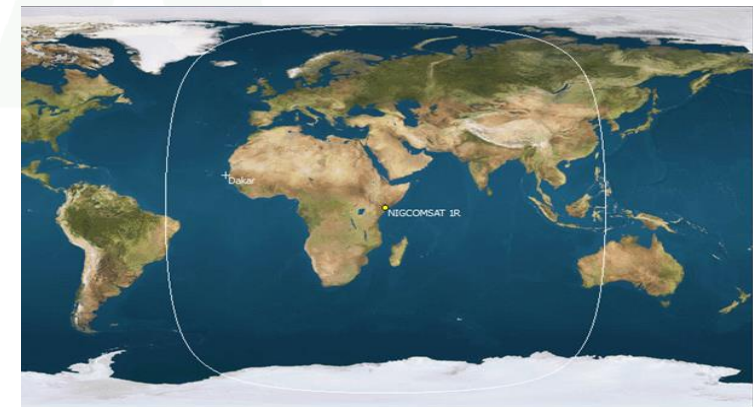
GNSS reference stations network  
(SAGAIE and IGS stations)



Representative SBAS prototype (Dakar)



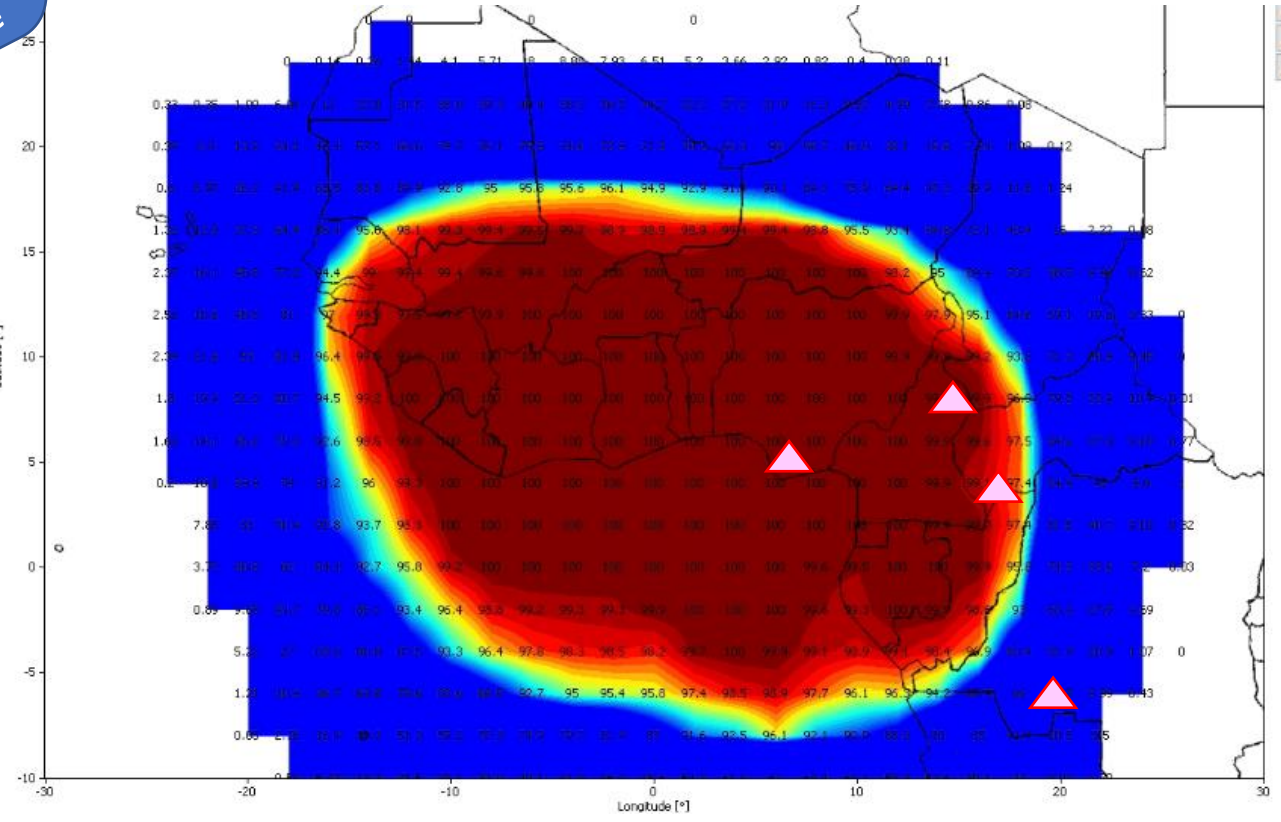
Uplink station  
(Abuja)



Nigcomsat 1-R GEO

# ANGA L1 demo service

Full SARPs compliance



APV-1 availability (L1)

# ANGA L1 demo service - Field demos

## AVIATION



Lomé, 27  
January 2021

SBAS LPV final approach on RWY22 (DH 250ft)



Douala, 2  
June 2021

SBAS PinS procedures and Low-Level Route



Abuja, 1st  
February 2023

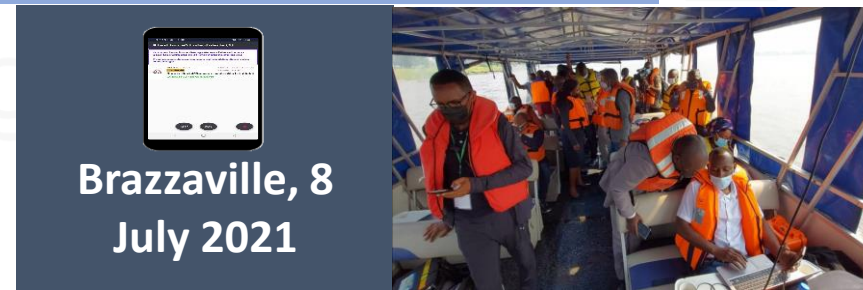
SBAS LPV final approach on RWY22 (DH 330ft)

## BEYOND AVIATION



Brazzaville, 7  
July 2021

Precise Point Positioning (PPP)



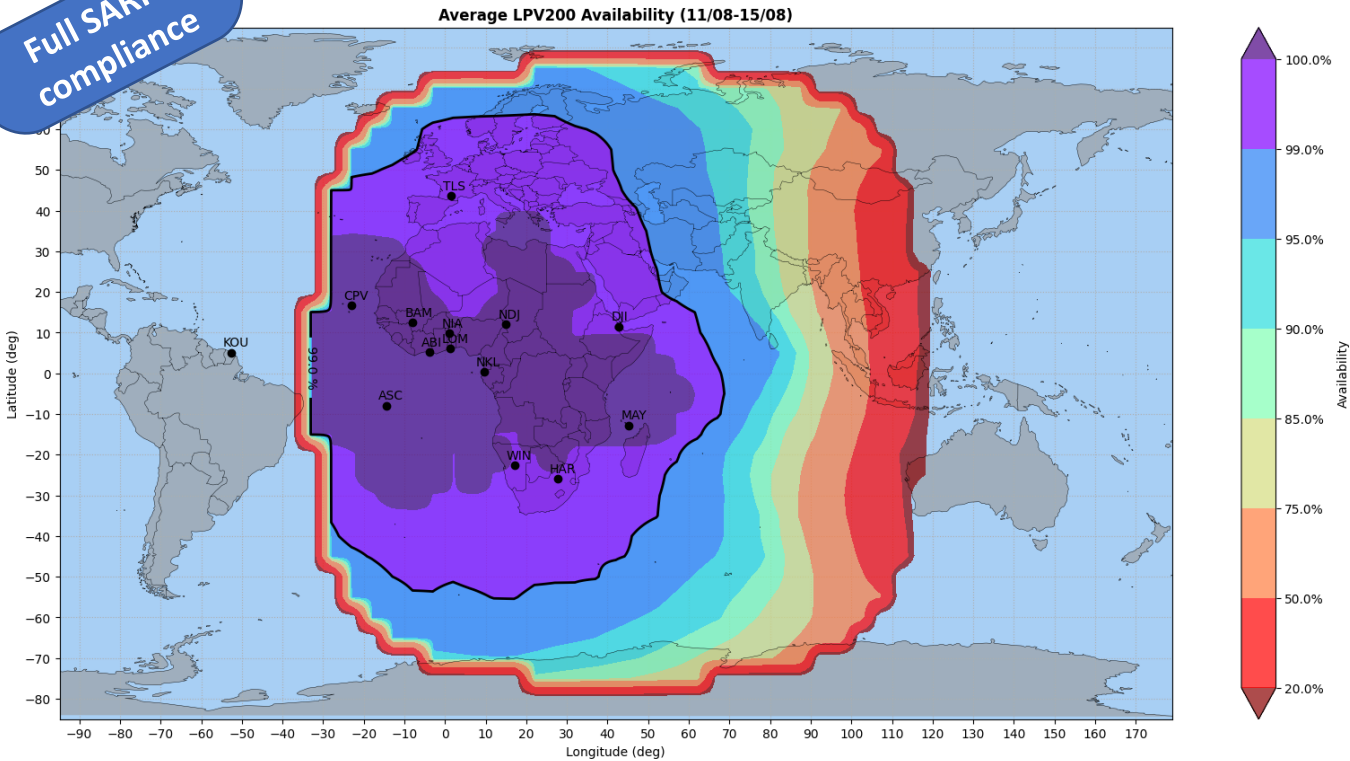
Brazzaville, 8  
July 2021

Emergency warning service



# ANGA DFMC demonstration service

Full SARPs compliance



CAT-I availability



First ever DFMC demonstration service to be provided in the world



Very good performances over Africa



Service available for field demonstrations all over Africa (and Europe)



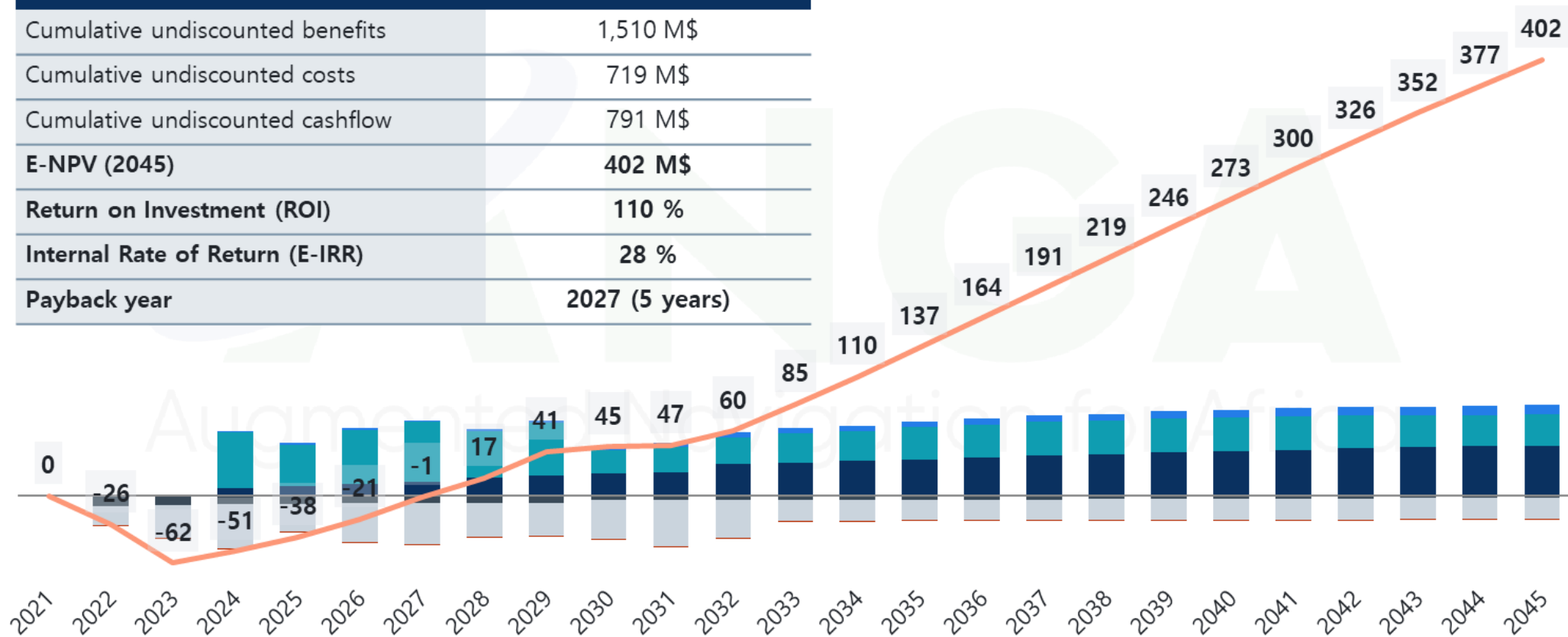
SiS available for DFMC aircraft receiver development

Thanks to  cnes for the support !

# SBAS high attractiveness in Africa

■ Airline benefits  
 ■ ANSP benefits  
 ■ Induced benefits  
 ■ Airline costs  
 ■ ANSP costs  
 ■ Induced costs  
 — NPV

Economic indicator	Overall
Cumulative undiscounted benefits	1,510 M\$
Cumulative undiscounted costs	719 M\$
Cumulative undiscounted cashflow	791 M\$
<b>E-NPV (2045)</b>	<b>402 M\$</b>
<b>Return on Investment (ROI)</b>	<b>110 %</b>
<b>Internal Rate of Return (E-IRR)</b>	<b>28 %</b>
<b>Payback year</b>	<b>2027 (5 years)</b>



Continental SBAS in Africa CBA study (African Union Commission)

# Users' perspectives

## Users of African airspace are already interested in or requesting expedition of SBAS deployment



« African airlines recognize the value of SBAS in enhancing safety and improving efficiency at African airports not equipped with ILS »

« To have SBAS in Africa will increase our aircraft efficiency and will provide more options for alternate airports »



« SBAS will quickly supersede conventional navigation, including ILS Cat I »

« Support to SBAS deployment, especially in Africa »






« SBAS will guarantee safety to access even remote regions »

« SBAS will reduce scheduled flights disruptions especially due to weather events »





mars-24



# Conclusion

-  provides a fully-fledged African solution for SBAS deployment in the whole continent
- Airlines acknowledge the important SBAS benefits and support  deployment
-  services will benefit, beyond aviation, to the African economy in many areas



-  demonstration services (L1 and DFMC) are effective
-  operational L1 services are expected from 2028
-  is a key component of the African Union Space Programme
-  is part of the worldwide GNSS infrastructure

- Tremendous support from Europe !





# ANGA media resources



- [ANGA programme video](#)
- [Lome SBAS/LPV demonstration for commercial aircraft](#)
- [Abuja SBAS/LPV demonstration for commercial aircraft](#)
- [Brazzaville SBAS demonstration beyond aviation](#)

**Follow us on:**



# The African solution for safe navigation



Aviation



Agriculture



Maritime



Land



Geo-location



Drone



The logo for ANGA (Augmented Navigation for Africa) is displayed in white on a blue background. The word "ANGA" is written in a large, bold, sans-serif font. The letter "A" is stylized with a white satellite icon and a curved orbital path around it. A silhouette of the African continent is integrated into the upper part of the "A". Below the main text, the full name "Augmented Navigation for Africa" is written in a smaller, clean sans-serif font.

# ANGA

Augmented Navigation for Africa