

CONTINENTAL COST BENEFIT ANALYSIS (CBA) FOR UTILIZATION OF GNSS APPLICATIONS AND IMPLEMENTATION OF SBAS SERVICES IN AFRICA.

by

Engr. Lasisi Salami LAWAL (PhD, CEng)

[*lasisi@nigcomsat.gov.ng*](mailto:lasisi@nigcomsat.gov.ng)

Nigerian Communications Satellite Ltd.

Obasanjo Space Center, Lugbe, Abuja.

Federal Ministry of Communications and Digital Economy, Nigeria

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INTRODUCTION (Abstract)

Utilization of Global Navigation Satellite System (GNSS) is increasingly becoming important to fast track considerable attainments of United Nations Sustainable Development Goals beyond Positioning, Navigation and Timing (PNT). In consideration of the importance of GNSS applications, nations and regions are investing and adopting its services as an emerging technology for adaptation. African continent is not left out and Satellite Based Augmentation (SBAS); a less ambitious system than GNSS is a satellite-based system that aids a Global Navigation Satellite System (GNSS) in providing further accuracy, integrity, availability to positioning, navigation, and timing in the aviation sector that involves safety of life (SOL) with verified performance on integrity of signal-in-space (SiS) and increasing applications and services in non-aviation sectors such as maritime, rail & road transport, oil & sector, agriculture, safety of public infrastructure such as dams, bridges & high-rise buildings, survey, civil engineering, mass market applications, atmospheric weather & landslide monitoring, among others. The paper provides some insights, summary and outcome on Continental Cost Benefit Analysis (CBA) of implementation of SBAS in Africa organized recently by African Union Commission (AUC) and African Civil Aviation commission (AFCAC); specialized arm of African Union (AU) on aviation matters with takeaways and recommendations to African member states including need for stakeholders and specialized institutions to embrace capacity building, awareness and sensitization activities to encourage rapid adoption of SBAS applications in aviation and non-aviation sectors.

INTRODUCTION (NIGCOMSAT-1R as a Hybrid Satellite)

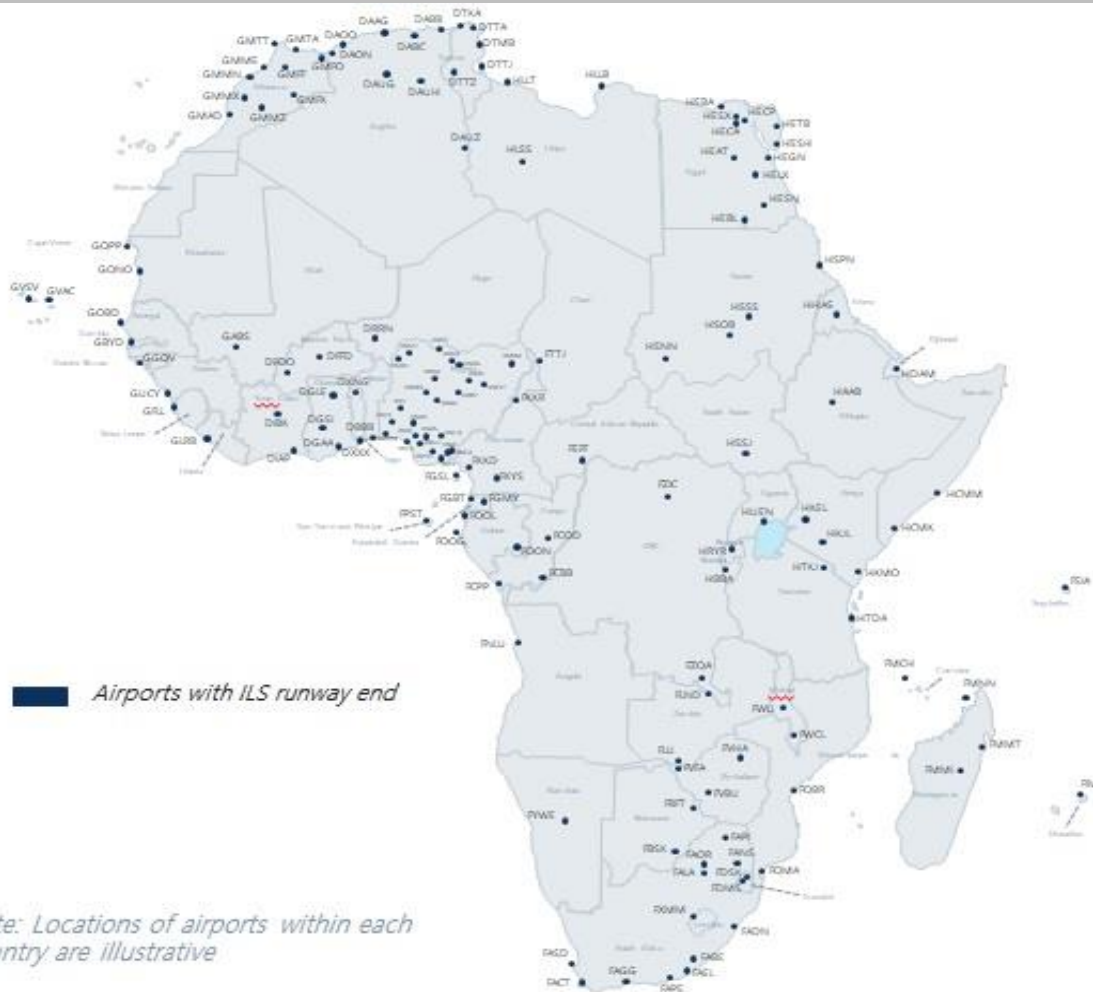
- NIGCOMSAT-1R is a hybrid satellite with a Navigation (L-Band) payload for a Space Based Augmentation System meant to provide a Navigation Overlay Service (NOS) similar to the European Geostationary Navigation Overlay Service (EGNOS).



NEEDS AND GAP ASSESSMENT OF GNSS IN AFRICA (Aviation Sector)

- In aviation, the instrument landing system (ILS) is a radio navigation system that provides short-range guidance to aircraft to allow them to approach a runway at night or in bad weather safely.
- Africa has numerous airports without ILS or alternative GNSS-based approach procedures.
- The Airports may have:
 - No ILS equipment but alternative GNSS-based RNP approaches
 - No ILS equipment nor GNSS-based RNP approaches
- For either of these cases, **SBAS offers substantial advantages:**
 - **SBAS** deployment on a continental level would allow for **CAT-I approaches on all runway ends**, greatly **enhancing** the **safety** and **operational efficiency** in the approach phase
- Even at **airports with existing RNP APCH procedures**, SBAS offers **lower decision heights and safety** benefits i.e :Terminal Maneuvering Area (TMA), Delays, Diversions and Cancellations (DDC) avoidance, CFIT (Controlled Flight into Terrain) / Landing accident avoidance, Mid-air collision avoidance etc.

NEEDS AND GAP ASSESSMENT OF GNSS IN AFRICA (Aviation Sector: Current Airport Infrastructure & Procedures)



**Continental Cost
Benefit Analysis
(CBA) on SBAS
Implementation in
Africa; 30th May,
2022**

Note: Locations of airports within each country are illustrative

NEEDS AND GAP ASSESSMENT OF GNSS IN AFRICA (Aviation Sector: Current Airport Infrastructure & Procedures)



Continental Cost Benefit Analysis (CBA) on SBAS Implementation in Africa; 30th May, 2022

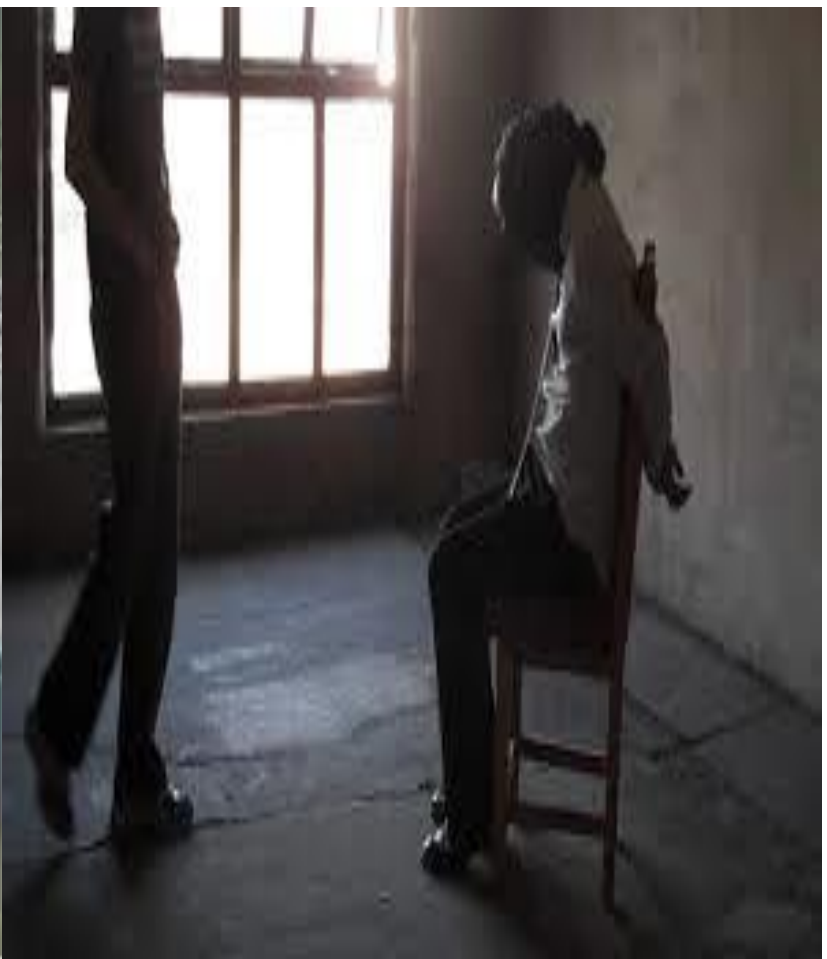
**NEEDS & GAP
ASSESSMENT IN
NON-AVIATION SECTOR**



Needs Assessment of GNSS/SBAS Applications in Farmers/Herders Clashes, Cattle Rustling etc



Needs Assessment of GNSS/SBAS Applications in Kidnap Menace



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Needs Assessment of GNSS/SBAS Applications in Careless Road Accidents

11



Needs Assessment of GNSS/SBAS Applications in Anti-Car Theft and Fleet Management

12



Needs Assessment of GNSS/SBAS Applications in High-Rise Buildings

13



Needs Assessment of GNSS/SBAS Applications in Bridges, Dams etc



Needs Assessment of GNSS/SBAS Applications in Ship Piracy, Tracking and Monitoring

15



Needs Assessment of GNSS/SBAS Applications in Fuel Smuggling and Diversion

16



Some Figures and Statistics

- Recurrent conflict between farmers and herdsmen in North- Central costs Nigeria at least \$14 billion in potential revenues based on a new study conducted by a Global Humanitarian Organization; Mercy Corps funded by DFID.
- Nigeria is ranked worse than Mexico, Iraq, Russia and Indonesia among the top five countries most plagued by oil theft. Nigeria's losses to crude theft is estimated to be \$1.7bn monthly as at 2014.
- Lagos Command of the Nigerian Police reported 542 Vehicles stolen etc in Lagos alone between December 2015 and November 2016.

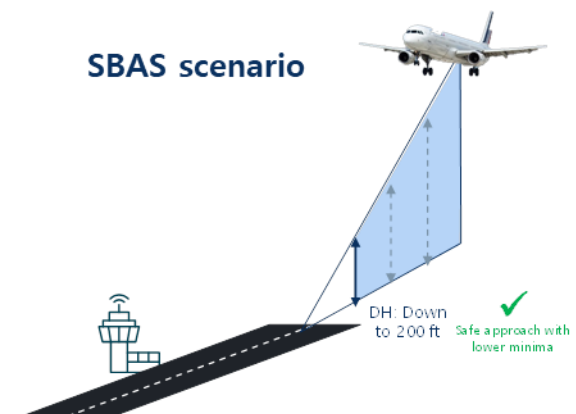
SBAS/GNSS APPLICATIONS

18



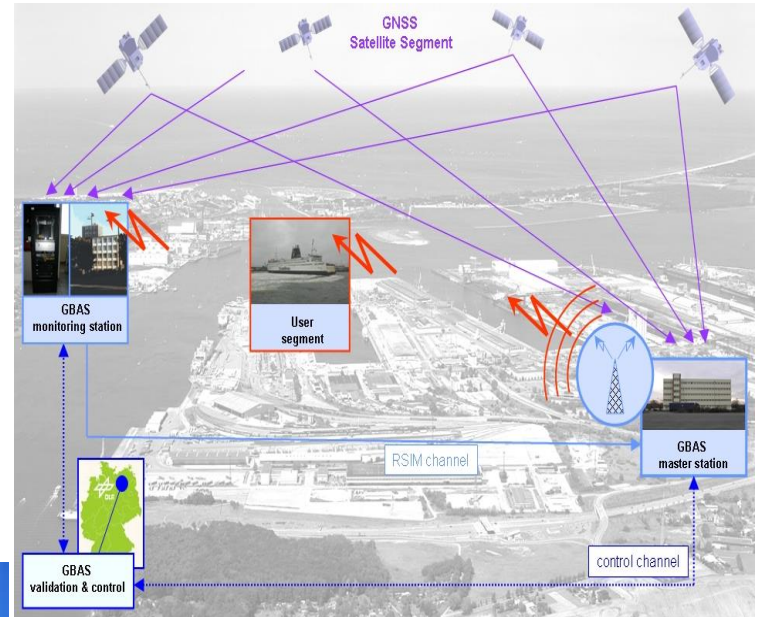
Aviation

- ✓ Exponential development of SBAS services in the world with growing acknowledgement by airspace users.
- ✓ We are working with relevant stakeholders in the aviation sector on SBAS initiative and program to help define the way SBAS system, should be deployed at best for the needs of the continent progressively.
- ✓ Most aircrafts expected to be SBAS capable from 2030. However, retrofit solutions are currently available at lower cost.
- ✓ Reduced and simplified equipment on board aircraft: SBAS airborne equipment acquisition, integration and installation costs is very minimal.
- ✓ Flight crew training costs (≈ 0).
- ✓ To encourage awareness and adoption of SBAS Technology for Navigation in Aviation sector, we will continue to showcase its importance with partners to stakeholders by conducting SBAS Flight demonstration across African countries (Francophone and Anglophone countries in Africa).



Maritime

- Ocean navigation
- Port approaches
- Restricted waters guidance
- Auto docking



Train Transportation

- **Automatic tracking and inspections.**
- **The prevention of collisions, derailments, work zone incursions, and rail switch errors.**
- **Automatic speed control / braking**
- **The increasing of capacity and efficiency for all rail users.**
- **Position control, loading and unloading operations**



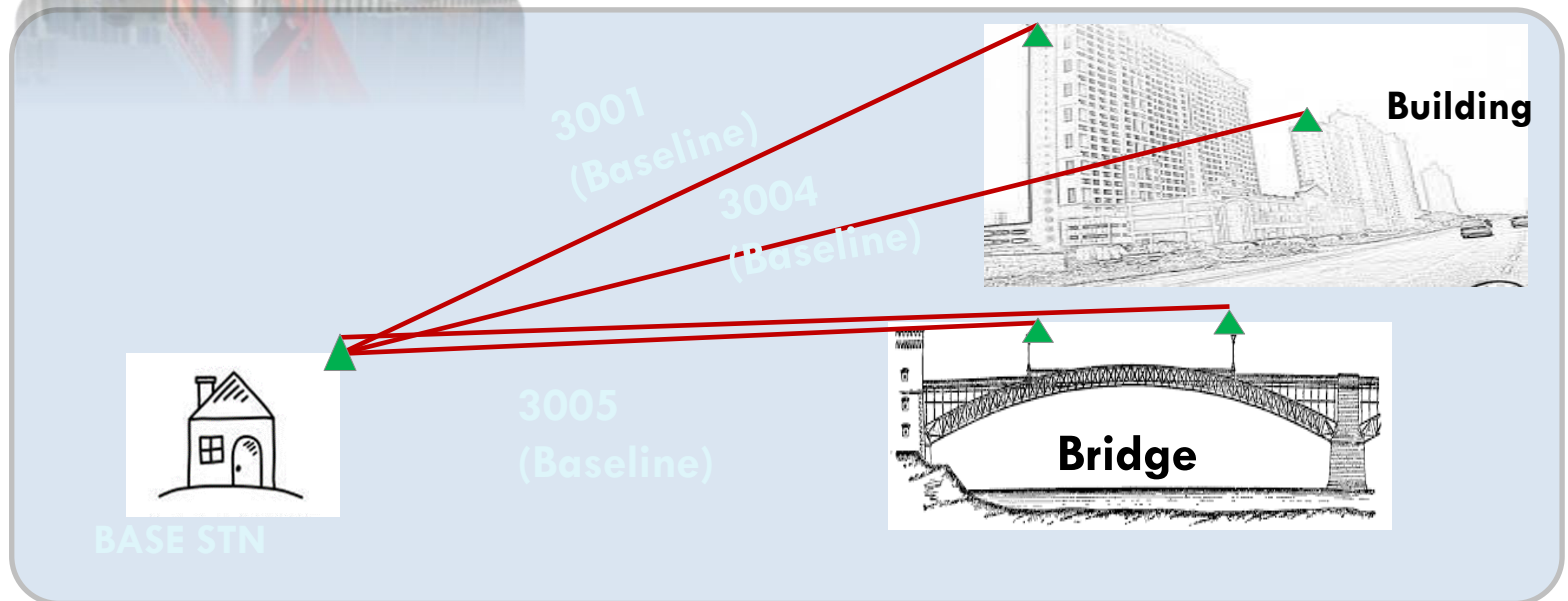
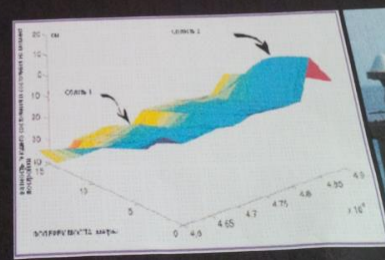
STRUCTURAL DEFORMATION MONITORING SERVICES IN BRIDGES & HIGH RISE



Bridges – critical for monitoring

GNASS/GPS receivers are placed at the critical control points

Control center – monitoring precise deformations in real time



Civil Engineering/GIS



Land Surveying



Land Slide



Precision Agriculture



**GIS
Collection**



Cadastral & Construction Surveying

For the high precision applications, the GNSS/SBAS terminals with sub-meter level position accuracy can be used for land surveying, slide, etc.

Road Transportation

- Vehicle Tracking, Fleet Management and Integration with GIS systems
- Demographic Information
- Tolling
- Telematics, Tolling
- Traffic Management
- Intelligent Transport System (ITS)
- Timing System
- Anti-Collision System



Road Transportation: Alternative to Speed Limiters & Drivers' License Issuance

- Monitoring and penalizing defaulters on speed limit.
- For Training and Certifying Could-be Drivers and Affirmation of Drivers' Skill Test.
- Remote Monitoring/ Supervision from a distance. i.e From control center.



Oil & Gas Sector

Oil & GAS



- ❖ *Fuel level monitoring*
- ❖ *Vehicle positioning and scheduling*
- ❖ *Vehicle crossing alarming*
- ❖ *Image monitoring*



UAV Solutions



- ❖ *Pipeline surveying and mapping*
- ❖ *Leak detection*
- ❖ *Real time monitoring*

APPLICATIONS IN PRECISION AGRICULTURE



Automatic harvesting



Farmland planning



Automatic water spray

High efficiency



Enhances estimate on output of grains



UAV spraying



Agricultural machinery automatic navigation system

APPLICATIONS IN AGRICULTURE AND LIVESTOCK

Livestock



- *Geo-fencing*
- *Tracking*
- *Detection of Diseases*

Agriculture



- *Precision Farming*
- *Precise Mechanical Control*
- *Crop Monitoring*

ASSETS AND STAFF MONITORING

- Vehicle Tracking, Staff & Fleet management with integrated GIS system.
- Demographic Information of Assets
- Solution for real-time monitoring



OTHER GNSS/SBAS APPLICATIONS ARE:

- Security of National Infrastructure: Pipelines, Power Lines, Gas Reservoirs, Strategic national Infrastructure.
- Improved Emergency Services, Recovery Services, Search & Rescue: Emergency Agencies, Fire Fighters, Road Safety Agencies: Guidance rescue operations etc.
- Utility Management: Energy and Communications Company for synchronization.
- Geographic Information System Companies
- Tourism
- Telematic Services i.e Insurance Companies
- Environmental Protection, Characterization and Demography
- Paramilitary Organizations, Security Agencies: Positioning and timing for field operations
- Emergency Warning systems
- Scientific Research



**CONTINENTAL
COST
BENEFIT
ANALYSIS
(CBA)**

THE SBAS SYSTEM HAS BEEN ANALYSED IN TERMS OF PERFORMANCES, SIGNAL AVAILABILITIES, GOVERNANCE STRUCTURE, SYSTEM ARCHITECTURE AND COST

SBAS system overview

System architecture

The SBAS system is made up of the

- **Ground Segment:** Ranging and Integrity Monitoring Stations, Mission Control Centre and Navigation Land-Earth Stations
- **Space Segment:** Geostationary satellites to broadcast signal to user
- **User segment:** Final user that takes advantage of SBAS signal

Cost of system deployment

The end-to-end cost of SBAS implementation in Africa has been benchmarking current operational systems and considers:

- SBAS infrastructure deployment
- Programme development
- Service Provision



Key finding

CAPEX

191-221 M\$

OPEX

18.2-20.5 M\$/year

Governance

The future SBAS service in Africa can be a combination of ongoing initiatives (NIGCOMSAT, EGNOSv3, A-SBAS, etc), which can be complementary and based on a common system architecture.

IN ORDER TO QUANTIFY THE BENEFITS OF SBAS, A DETAILED COMPARISON WITH RESPECT TO OTHER ALTERNATIVE NAVIGATION TECHNOLOGIES HAS BEEN MADE

SBAS comparison with alternative technologies

Baro-VNAV



- The study has concluded in considerable **performance advantages of SBAS versus BaroVNAV** equipage in terms of procedure approach minima
- The provision of **geometric guidance**, as opposed to barometric, is also considered a **key factor in terms of safety** by institutions such as ICAO's NSP, IFALPA and IATA'S JURG

Decision height advantage vs BaroVNAV

- **SBAS APV-I: 58 ft**
- **SBAS LPV-200:91 ft**

ILS



- **ILS CAT-I and SBAS approaches** can be **considered operational equivalents**, having **SBAS superior service availability** after stakeholder consultation (97.15% vs 99.16%)
- SBAS has an opportunity to provide CAT-I service to ILS-unequipped airports, to rationalise the ILS network or to provide contingency services in ILS-equipped aerodromes

GBAS



- **GBAS and SBAS are complementary solutions** for Africa in the long term
 - DFMC GBAS to provide CAT II/III approaches in large airports upon operational need (≈2035)
 - SBAS to provide CAT I approaches at all airports regardless of size, at all times

Key finding:

From a technological point of view, **SBAS has been identified as a key system** that can **fill a gap** currently existing in the African aviation landscape **and also act in synergy with existing technologies**

The relevance of Continental CBA being developed is stressed, as all previous CBAs have scope limitations, either geographical or stakeholder-related

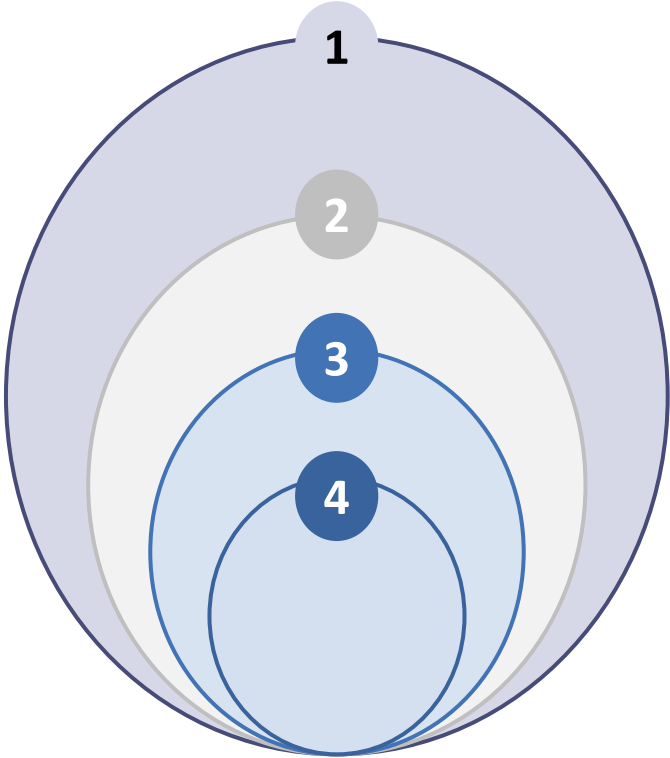
Review of existing literature

CBA Study	Results	Limitations
SBAS for AFI-CBA for Airlines (2020)	<ul style="list-style-type: none"> ▪ ROI: 767% ▪ Undiscounted benefits: 770 M€ ▪ Undiscounted costs: 89 M€ 	<ul style="list-style-type: none"> ▪ The study is limited to airlines and doesn't consider ground-side users such as ANSPs and airport operators or the induced impact
EGNOS Aviation CBA for AFI-ESESA (2010)	<ul style="list-style-type: none"> ▪ ROI: 391% ▪ Undiscounted benefits: 1,774 M€ ▪ Undiscounted costs: 361 M€ 	<ul style="list-style-type: none"> ▪ Outdated (2010) ▪ Doesn't consider all the African continent ▪ Doesn't consider the induced impacts of SBAS
Preliminary Benefit Assessment of SBAS for Eastern African Module (2018)	<ul style="list-style-type: none"> ▪ Profit (NPV) for ANSPs and airport operators: 26 M€ ▪ Profit (NPV) for airspace users: 493 M€ ▪ Profit (NPV) for State and Society: 1,140 M€ 	<ul style="list-style-type: none"> ▪ Only considers Eastern Africa

Sources: Introducing SBAS in Eastern Africa module (JPO); ESESA EGNOS Aviation CBA for AFI (LEK); SBAS for AFI-CBA for Airlines (AEGIS)

The combination of the geographical, airport and fleet submodels, allows a precise calculation of SBAS benefits and costs in Africa

CBA scenario definition



1

All landings by all types of aircraft in Africa



2

Landings in countries covered by the African SBAS at a particular instance in the analysis timeframe



3

Landings in airports with LPV procedures at their runway ends



4

Landings by SBAS-equipped aircraft



Data gathering process compiled information from 23 African States, the rest of the inputs coming from SatNAV JPO and numerous databases (ICAO AFI eANP, AFRAA Annual Report, ICAO traffic forecast...)

SBAS can provide substantial operational benefits for both aircraft operators and ground-side users as well as positive environmental impact

SBAS benefits

2

ANSPS / AIRPORT OPERATORS

Equipment rationalization

SBAS can trigger progressive decommissioning of traditional ground aids to navigation (VOR, DMEs NBDs) as well as ILS, reducing the operational and capital expenses of ANSPs and airport operators

Socio-environmental benefits

The fuel savings derived from the airlines' operational benefits can be monetized with the social cost of carbon

1

AIRCRAFT OPERATORS

Delays, Diversions and Cancellations

Persistently poor weather conditions or equipment unavailability could cause an aircraft to cancel the flight (**cancellation**) to head to an alternate airport (**diversion**) or to postpone the landing (**delay**)

Pilot errors, equipment problems, poor weather conditions as well as navigational equipment issues may cause a CFIT or runway incidents, specially in airports non-equipped with ILS infrastructure



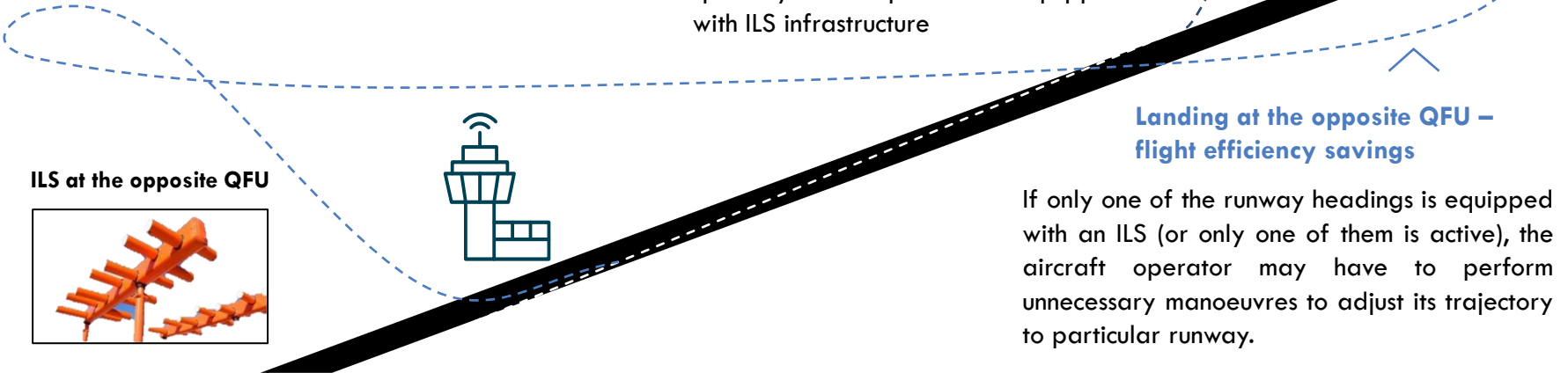
CFIT / Runway accident - Safety

Landing at the opposite QFU – flight efficiency savings

If only one of the runway headings is equipped with an ILS (or only one of them is active), the aircraft operator may have to perform unnecessary manoeuvres to adjust its trajectory to particular runway.

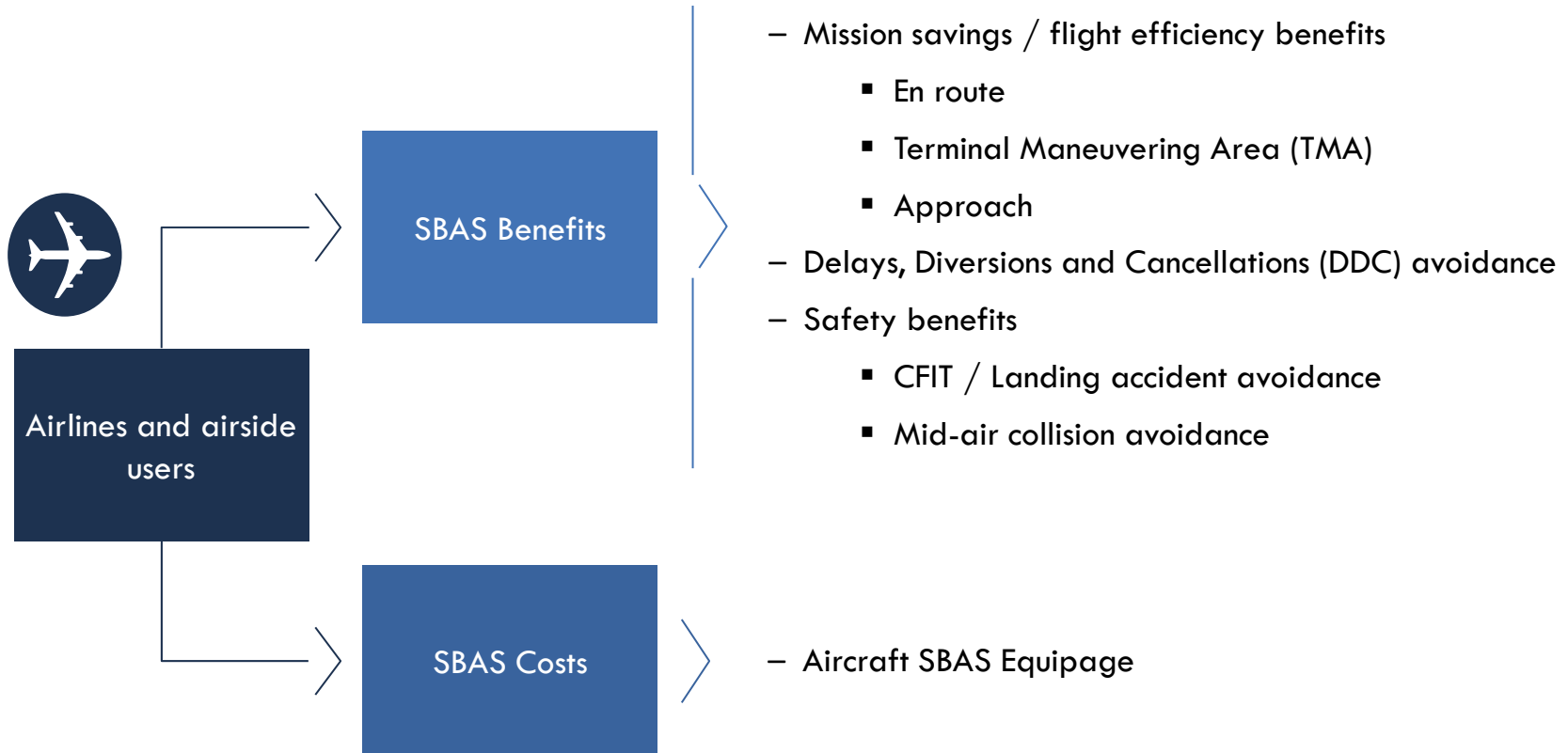
Non exhaustive

ILS at the opposite QFU



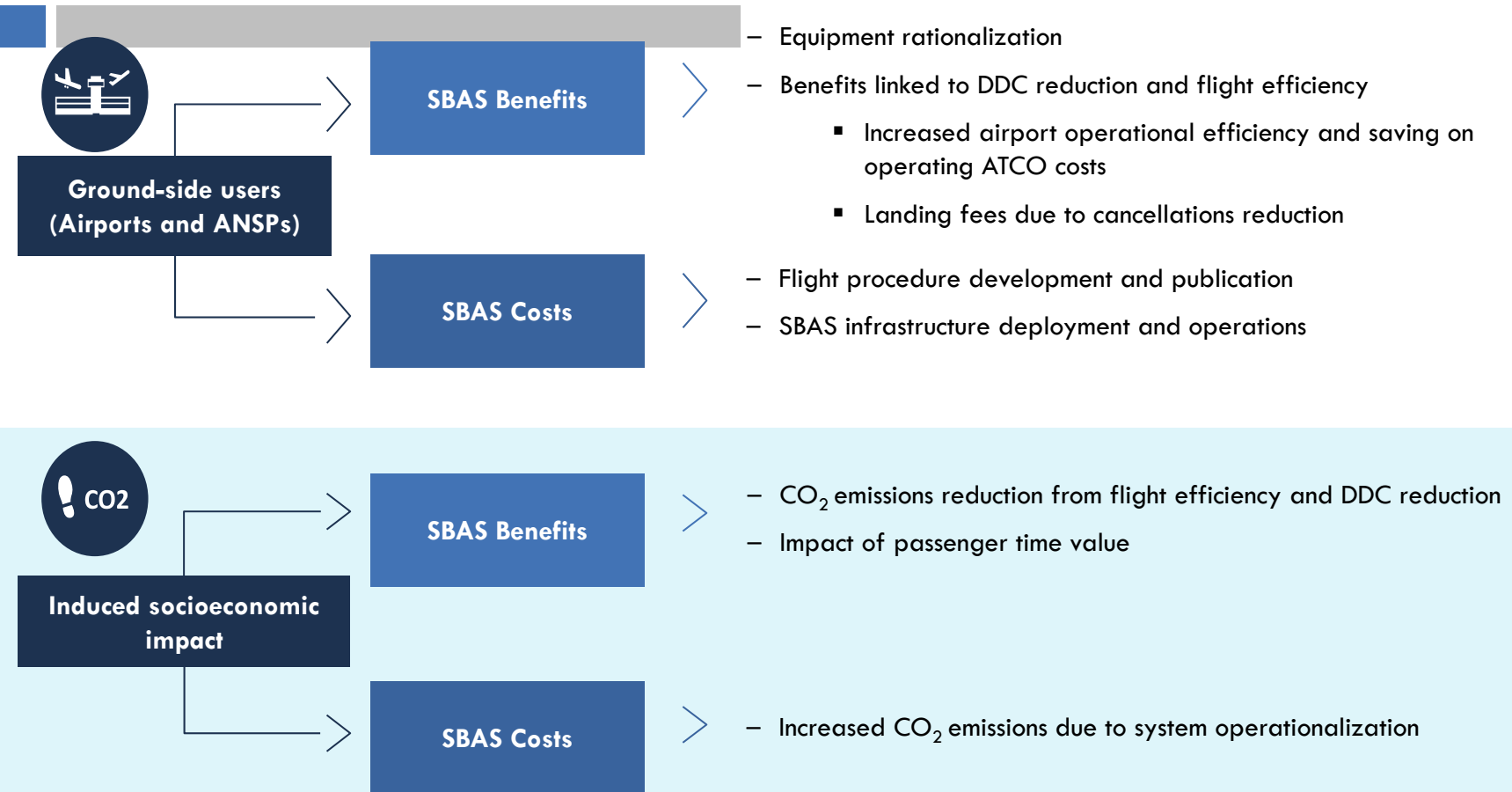
The airspace users benefit from the increased accuracy and integrity with flight efficiency, safety and DDC avoidance benefits, at the cost of fleet equipage

Cost-benefit identification and calculation mechanisms



Ground side users invest in the SBAS infrastructure and benefit from equipment rationalisation as well as from DDC avoidance and increased flight efficiency

Cost-benefit identification and calculation mechanisms



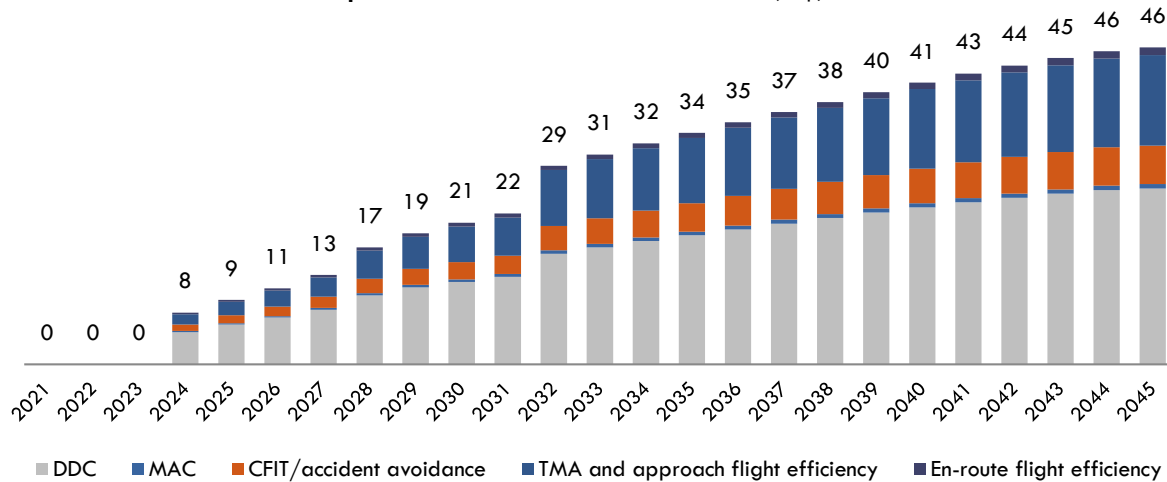
The methodology, inputs and data sources used for all benefits and costs are included in the full CBA report

The business case for airlines is highly profitable, with a 545% ROI, 36% IRR, NPV of 287 M\$ by 2045 and a 6-year payback period

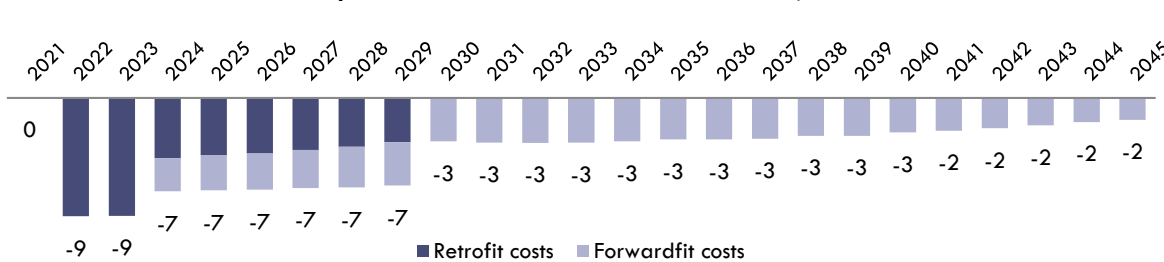
CBA results and sensitivity analysis

Step 1: Financial Analysis

Benefit breakdown of SBAS implementation for African airside users (M\$)



Cost breakdown of SBAS implementation for African airside users (M\$)



Financial indicator	Overall
Cumulative undiscounted benefits	662 M\$
Cumulative undiscounted costs	103 M\$
Cumulative undiscounted cashflow	559 M\$
NPV (2045)	287 M\$
Return on Investment (ROI)	545%
Financial Internal Rate of Return (F-IRR)	36%
Payback year	2028 (6 years)

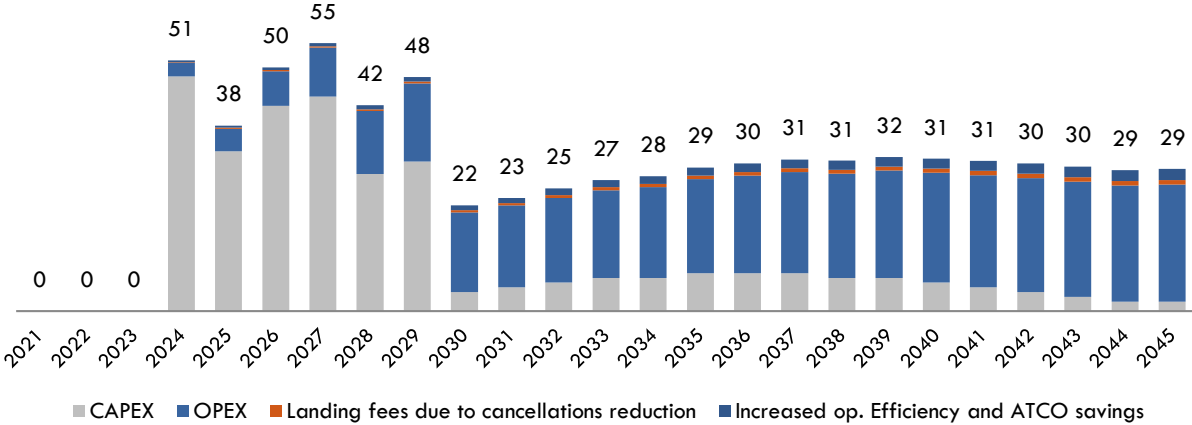
Benefits are dominated by DDC events reduction and increased flight efficiency; while the majority of the costs are incurred during the ramp-up phase of aircraft retrofitting

The business case of ground-side users, albeit positive, has lower returns than the case for airlines, with a 15% F-IRR, 21% ROI and 59 M\$ NPV

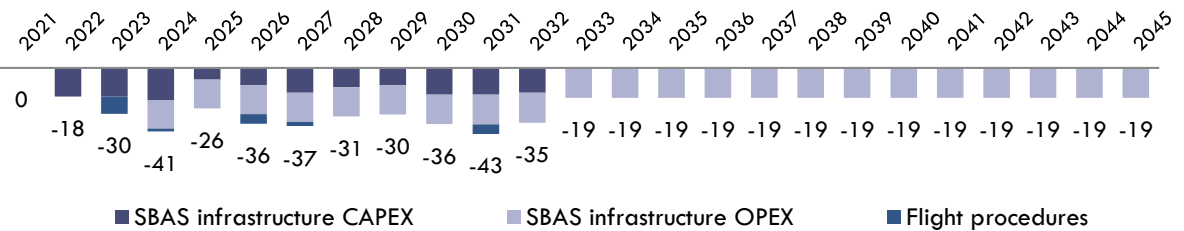
CBA results and sensitivity analysis

Step 1: Financial Analysis

Benefit breakdown of SBAS implementation for African airside users (M\$)



Cost breakdown of SBAS implementation for African ground-side users (M\$)



Financial indicator	Overall
Cumulative undiscounted benefits	741 M\$
Cumulative undiscounted costs	615 M\$
Cumulative undiscounted cashflow	127 M\$
NPV (2045)	59 M\$
Return on Investment (ROI)	21%
Financial Internal Rate of Return (F-IRR)	15%
Payback year	2028 (6 years)

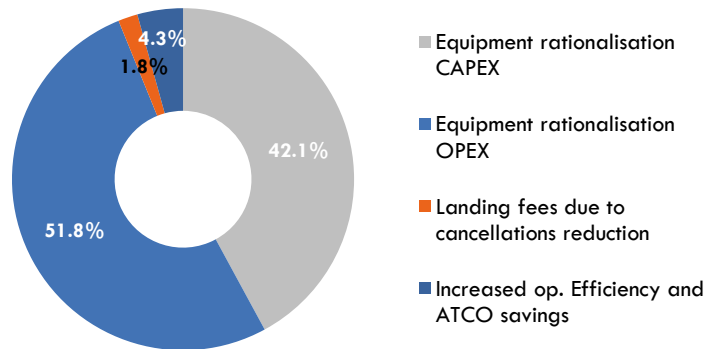
The benefits of SBAS implementation are dominated by infrastructure rationalization (~94%), due to decommissioning and avoided backlog, while 96% of the costs are related to SBAS infrastructure deployment

The different dynamics in benefits and costs for both stakeholders lead to the same payback period of 6 years

CBA results and sensitivity analysis

ANSPs / airport operators

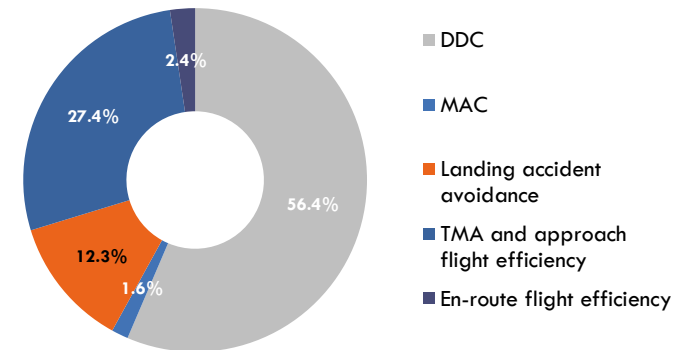
- The benefits of SBAS for ground-side users are dominated by infrastructure rationalisation (decommissioning of old ILS equipment that will not be renewed due to the deployment of SBAS)
- Although the CAPEX is incurred during the deployment phase (2022-2032), there is considerable OPEX expenses throughout the entire timeframe
- This is the reason why, although profitability is limited, the payback period is 6 years



1

Aircraft operators

- The benefits of SBAS for airlines are driven by the following factors:
 - Progressive SBAS fleet ramp-up
 - Progressive coverage evolution in the successive SBAS evolutions
 - Increased traffic
- The costs are concentrated in the first periods, during the fleet ramp-up and the higher cost of retrofitting
- This is the reason why, although overall the benefits are much higher, the payback period is also 6 years

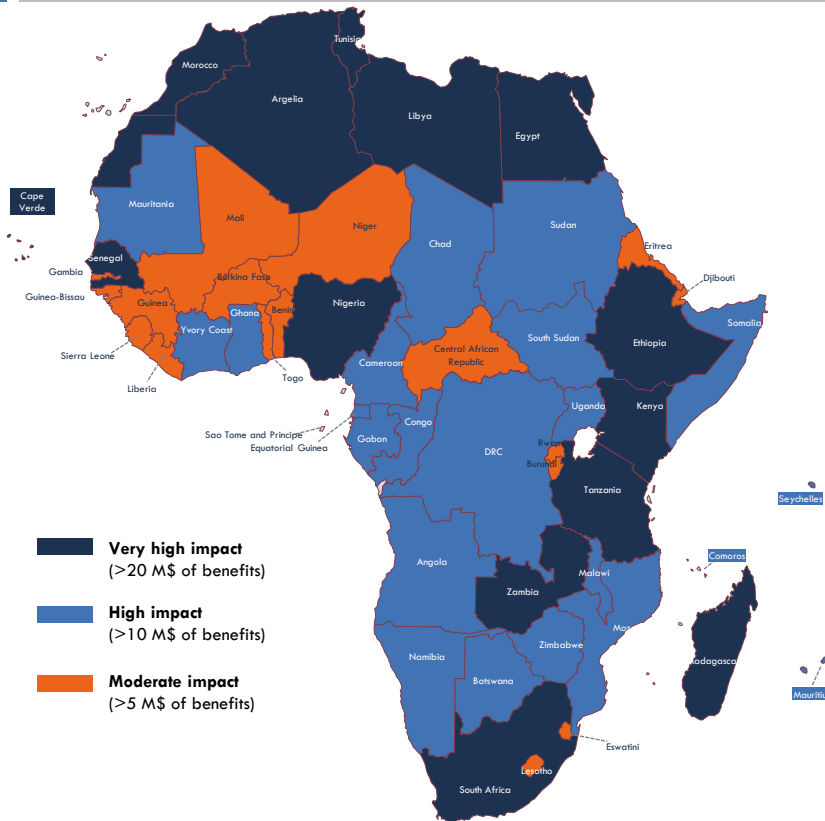


Note: The increase of benefits related to accident avoidance are related to the increase in equipage, traffic and SBAS coverage. The model considers the efforts made in the last decade to increase safety at African airports and the decreased accident rates in the continent

All countries in Africa regardless of size can reap the benefits of SBAS technology, which will be dependent specially on traffic volumes and equipage at airports

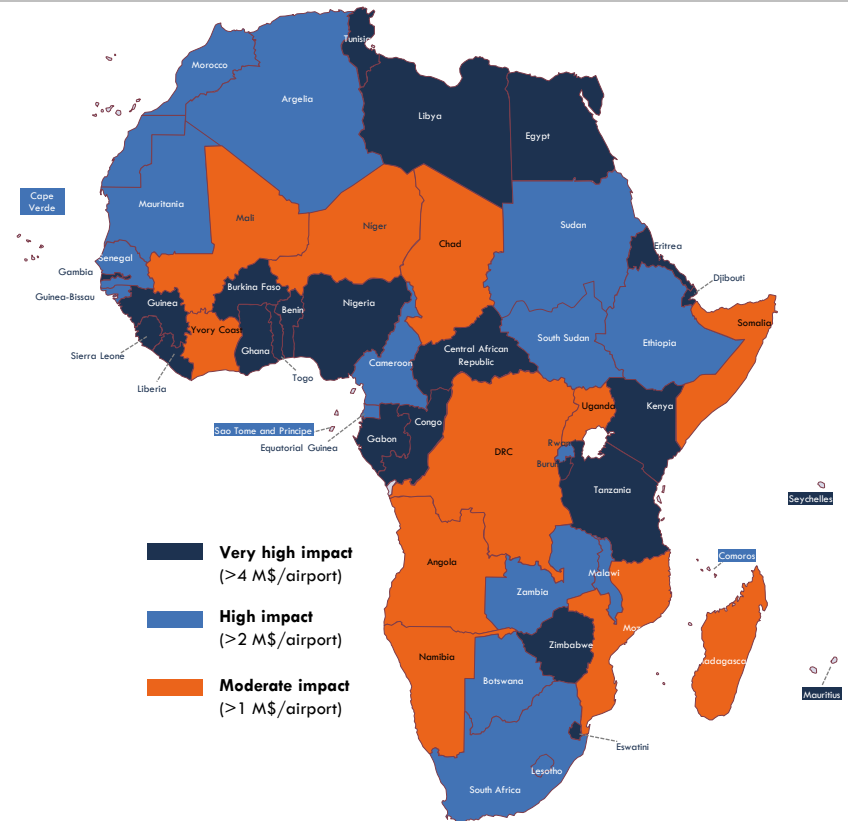
CBA results and sensitivity analysis

Benefits by country [M\$]



All African countries are recipients of benefits from SBAS implementation. The degree of benefits is driven, among many other reasons by overall country traffic levels and ILS equipage at airports

Unitary benefits by country [M\$ of benefits per airport]



When examining the benefits by airport, the distribution of countries more benefited by SBAS technology varies, with a mix of large and small countries reaping the most benefits

The SBAS system's implementation in Africa on a continental scale is economically positive for all stakeholders under all the evaluated scenarios

CBA conclusions and recommendations

Conclusions and recommendations



1- SBAS implementation is economically attractive, with a 402 M\$ NPV at 2045, E-IRR of 28%, ROI of 110% and a 5-year payback period



2- The business case for airlines is extremely favorable, while for ANSPs and airport operators, the results are moderate due to the high deployment costs



3- The carbon footprint of the project is highly positive, with net emission savings amount to 1,424 million kg of CO₂ over the analysis timeframe









4- The sensitivity analysis has proved the robustness of the CBA against variations to the main input parameters

Evaluation of seven market segments resulted in the selection of the Maritime and Agricultural markets as the two sectors to focus immediate CBA analysis



Market segment selection and applications identification in non-Aviation Sector *Criteria: ✓ 2 pts ~ 1 pt ✗ 0 pts*

Markets	Evaluation Criteria	Market size	Market impact	Market conditions	Total
	>	~	✓	✓	5
	>	✓	✓	~	5
	>	✓	✓	✗	4
	>	✗	✓	~	3
	>	✓	✗	~	3
	>	~	~	~	3
	>	✓	✗	✗	2

Priority sectors



Attractiveness

In both sectors, SBAS is expected to become a disruptive technology, with a highly positive market impact which can drive their development

Priority sector selection: Maritime and Agriculture

Maritime

Key market features



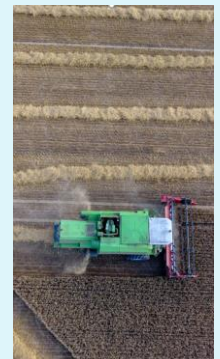
- The maritime market is expected to have around **2.9 million SBAS-enabled operations by 2045**
- SBAS is expected to be a **more cost-effective solution than other legacy GNSS-augmentation technologies** in the sector (DGNSS beacons)
- The **improved accuracy and integrity** for vessel navigation, positioning, collision avoidance and traffic management will **positively impact both vessel operators and maritime authorities**
- The **market readiness** in the maritime industry is already **high**

Key market features

- Agriculture represents around **15% of the continent's GDP** and employs two thirds of its population, so it is a critical market in African economy
- The SBAS market is expected to be very large, with **6.1 million operations with SBAS-equipped machinery predicted by 2045**
- There are various applications, such as tractor guidance and variable rate application technologies for lower-value crops, in which **SBAS can act as an enabling technology and greatly boost the productivity of the sector**



Agriculture



The business case of SBAS for maritime stakeholders, including both vessel operators and authorities, is positive, with a 114 M\$ NPV and 30% E-IRR

Business case development

Maritime

Vessel operators

Mar. Authorities



SBAS Benefits

SBAS Costs

- Operational efficiency savings and route opt.
- Improved safety

- Fleet equipage

- Infrastructure Capex and Opex savings
- Environmental benefits (CO₂ emissions reduction)

- SBAS infrastructure deployment

Description

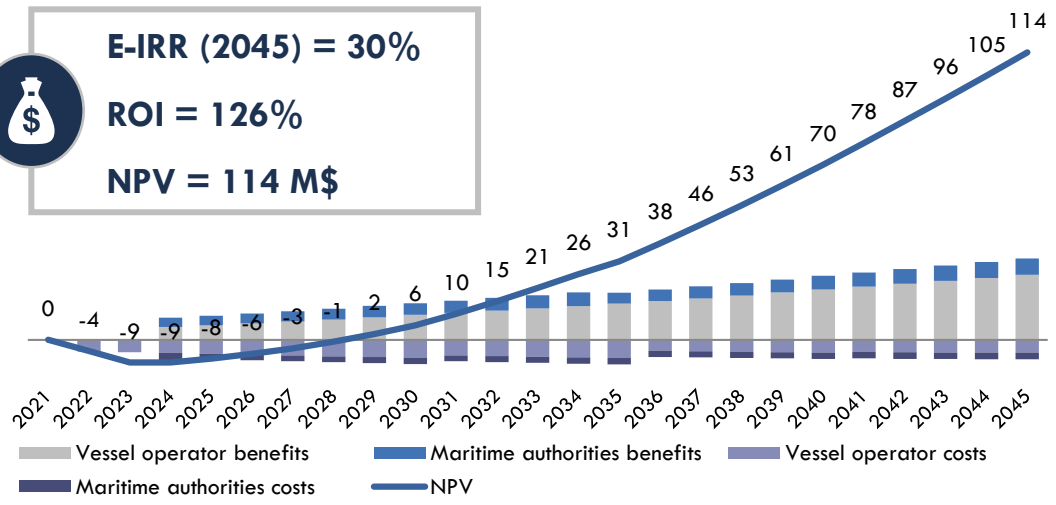
Scope: The business case is centred on the benefits of increased positioning and integrity provided by SBAS in general and coastal navigation and vessel positioning

Scenarios:

- Reference scenario:
 - *Maritime authorities:* Current AIS stations located along the African coastline stations relay DGNSS corrections
 - *Vessel operators:* Fleet currently equipped with AIS transponders benefit from DGNSS
- SBAS scenario:
 - *Maritime authorities:* Incur in the costs to deploy SBAS infrastructure in the coastline
 - *Vessel operators:* Receive SBAS signal either directly from the satellites or from the coastal infrastructure

Economic results

E-IRR (2045) = 30%
ROI = 126%
NPV = 114 M\$



Assumptions: Detailed assumptions on the values used for the computation of the costs and benefits, are detailed in the Task 3 report

The economic attractiveness of SBAS for agriculture is extremely high, and the enhanced positioning benefits can be disruptive for a key industry in Africa

Business case development



SBAS Benefits

- Fuel savings
- Input (seeds, fertilizer...) savings
- Time and labour savings

SBAS Costs

- Equipment equipage costs

Description

Scope: The business case is centred on the use of SBAS for farm machinery guidance

SBAS benefits are based on the improvement that the technology provides with respect to manual or standalone GNSS in terms of pass-to-pass accuracy, at the cost of equipage of the machinery


Scenarios:

- Reference scenario: Unaided driving (most machinery in Africa is not GNSS-equipped)
- SBAS scenario: Manual (the operator has enhanced positioning but not autosteer)

Assumptions:

- The analysis is limited to lower value crops (wheat, maize, lentils, beans...) and extensive areas, in which tractors are used as opposed to other power sources (animals or humans)
- The pass-to-pass errors in agriculture are assumed to occur in overlaps, implying wastes of fuel, time and inputs (seeds, fertiliser...)

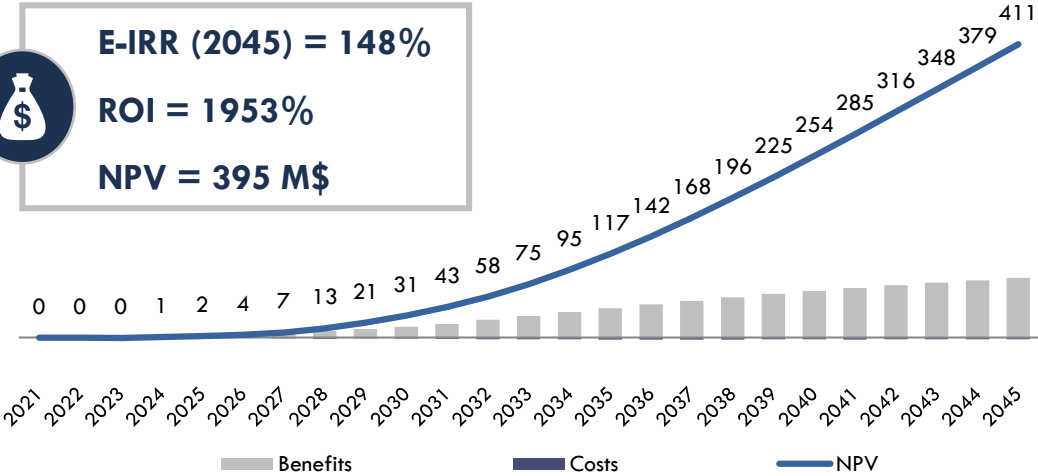
Economic results



E-IRR (2045) = 148%

ROI = 1953%

NPV = 395 M\$



The results presented in this CBA are conservative, as only two priority sectors have been quantified and other potentially profitable markets are not considered

Business case development

SBAS Implementation

Priority sectors



Quantitatively assessed

Leading sector



Quantitatively assessed

Other impacted sectors



Qualitatively assessed



Key financial indicators

Combining the results from both sectors with the outcomes of the Aviation CBA, the overall results of SBAS implementation for Africa are obtained

Integration with aviation CBA and cost apportioning



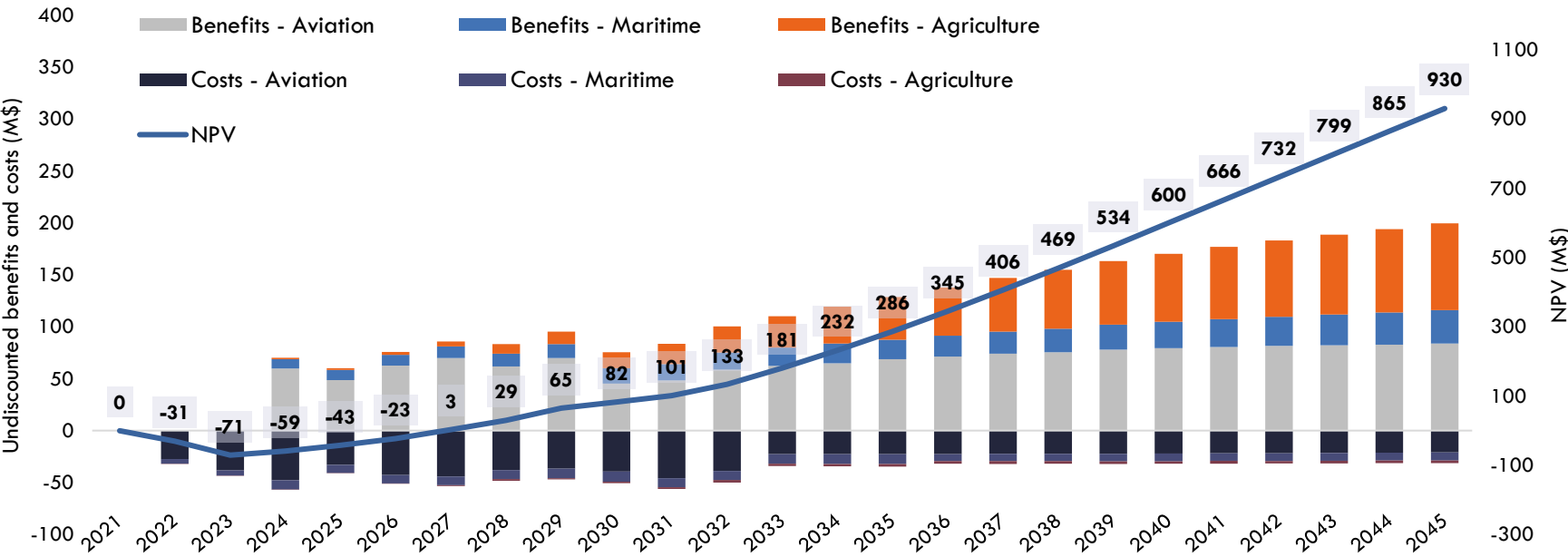
E-IRR (2045)
34%

ROI
195%

NPV (2045)
930 M\$

Payback
5 years

Overall economic results of SBAS implementation for the African economy (M\$)



Considering the accrued impact of aviation, maritime and agricultural markets, the SBAS CBA results for the entire African economy are extremely positive, even without considering other potential sectors (drones, geoinformation...)

Overall, the main conclusion drawn from the study is how the implementation of SBAS system in African is economically highly positive for the continent

Conclusions and recommendations



1- SBAS is a relevant technology across many sectors in the African industry, among which the **agricultural** and **maritime** markets stand out



2- The **economic attractiveness of SBAS implementation has been demonstrated** for both agricultural and maritime stakeholders



3- Considering the accrued impact of all three sectors, the overall **SBAS CBAS for Africa** results in an **NPV of 930 M\$** at 2045, with a **34% E-IRR, 195% ROI** and **5-year payback period**



4- It is recommended to explore the option of involving stakeholders of other industries and **obtain governmental support, providing the basis of SBAS social infrastructure with wide economic benefits**

Recommendations and Conclusions

- Presentations of DT Global Consultants as support to AUC for Continental Cost-Benefit Analysis (CBA) on Satellite-Based Augmentation System (SBAS) implementation in Africa was well received and appreciated by African Member States, regional & international organizations on 31st May, 2022.
- There is need for National telecoms regulatory authorities to manage the assignment of frequency spectrum to any service at national level to avoid harmful interferences with SBAS signals with particular attention to uplink signals.
- Need for African Institutions (i.e AUC and AFCAC) in collaboration with stakeholders and partners to develop governance and institutional framework for SBAS including financing models.
- Aviation States to continually support regional satellite service providers in the assignment of Pseudo Random Noise (PRN) code by the US Space Force for broadcast of SBAS signals in Africa and surrounding waters.

Recommendations and Conclusions

- In addition to the key non-aviation applications that were considered in the study, stakeholders noted the importance and benefits of SBAS applications in other areas such as urban planning, precise geo-location information, cargo tracking systems, rail & road transport, drone applications etc.
- It is recommended to explore options of involving other stakeholders in related industries and obtain governmental support in providing the basis of SBAS social infrastructure with wide economic benefits.
- Specialized institutions and partners in Africa are encouraged to undertake capacity building and awareness activities for the applications of SBAS in aviation and non-aviation sectors.
- Outcomes, comments and recommendations made during the workshop are to be submitted to African Union policy organs for considerations.



Thank
you 

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