INTERNATIONAL CIVIL AVIATION ORGANIZATION

AFI PLANNING AND IMPLEMENTATION REGIONAL GROUP
NINETEENTH MEETING (APIRG/19)
(Yamoussoukro, Cote d'Ivoire, 30 November - 2 December 2015)

Agenda Item 6: Any other Business

EGNOS/SBAS services in Africa as a Regional Programme

Presented by EGNOS-Africa Joint Programme Office (JPO)

SUMMARY

This information paper presents an overview of ongoing implementation of the Joint Africa-EU strategic partnership's specific Action Plans (2007/2009, 2010/2012, 2013/2016) adopted at the highest political level to enhance aviation safety through satellite navigation.

ACTION:

a) Note the progress of various EGNOS initiatives in Africa through the Joint Africa-EU Strategy.
b) Support the JPO proposal to work with ICAO and AFCAC in addressing the implementation of APIRG **Conclusion 19/29** on the impact analysis of SBAS implementation in AFI Region.

REFERENCES:

1. Joint Africa-EU Strategy (JAES), Lisbon, 9 December 2007
2. Joint Africa-EU Strategy (JAES), Action plan 2011-2013, Tripoli, November 2010
3. Joint Africa-EU Strategy (JAES), Joint Roadmap 2014-2017, Bruxelles, 2-3 April 2014
4. Reports of SAFIR working sessions

1 INTRODUCTION

Background

1.1 The Joint AFRICA-EU Strategy based on a shared vision and principles, provides an overarching long-term framework for Africa-EU relations. It is being implemented through successive short-term Action Plans and enhanced political dialogue at all levels resulting in concrete and measurable outcomes in all areas of the partnership.

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1.2 Its objectives include the support to aviation safety in Africa through satellite navigation which started with bilateral cooperation programmes between EU and a number of individual African States and regional grouping to support EGNOS initiatives in Africa. For the remaining Sub-Saharan African countries, a framework programme through Action Plan 2011-2013 "Support to Air transport sector and satellite navigation in Africa" was initiated in 2011.

Satellite based augmentation system (SBAS)

1.3 A satellite based augmentation system (SBAS) provides corrections information from satellite broadcasts to users of the primary GNSS system services (GPS, Glonasss, future Galileo, etc) in order to improve integrity, accuracy, availability and continuity of these global navigation systems. SBAS is one of the key enabling technologies for implementing improved air navigation concepts, such as Performance Based Navigation (PBN). SBAS, with its advantage of wide area coverage (regional system), is the GNSS enabler for ICAO ASBU providing vertical guidance for all runway ends in its coverage region, as compared to ILS ('Instrument Landing System) that provides guidance to only one at a time. Moreover, it enables straight in approaches with reduction of minima during landing down to 200 feet offering the potential to remove circling approaches.

Benefits of SBAS in Africa in the aviation sector

1.4 The adoption of SBAS can generate important benefits to civil aviation, improving safety during all phases of flight, operational efficiency, and economic value. One of the main benefits of SBAS is the enabling of PBN to improve safety and efficiency of air navigation, notably through the reduction of accidents during the airport approach and landing phase by providing a vertical guidance. Moreover SBAS improves accessibility by enabling decision minima down to 200 ft. SBAS can therefore easily provide coverage of areas currently not equipped with the traditional navigation aid instruments, the opening-up of airports in isolated regions, savings on investments at local level (by reducing drastically the need of ground facilities in the airports and associated maintenance requirements), and savings obtained by the choice of optimized routes. Potential elimination of some ground-based navigation aids (NDB, VOR, ILS) can provide a cost saving to air navigation service provider.

SBAS initiatives in Africa

1.5 By the time being, the only part of Africa where SBAS (EGNOS) signal is available is North Africa (MEDA region). However, EGNOS Geo-satellite footprints cover the entire African continent and SBAS services could be therefore extended through some adaptations and installation of ground facilities in Africa or by setting up an independent EGNOS-like regional/sub regional system. The Joint Africa - EU Strategic Partnership recognises this fact as an opportunity to exploit in order to make SBAS available in Africa.

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1.6 As a result of the Joint Africa - EU Strategic Partnership, ongoing SBAS initiatives in Africa include the MEDUSA project (MEDA[1] countries) involving North African countries, the ASECNA[2] SBAS programme, and the EGNOS Service Extension to South Africa (ESESA) - Republic of South Africa. The most current SBAS initiative, within the same framework, is through the African, Caribbean and Pacific Group of States/European Commission (ACP/EC) framework Programme ''Support to the Air Transport and Satellite navigation services in Africa''. The framework Programme, covering Sub-Saharan Africa, consists of four projects focusing on aviation security, aviation safety, and support to the introduction of satellite navigation in Africa based on EGNOS. It is funded by the European Commission through the 10th EDF Intra-ACP envelope and managed by the ACP Secretariat as a contracting authority. Governance of the Programme is through the Steering Committee consisting of the ACP Secretariat, representatives of EC, AUC, the African Civil Aviation Commission (AFCAC), Regional Economic Communities (RECs), and observers approved by the Steering Committee.

1.7 he component of the Framework Programme to support the introduction of satellite navigation in Africa based on EGNOS includes two projects (SAFIR project and TREGA project) which were specifically created to support capacity building for the development and introduction of EGNOS SBAS services in Africa (institutional and skills). The specific objectives of the two projects are:

1.8 The set-up, staffing and operations of an EGNOS-Africa Joint Programme Office (JPO) with a proper regional participation as a Pan-African "implementing instrument" to coordinate GNSS/EGNOS introduction in Africa for all types of applications with a particular attention given to aviation as main driver.

1.9 The organisation of technical Working Sessions composed of regional stakeholders concerned with GNSS/EGNOS in sub-Saharan Africa. The Technical Working Sessions address all aspects of EGNOS-Africa system development and service provision in preparation of the infrastructure deployment phase, including system performance, applications, certification policy, service provision, maintenance, liability policy, governance structure, etc.

1.10 The training of the JPO staff at the UNESCO-International Centre for Theoretical Physics (ICTP) facilities in Trieste, Italy.

1.11 The procurement of a Testing-platform/Software simulator to address specific ionospheric conditions in the equatorial region over Africa and the training of two African GNSS experts who have been selected to work on the simulation platform. At the end of the experts` training, the simulation platform will be installed at JPO offices.

1.12 EU-Africa Partnership on the development and introduction of GNSS/EGNOS services in Sub-Saharan Africa

[1] The MEDA programme is the main financial instrument of the Euro-Mediterranean partnership (It includes 5 African States - Morocco, Algeria, Tunisia, Libya, Egypt)
[2] Agence pour la Sécurité de la Navigation Aérienne en Afrique et à Madagascar (17 African States)

Creation of the EGNOS-Africa Joint Programme Office (JPO) to support the development and introduction of GNSS/EGNOS in Africa

1.13 The need for a coordinating entity was clearly expressed by the African stakeholders during the EU-Africa Aviation Conference jointly organised by the European Commission and the African Union Commission in April 2009 in Windhoek, Namibia. The Conference underscored the need for a capacity building programme, including the establishment of the programme coordinating entity, as a prerequisite for the introduction of GNSS/EGNOS based satellite navigation in Africa.

1.14 Africa as part of the worldwide aviation community has to be fully engaged in the ongoing deployment of the SBAS worldwide considering its advantages. Creation of JPO provides a baseline for the preparation for SBAS implementation in a coordinated, cost effective, and harmonized Pan-African approach. Ongoing deployment of SBAS in other part of the world (EU, India, USA/Canada/Mexico, Japan and its neighbouring countries, Korea, Malaysia, Russia, and China) and creation of JPO present an opportunity to the AFI Region in defining concrete steps which will address implementation and operational challenges to enable efficient SBAS services in the Continent.

1.15 Through the JPO, the EU-Africa Partnership on satellite navigation has provided a mechanism for Africa to participate directly in planning the evolution of the SBAS technology through world and regional forums such as:

a) the SBAS Interoperability Working Group (IWG) which meets twice a year with the main objective of ensuring that the various SBAS systems work together on a standard basis and provide seamless services to users.
b) the European GNSS Evolution Programme (EGEP) ANSP Experts Panel which meets in a quarterly basis to discuss the status of implementation of EGNOS, the standardization activities and any issue related to the implementation of EGNOS.

Coordination of African initiatives on the development and introduction of SBAS services

1.16 The EU-Africa Partnership on satellite navigation as part of the Second Action Plan of the Joint Africa - EU Strategic Partnership adopted during the third Joint Africa-Europe Summit in 2011, involves African States who are members of APIRG either through the SBAS initiatives mentioned above. This indicates that majority of APIRG members are engaged in various SBAS initiatives in Africa on the development and introduction of GNSS/EGNOS (17 ASECNA Member States, South Africa and five members of the MEDA countries). These fact calls for the serious consideration of the APIRG members on how the presence of JPO can be utilized to realize coordination of ongoing SBAS initiatives on the development and introduction of SBAS services involving the majority of APIRG members.

2 EMERGING ISSUES TO CONSIDER

Ionospheric interference in the equatorial region over Africa

2.1 The major technical problem regarding the implementation of SBAS in sub-Saharan Africa was its performance limitation in the equatorial region over Africa. The main challenge to the deployment of the SBAS in the Sub-Saharan Africa has been ionospheric scintillation in the equatorial region over Africa. Uncorrected propagation delays to GNSS satellite L-band signals caused by the ionosphere may significantly limit the performance of a Satellite Based Augmentation System (SBAS) for approach with vertical guidance (APV) and precision approach (PA). This potential limitation of the SBAS performance in Africa has been a matter of discussion on whether Africa can benefit from SBAS services using existing technology. The fact is; the current EGNOS technology (EGNOS V2 Single frequency) being used in Europe may not meet the required performance criteria in some parts of Africa as explained above. However, it is known that Dual Frequency Multi Constellation (DFMC) SBAS systems addresses SBAS performance limitation in the equatorial region over Africa. The next generation of EGNOS (EGNOS V3) will provide dual-frequency signals on L1 and L5 bands and augment both GPS and Galileo constellations as part of the Multi-Constellations Regional System (MRS) concept. Resolving the ionospheric interference problem in the equatorial region over Africa facilitates the inclusion of Sub-Saharan Africa in the ongoing deployment of the SBAS as the worldwide system.

Impact analysis of SBAS implementation in AFI Region

2.2 The APIRG/19 conclusion regarding the implementation of GNSS/SBAS in the AFI Region underscores the need for an impact analysis related to SBAS covering operational, technical, environmental and economic aspects of this GNSS augmentation system.

2.3 The successful implementation of SBAS in Africa requires the effective stakeholders' participation and involvement. Considering that the majority of the APIRG members are currently engaged in SBAS activities as it was presented above, there is an urgent need for the APIRG to address outstanding issues toward a continental wide decision on the implementation of GNSS/SBAS in the AFI Region.

2.4 JPO is ready to support ICAO and AFCAC in addressing the issue of the impact analysis of SBAS implementation in AFI Region as per APIRG/19 conclusion.

Roadmap for the implementation of SBAS services in Africa

2.5 The EU-Africa Partnership on the development and introduction of GNSS/EGNOS services in Sub-Saharan Africa is a long term programme targeting a technology which is applicable to Africa (EGNOS V3 DFMC) and readiness of users. Considering the lead time to the introduction of EGNOS V3 and readiness of the users, JPO prepared the draft EGNOS services implementation roadmap based on EGNOS V3 and the ongoing initiatives. It was developed to support African States in the introduction of harmonised, safe and cost effective EGNOS SBAS services. It proposes a strategy for EGNOS implementation in Africa and includes main milestones necessary to support the process of decision making and subsequent implementation. Development of the Roadmap involved African experts through their participation in the working sessions.

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2.7 APIRG members benefited by being involved in the various activities related with the preparation of the roadmap. This was an opportunity to build the capacity of the African experts on GNSS/SBAS to enable them participate on the same level, as other aviation stakeholders from other regions, in the ongoing deployment of the SBAS as the worldwide system.

3 CONCLUSION

3.1 **Technical:** The EU-Africa Partnership on the development and introduction of GNSS/EGNOS services in Sub-Saharan Africa is a long term programme targeting EGNOS V3 DFMC services which addresses performance limitation of EGNOS V2 single frequency in the equatorial region over Africa caused by ionospheric scintillation.

3.2 Sub-Saharan Africa EGNOS initiative as part of ongoing deployment of the SBAS worldwide: JPO through the EU-Africa Partnership is an opportunity for Africa to join other regions in making sure that SBAS is available around the world. It addresses the need for a capacity building programme as the prerequisite for the introduction of EGNOS based satellite navigation in Africa. The JPO work programme can be used to provide inputs/solution to the APIRG conclusions such as the impact analysis of SBAS implementation in AFI Region as per APIRG/19 conclusion.

3.3 Coordination in the implementation of EGNOS: Majority of APIRG members are engaged in various projects on the development and introduction of GNSS/EGNOS (17 ASECNA Member States, South Africa and five members of the MEDA countries - MEDUSA project). This fact makes EGNOS as the SBAS system under consideration for implementation by the majority of APIRG member states. Considering that SBAS initiatives involve almost 50% of the African States, JPO is an opportunity to facilitate a continental wide coordination for implementation of SBAS.

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4 ACTION BY THE MEETING

4.1 The meeting is invited to:

a) Note the progress of various EGNOS initiatives in Africa through the Joint Africa-EU Strategy.
b) Support the JPO proposal to work with ICAO and AFCAC in addressing the implementation of APIRG **Conclusion 19/29** on the impact analysis of SBAS implementation in AFI Region.

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