



EGNOS BULLETIN

Issue 33, Summer'20 Edition



Credits: VistaJet



European
Global Navigation
Satellite Systems
Agency



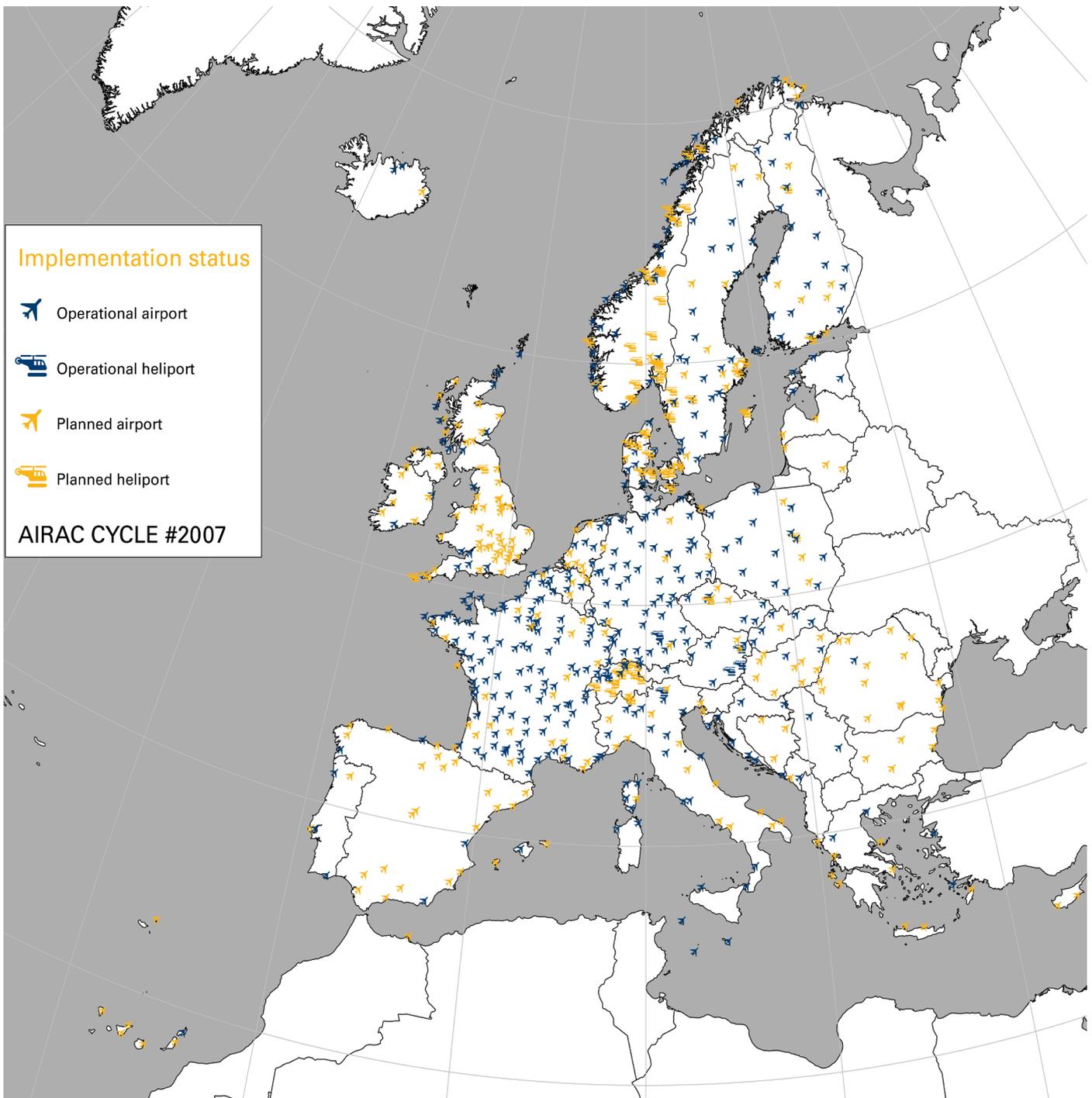
NAVIGATION
MADE IN
EUROPE

<https://egnos-user-support.essp-sas.eu/>



<https://www.essp-sas.eu/>

EGNOS implementation



EGNOS

Success Stories

VISTAJET

VistaJet's view as the world's largest fleet operator with aircraft approved for EGNOS approaches



Credits: VistaJet

VistaJet was founded in 2004, and offers global services unlike any other company in business aviation. With unparalleled experience flying in and out of the hardest-to-reach destinations, VistaJet has arranged for heads of state, corporate leaders, entrepreneurs and private individuals to fly to over 1,900 airports over the world. VistaJet's iconic silver and red-striped fleet is composed of over 70 Bombardier aircraft, from the Challenger 350 to the Global 7500.

Data from the research presented by The Jet Traveler Report, highlights that the most common reasons for passengers to use private jets include maximizing and being in control of time, perceptions of safety, mitigating risk and perceived value. These criteria can be satisfied by operating safely in and out of the preferred

airports by the customer - which are not generally the biggest commercial hubs.

Offering the widest coverage area in the industry, VistaJet has fully taken advantage of the capabilities offered by SBAS, and especially EGNOS, in Europe. EGNOS approaches, which have an equivalent level of safety as accurate ground-based systems, such as Instrument Landing System (ILS), are becoming fundamental both at minor airports, which are not always equipped with instrument guidance systems for landing, and at major airports, as a valid backup to traditional systems. At minor airports, especially those located in mountainous areas or areas confined

“ EGNOS approaches are becoming fundamental at minor and at major airports ”

“ EGNOS procedures allow operating under the minimum weather conditions required ”

by close-in obstacles, the introduction of EGNOS approaches has allowed VistaJet to safely expand aircraft operations. Traditional ground-based systems used to guide aircrafts for landing, require dedicated ground equipment that generates installation and maintenance costs, and are not fully flexible in the approach procedure design, therefore limiting the accessibility to many airports. The alternative has always been the ‘visual approach’ performed by pilots using external visual references, requiring perfect visibility to ensure the avoidance of obstacles. Here are a few examples for illustration purposes of the positive impact EGNOS has had in two VistaJet destinations:

- **Dübendorf**, an airport in Switzerland close to Davos (where the World Economic Forum is held every year), has established an LPV (Localizer Performance with Vertical Guidance approach) approach procedure. Unlike the traditional procedure available, this new procedure based on EGNOS, is not classified as a “steep approach” and can be performed by any airplane and crew,

without requiring specific aircraft modification and training.

- Thanks to EGNOS, when landing at **Innsbruck**, Austria, the approach procedure now starts at significantly lower altitudes, resulting in a less steep and shorter approach.

In addition, the EGNOS procedures available at these two airports allow operating under the minimum weather conditions required, similar to those needed with the traditional ILS.

Aviation is going through an unprecedented change caused by the evolution of the novel coronavirus SARS-CoV-2, and some of the challenges faced a few months ago - such as congestion at airport, delays due to slots, and long approach paths — have been reduced significantly. Nonetheless, new needs are emerging, and VistaJet expects customers will prefer avoiding crowds, which are often associated with major airports. Operations at minor airports will grow to satisfy the new requirements of VistaJet customers. And so, we are continuously adapting how we operate to safely increase flexibility for our customers.

Credits: VistaJet



ANAPTIXI

Anaptixi benefits from EGNOS to carry out geomatics projects such as the LUCAS Survey



Credits: Anaptixi

Anaptixi is a growing research and engineering Greek company, founded in Greece in 1994, which specializes in the collection, processing and management of spatial information. Anaptixi's main lines of work include digital mapping, topographic surveying and transportation engineering, as well as other Geographic Information Systems (GIS), remote sensing and photogrammetry activities. Anaptixi is frequently involved in cadastral projects related to property and land registration, and has made for over 2,500,000 land registrations all around Greece. "In the first stage, these projects require to perform a quick and low-cost assessment of the location and dimensions of the different field parcels with an accuracy better than 3 meters," explains Pantelis Chourdakis, surveying engineer and co-founder of Anaptixi. This is where EGNOS comes into play, since it significantly reduces the margin of error provided by GPS only, allowing Anaptixi to successfully comply with the requirements of this preliminary surveying task. Since the EGNOS Open Service was declared available in 2009, Anaptixi employs handheld GNSS devices equipped with EGNOS, such as the Magellan eXplorist XI, not only for the aforementioned cadastral activities, "but also for field inspection tasks related to area-based subsidies, such as those required by the Common Agricultural Policy (CAP), as well as any other

reconnaissance surveys, such as the LUCAS Survey", as Pantelis remarks. The LUCAS Survey, carried out by EUROSTAT on a triennial basis since 2006, and currently part of the Copernicus Land Monitoring System, focuses on the state and changes in the type and use of land. The survey is carried out in-situ, so a large number of observations are made and registered throughout the European Union.

Anaptixi has participated in all LUCAS Surveys in Greece since 2009. For this purpose, Pantelis states that "the simultaneous work of more than 50 surveyors in different parts of Greece is usually required". These LUCAS surveyors employ GNSS handheld devices to reach the specific point to be surveyed and to track the complete path that is followed for quality control purposes. In summary, every LUCAS Survey implies the availability of a high number of surveyors with GNSS units to acquire multiple positioning data with enough accuracy in different areas. In this context, EGNOS continuously provides GPS corrections over Europe, allowing LUCAS surveyors to enhance the accuracy of their GNSS handheld equipment in real time at no cost. As a result, Pantelis concludes that "EGNOS is for us the most cost-effective solution to perform the LUCAS Survey field tasks".

“ EGNOS is for us the most cost-effective solution to perform the LUCAS Survey field tasks ”

GZC-SLOVENIA

Credits: GZC



Field inspector from GZC performing an OTSC with portable GNSS equipment that uses EGNOS

Geodetski zavod Celje d.o.o. (GZC) is an international company with more than 60 years of experience providing consultation and technical assistance services to the public sector. GZC specialises in spatial and rural development planning, implementation, monitoring and evaluation, as well as in the provision of technical assistance in the above fields for capacity building of national and local institutions, managing numerous projects mainly in Slovenia and the Western Balkans. In particular, GZC is the contractor of the Slovenian Agency for Agricultural Markets and Rural Development for all Common Agricultural Policy (CAP) controls, both with remote sensing and on-the-spot checks (OTSC), since 2006.

For the implementation of CAP controls, the eligible agricultural area, i.e. where actual crops are grown, needs to be identified. For this purpose, the performance of OTSC with GNSS devices is usually required, e.g. if no suitable satellite imagery of a specific area is available. In this sense, as soon as the EGNOS Open Service was declared available in 2009, GZC confirmed its validity for CAP OTSC, following the Joint

Research Centre's validation protocol based on the ISO 5275 norm, and, as a result, has used it since then for this type of in-field campaigns. As EGNOS is integrated in almost all professional GNSS devices, GZC has been able to use it with different equipment throughout the years, namely Hemisphere A100, Hemisphere A325, SXBlue II+ GNSS, Trimble GeoXT, Trimble 6000 series, Trimble Juno and Leica Zeno 20.

In the specific case of Slovenia, there is a network of permanent GNSS base stations that provides DGNSS and RTK corrections. However, mobile networks, which are needed to receive this data, present a limited coverage in remote rural areas. This drawback is overcome by EGNOS, since its signal is broadcasted by geostationary satellites and, therefore, constantly available in Europe (rural and urban visibility maps can be consulted in the EGNOS' User Support website). In addition, EGNOS is free of charge, providing significant economic savings to GZC, as they require corrections for about one hundred GNSS units. For these reasons, GZC relies on the EGNOS Open Service as the standard GNSS solution for those tasks where sub-metric accuracy is enough, such as CAP OTSC.

“ This drawback is overcome by EGNOS as it is a service constantly available in Europe ”

FINLAND MARITIME RECEIVER TESTS

GNSS data collection campaign along the Gulf of Finland



Credits: ESSP

GSA and ESSP, in collaboration with Väylä (Finnish Transport Infrastructure Agency), MML (Finnish Geospatial Research Institute) and OSM Group AS (Norwegian Oil Transport provider), performed a GNSS dynamic data campaign along the Finnish coast on board the crude oil tanker Mastera, between November 1st and 14th, 2019.

The aim of this GNSS data campaign was to assess EGNOS' performance at a user level in the maritime domain and at high latitudes in Europe, along the Gulf of Finland (among Porvoo-Finland, Primorsk-Russia and Naantali-Finland).

Position navigation results, coming from a set of different GNSS receivers (maritime receivers and high-end receivers), point out that the EGNOS L1 service is compliant with the operational requirements defined in the IMO Res. A.1046 for ocean waters, coastal waters and harbour entrances/approaches at those high latitudes in Europe.

- The EGNOS signal in space availability was

100%. In fact, both GNSS receivers were able to track EGNOS messages from both operational GEO satellites (PRN123 and PRN136) 100% of the time.

- EGNOS position availability was 100% for both GNSS receivers during the whole period.

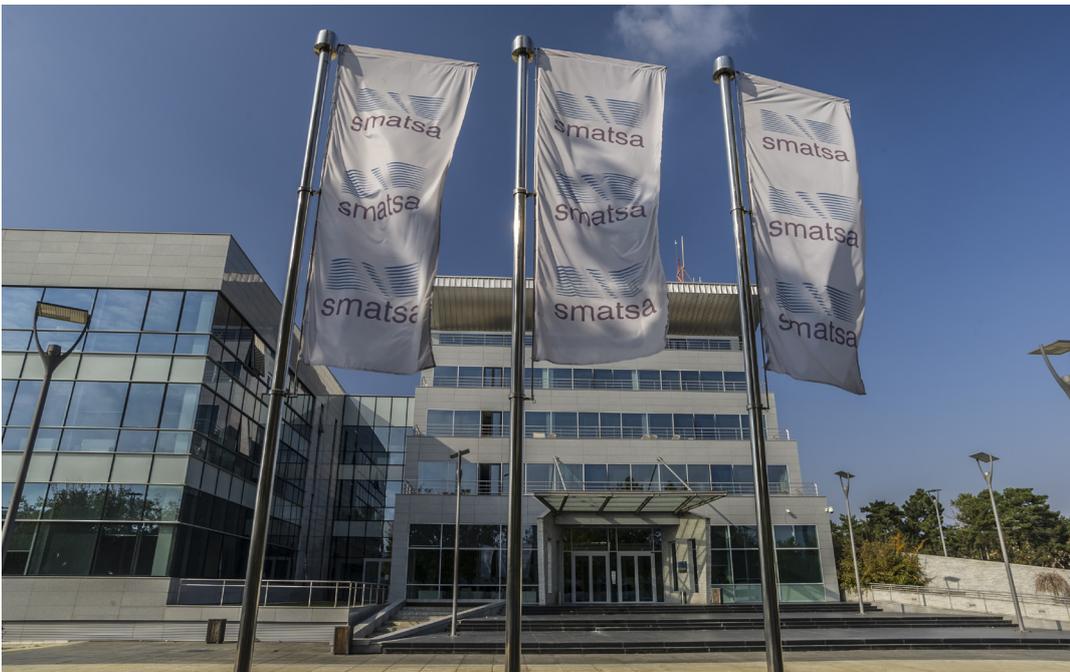
- EGNOS position continuity was 100% for both receivers during the whole period, since no EGNOS continuity events were detected during the data campaign period.

- The 95th percentile of the Horizontal Position Error was 0.81 m during the data campaign period with a maritime receiver and 0.971 m for the high-end receiver.

- EGNOS' horizontal position accuracy is enhanced between 54% and 151% with respect to GPS standalone solution in the case of the maritime receiver. As an example, on November 2nd, the percentile at 95% of the horizontal position accuracy was 0.791 m for EGNOS, whereas it was 1.809 m for GPS.

Talking about EGNOS with... SMATSA

SMATSA llc was established in 2003 as a limited liability company by the governments of the Republic of Serbia and Montenegro as a mutual provider of air navigation services. Additional services provided by SMATSA llc include air traffic control officer training, flight training, flight inspection of NAVAIDs and aircraft maintenance. In this EGNOS Bulletin, we interview SMATSA's Velibor Andrić, Instrument Flight Procedure Design Specialist, and Marko Ljubičić, Instrument Flight Procedure Design Coordinator from the Airspace Management Department



Credits: SMATSA

First of all, could you please give us an overview of the EGNOS-based procedures implementation in Serbia and Montenegro?

It was a long and complex process with more than a few iterations. Since SMATSA llc provides services in two non-EU countries, the whole process of signing two separate EWAs with ESSP (19/12/2018) took much longer, and was more complex, than for the regular EU-member ANSP. Due to these specifics, the process had to go through several iterations, including final approval by EASA. In obtaining this approval, SMATSA had great support from national CAAs: DCV (Serbian CAA) and ACV (Montenegrin CAA), which both gave warranties and confirmation that SMATSA operates in accordance with SES regulations, and continuity in this regard has been ensured.

Regarding the procedures during the design phase, we would like to mention that the previous experience, which was obtained through our participation in the CaBiAvi and BEYOND EU founded projects within the Horizon 2020 programme together with DCV and ACV, was also of great help to us.

Relying on the significant experience of PANS-OPS, which was developed decades ago and passed on to the current generations of designers, we had no major problems in designing EGNOS-based procedures at these three airports – Belgrade, Niš and Podgorica.

Could you please describe the process followed for the publications?

At the Belgrade aerodrome we had a clean situation regarding obstacles and terrain limitations. For that

reason, this airport was a trial project that served as an example for the procedure design at other airports.

At the Niš aerodrome only one approach with a 5-degree offset for RWY 29 was constructed due to a complex terrain situation in the extended runway centerline. Previous cooperation with the company PildoLabs during the CaBilAvi project was of a great help in the design process for this procedure.

At the Podgorica aerodrome the most challenging problem was the available airspace, limited by high terrain in all quadrants and the close proximity of Montenegro/Albania's state border. This had to be solved during the EGNOS-based Instrument Approach Procedures design process. With this in mind, it was necessary to keep the final approach segment length at the minimum allowed value. Also, the missed approach procedure had to be designed as a non-standard, requiring both the

bank angle and airspeed restrictions during the missed approach turn. Flight validation checks demonstrated that the design was safe to use and the procedure was approved by the ACV.

Flight Validation –SMATSA's Flight Calibration Department uses the Beechcraft King Air 350, equipped with a flight inspection system manufactured by Aerodata AG and a flight validation of LPV procedures of up to DH-200 fully supported by the aircraft's flight management system (FMS). Since SMATSA's Flight Calibration has been commercially providing services in the region and beyond for more than a decade, they already have previous experience with flight validation of LPV procedures, so it can now be said that SMATSA's Flight Calibration Department has performed LPV flight validations in four different countries: Croatia, Bosnia and Herzegovina, Montenegro and Serbia.

Both Serbia and Montenegro are non-EU member states and, thus, not legally bound to European Regulation (EU) 2018/1048 (the PBN Implementing Rule). What is your regulatory framework?

Although Serbia and Montenegro are EU candidate countries, they are both signatories of the European Common Aviation Area agreement (ECAA), which obliges those two states to transpose the EU legislation to the national jurisdictional system. Because of that, the CAA of Montenegro has already transposed the EU 2018/1048 (PBN IR) to its national regulatory requirements, and Serbia plans to do the same in the near future. Nonetheless, in order to support a harmonised approach at a European level, SMATSA has already started drafting PBN transition plans for both countries and, at the moment, the plans are in the phase of initial coordination with stakeholders. At this stage, this activity is coordinated by Eurocontrol's Network Manager.

Which are, from your point of view, the most relevant benefits brought by PBN, especially by EGNOS?

PBN significantly enables the design of instrument procedures for aerodromes in mountainous terrains. One of the main challenges in the design of the procedure, aside from the terrain itself, is the actual coverage of used radio-navigational aids. Especially in mountainous terrain, NAVAID coverage can be a very limiting factor. With GNSS navigation, ground-based NAVAID coverage is no longer an issue; and with the addition of EGNOS, thanks to precise and safe satellite positioning services and the possibility of implementing CAT I minima, the whole thing is taken to another level. Additionally, we are currently facing large-scale renovation and expansion projects at Belgrade Airport, including intense construction works on the temporary parallel-inserted runway. Knowing that the procedures for the new runway can be developed independently from the installation of new ground NAVAIDs, makes us feel more conformable and self-assured during this process.

Could you please tell us about plans on new EGNOS-based implementations? For instance, new airports or specific procedures for helicopters, including PinS

At this exact moment, we do not have detailed or agreed plans for the publication of helicopter

“ PBN significantly enables the design of instrument procedures for aerodromes in mountainous terrains ”

procedures; however, that is the direction we are going towards in the near future. This is something that is expected, especially when you take into account that, in 2019, the Serbian Air force and police started to equip themselves with Airbus H145M helicopters.

With respect to aerodromes, we plan to publish an RNP approach procedure at Tivat Airport, but it has quite challenging surrounding orography. This is the main reason why the procedures have not been developed yet. Currently, there is a project for the design of an RNP AR approach, financed by the airport authority and developed by Navblue.

Which have been your main lessons learnt in this process?

Actually, the whole process was a great opportunity for us to learn and improve. There are literally no individual activities that we would

specifically emphasize or exclude. We have grown during the process. Our experience and acquaintances have increased. And, acquaintance and cooperation between specialists are the most important preconditions for growth in every field of work. We expect to continue doing that in the future.

And, to finish, is there any final message you would like to share with our readers?

We would like to express our excitement and gratitude in that we have finally become a part of the EGNOS family. EGNOS' service truly creates added value in aviation, especially in the domain of safety of operations. Having that service in your own area of responsibility, available to the users, without a doubt, feels special.

“ We would like to express our excitement and gratitude in that we have finally become a part of the EGNOS family ”

Meet the users



Marko Ljubičić,
Instrument Flight
Procedure Design
Coordinator

Graduated from the Faculty of Transport and Traffic Engineering (FTTE) at University of Belgrade in 2002 (Department of Air Transport and Traffic). He has been working in SMATSA since 2004, beginning in AIS as a specialist for NOTAM's systems, and in NOF as a work procedures technologist. Finished IFP Design training in 2010 and, since then, works in the Airspace Management Department. Part-time lecturer at SMATSA ANS' Personnel Training Centre.



Velibor Andrić,
Instrument Flight
Procedure Design
Specialist at
SMATSA Ilc

Graduated from the Faculty of Transport and Traffic Engineering (FTTE) at University of Belgrade in 2009 (Department of Air Transport and Traffic). He joined the company in 2015, previously completing traineeship programmes at Eurocontrol and SMATSA Ilc. Worked for several years as a research assistant at the FTTE, and has experience in the fields of navigation and flight operations in the airline business. Dedicated to the call of exploring possibilities of IFPs utilisation in everyday job activities and as a PhD Candidate at FTTE Division of Airports and Air Traffic Safety.

EGNOS services highlights

GEO SWAPS: SUCCESSFULLY COMPLETED



Due to the planned activities required in the operational EGNOS geostationary satellites (GEOs), the INMARSAT 4F2 (PRN 126) was introduced in the EGNOS' Operational Platform in January, while the ASTRA SES-5 (GEO-1/PRN 136) and ASTRA 5-B (GEO-2/PRN 123) became part of the EGNOS TEST Platform, broadcasting the TEST Signal-In-Space (SiS) in alternate periods.

With the successful completion of the last scheduled GEO Swap at the end of March, all swaps planned for the first quarter of 2020 were finalised, and the Operational EGNOS Space Segment is back to the nominal configuration with both ASTRA GEOs (PRN 123 and PRN 136). Take a look at [Service Notice #22](#) for detailed information.

Should you like to be notified with updates on the EGNOS PRN configuration in the future, please subscribe to the EGNOS' Documentation Notification Service. In order to do so, please refer to the [Subscriptions](#) section on the EGNOS' User Support website, which will allow you to select the notifications you would like to receive, and make sure you select "Service Notices".

EGNOS SERVICE IMPLEMENTATION ROADMAPS: NEW VERSION 4.3 RELEASED



The new version of the [EGNOS Service Implementation Roadmaps \(v4.3\)](#) has been released and is now available at EGNOS Service Implementation Roadmap section of the EGNOS User Support website! * The EGNOS Service Implementation Roadmaps provide a high-level overview of the expected evolution for the upcoming years on each of the EGNOS Services: Safety of Life (SoL), Open Service (OS) and EGNOS Data Access Service (EDAS).

Some of the relevant EGNOS' milestones detailed within the new release of the document include the following:

- New System Releases to be deployed.
- Optimisation of ionospheric monitoring algorithms, improving the system's robustness.
- We invite you to explore the upcoming evolutions described in the Service Implementation Roadmaps, which are available both in PDF and in interactive view formats. Do not hesitate to contact us if you have any question.

COVID-19 CRISIS



EGNOS' service has been continuously delivered in spite of the COVID-19 crisis affecting Europe. Assets maintenance, operations and activities required to provide EGNOS' services have been performed, ensuring the security of the infrastructure while, at the same time, guaranteeing health and safety. A big 'thank you' to all the staff making this possible, for their cooperation, solidarity and capacity to adapt to the circumstances. Thanks also for the support received from all programs' stakeholders: EC, GSA, ESA, EASA and the supply chain.

NEW LPV OPERATORS MAP

A new functionality has been introduced in the **LPV map** under "Resources and tools" in the **EGNOS User Support Website**. You can now access information on the status of LPV Implementation for European operators by switching from "Procedures" to "Operators" on the button placed in the upper right-hand corner of the LPV map (See image). An emerging pop-up box will be displayed when the cursor is placed over each country, showing the details of the LPV certified aircraft that are registered in that state. As you can see in the picture, that includes the air operator, the aircraft manufacturer, the model and the number of "Operational" and "Ongoing" LPV certified units. "Operational" aircraft stands for LPV certified aircraft, having received the operational approval, or where no operational approval is required, while "Ongoing" aircraft



stands for LPV certified aircraft which have not received the operational approval yet (more info in [this link](#)). The information provided is based on feedback obtained from the aviation community, mainly from the airspace users. Do not miss the opportunity to explore the map!



EGNOS
EGNOS, it's there. Use it.

USER SATISFACTION SURVEY 2019

Legend 2018 results

The questionnaire has been filled by

124

140

respondents

26

25

Non-EGNOS Users



98

115

EGNOS Users

35 (*)

42

Safety of Life (SoL)

19 (*)

18

EDAS

24 (*)

54

Open Service (OS)

(*) Each respondent can use more than one service.



8.6

Global Satisfaction

8.3

Grading scale of 10 points

EGNOS SUPPORT



8.0

8.1

Support Website



8.3

8.6

Documentation



8.7

9.0

Helpdesk

SATISFACTION PER MARKET SEGMENT



EGNOS TIME SERVICE

9 respondents are using EGNOS Time Service. 4

7.9 ▲ 7.0

18% could be interested in using this service. 18%

NOTE.- 3 respondents marked "other" MS and 1 did not indicate it. (*) LBS = Location-Based Services.

Your SATISFACTION is our reason for being!

EGNOS SERVICES

(*) Each respondent can use more than one service.

36%
EGNOS Users (*)

SoL

9.1 ▲ 8.7

24%
EGNOS Users (*)

OS

8.4 ▲ 8.1

19%
EGNOS Users (*)

EDAS

8.3 ▲ 8.2

Performance

9.3 ▲
EGNOS SoL accuracy

9.1

9.3 ▲
EGNOS SoL availability

9.0

8.8 ▲
EGNOS SoL continuity

8.5

8.9 ▲
EGNOS SoL coverage

8.2

8.0 ▲
EGNOS OS accuracy

7.9

8.8 ▲
EGNOS OS availability

8.3

8.1 ▲
EGNOS OS coverage

8.0

What's new?

Since the last bulletin...

EGNOS WORKING AGREEMENTS SIGNED (EWA)

The following EWAs have been signed in the last quarter:



Sindal Airport **Denmark**



Czech Air Force **Czech Republic**



Slovenia Control **Slovenia**

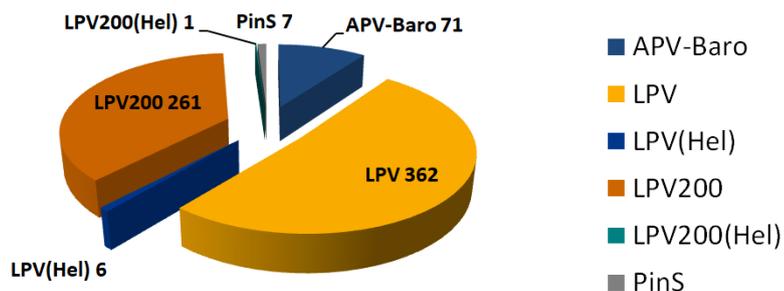
LPV, LPV-200, PinS & APV Baro procedures published (including AIRAC cycle 2020 #07– 18/06/2020)

Next graph shows, the number of procedures
LPV, LPV-200, PinS, APV-Baro, LPV-Hel and LPV200-Hel. The total number is **708**.

LPV, LPV-200, PinS & APV Baro procedures published (including AIRAC cycle 2020 #07– 18/06/2020)

Next graph shows, the number of procedures

LPV, LPV-200, PinS, APV-Baro, LPV-Hel and LPV200-Hel. The total number is **708**

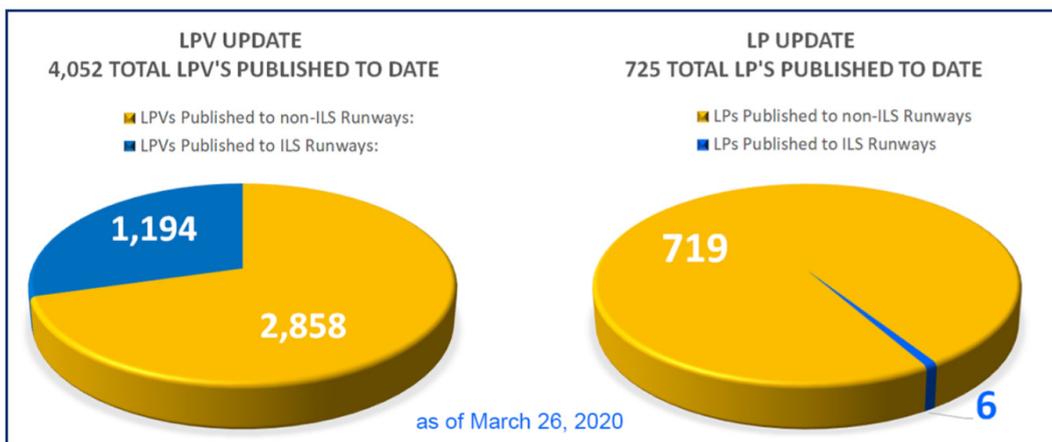


SBAS in the world

FAA PROCEDURE TABLE

Chart below shows the WAAS list of satellite based approach procedures. You can find further information on [SatNavNews](#).

Courtesy of the FAA WAAS Team.

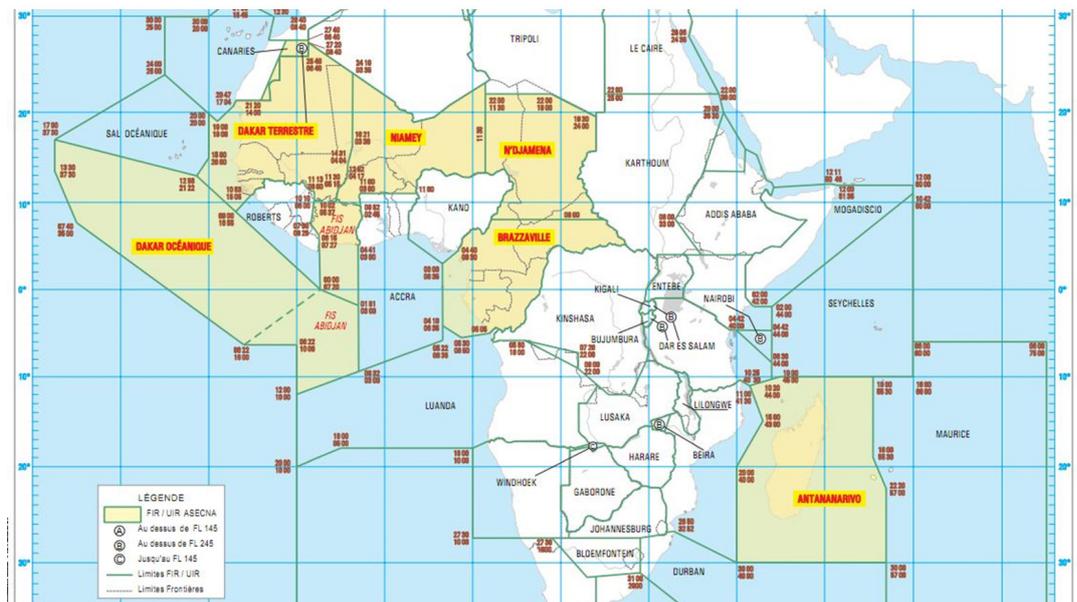


Did you know...?

ASECNA, the Agency for Air Navigation Safety in Africa and Madagascar, is an international public organisation of 18 Member States*. Created in 1959, its main mission is to provide air navigation services within an airspace of 16 million squared kilometres, corresponding to the airspace under the jurisdiction of its Member States and to oceanic airspace in central Atlantic Ocean, gulf of Guinea and Indian Ocean entrusted by the international community.

*Benin, Burkina Faso, Cameroun, Central African Republic, Comoros, Congo, Côte d'Ivoire, France, Gabon, Guinea Bissau, Equatorial Guinea, Madagascar, Mali, Mauritania, Niger, Senegal, Chad and Togo

“SBAS FOR AFRICA AND INDIAN OCEAN”; A NEWCOMER IN THE SBAS WORLD



Flight Information Regions (FIR) under the ASECNA responsibility (shaded areas)



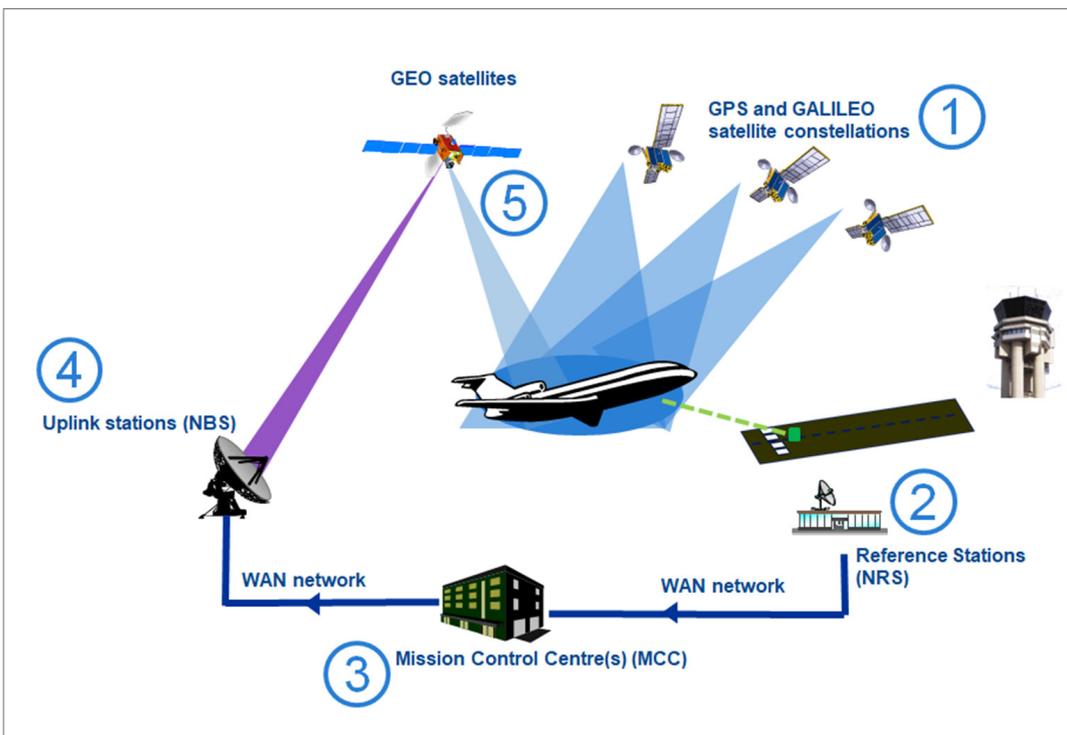
“SBAS for Africa and Indian Ocean” is the SBAS initiative led by the Agency for Air Navigation Safety in Africa and Madagascar (ASECNA) which pursues the autonomous provision of SBAS services over the African and Indian Ocean region, in the framework of the African Union Space Policy and more globally of the Strategic Partnership between Africa and the European Union.

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

“SBAS for Africa and Indian Ocean” services are indeed intended to enhance PBN and ADS-B

operations for all phases of flight, from en-route down to approach, and thereby to increase significantly flight safety and economical and environmental efficiency, which are all the more pertinent in the post-Covid changing air transport. These services will primarily aim to improve availability for all RNAV routes and flexibility for new and more efficient routes, and to provide an effective solution for CAT-I equivalent operations “everywhere every time,” especially in the very large number (more than 80%) of runway ends in Africa not served by precision approaches today. It will also enable to ensure service continuity during ILS maintenance and renewal periods and will overcome limitations of LNAV/VNAV operations. L1 initial services provision is planned by ASECNA from 2022/2023 and DFMC services beyond 2028-2030. The system architecture, based on EGNOS, and related incremental services areas, are today validated and under preliminary design. A test-bed is under deployment in Africa and Indian Ocean, and the provision of pre-operational service is expected in the next months, along with field demonstrations with partner airlines.

The “SBAS for Africa and Indian Ocean,” also



SBAS for Africa and Indian Ocean architecture concept

temporarily called “A-SBAS”, is today recognised by ICAO and has been assigned a Service Provider identifier, like other SBAS under development (BDSBAS, KASS and SPAN in China, Republic of

Korea and Australia/New Zealand respectively). Those identifiers will be applicable from November 2020 as per the upcoming amendment n°92 of the ICAO Annex 10:

Identifier	Service Provider
0	WAAS
1	EGNOS
2	MSAS
3	GAGAN
4	SDCM
5	BDSBAS
6	KASS
7	SBAS for Africa and Indian Ocean (A-SBAS)
8	SPAN

SBAS service provider identifiers (ICAO Annex 10)

What's going on...



in aviation.

INSTRUMENT FLIGHT PROCEDURES FOR GENERAL AVIATION SUPPORTED BY EGNOS

Credits: Grenchen
aerodrome



The General Aviation community undertakes millions of flights on aircraft equipped with GNSS-enabled receivers. To support and ensure this community takes full advantage of this technology, it is a priority for the European GNSS Agency (GSA) and the EGNOS Service Provider (ESSP) to facilitate the publication of Instrument Flight Procedures based on EGNOS.

In this sense, the ESSP has supported the GSA in the elaboration of a **document containing safety promotion material on the implementation of GNSS-based Instrument Flight Procedures for General Aviation, uncontrolled aerodromes and non-instrument runways**, for EASA to publish it, in an effort to support a wider use of EGNOS in General Aviation.

The document draws together the current regulatory analysis supporting EGNOS-based operations, along with enablers and best practices to support implementation, open issues and, last but not least, use cases to encourage national authorities approving these types of operations in their countries. These examples also illustrate how instrument flight procedures based on EGNOS can be implemented at locations where visual

flight rules apply.

The material is aligned with the EASA Roadmap for General Aviation, which identifies simpler and more proportional rules with operations that are cost efficient, flexible enough and based on existing best practices. In fact, the document has been also published in the EASA website as Safety Promotion Material, to support and contribute to the continuous improvement of aviation safety in Europe and worldwide. **The document highlights the importance of the EGNOS' Service Provision in supporting the implementation of Instrument Flight Procedures for General Aviation.**

The publication of this material is just the beginning. There are many on-going activities in which GSA and ESSP are collaborating to promote and illustrate the use of EGNOS in General Aviation, proving that GNSS/SBAS is ready to support EGNOS-based operations for General Aviation.

This document is already published at [EASA](#), [GSA](#) and [ESSP websites](#).

EGNOS PRESENT AT THE ERA'S OPERATIONS GROUP MEETING



Credits: ESSP

EGNOS was once again present during ERA's (European Regions Airline Association) Operations Group meeting, which took place on the 12th of March in Madrid, Spain. The meeting was kindly hosted by Wamos Air, at their headquarters.

This meeting allowed the ERA-member personnel directly involved in flight operations or flight operations support to participate, contribute and help define the future operational policies of the regional aviation industry.

The European GNSS Agency (GSA) and ESSP, the EGNOS Service Provider, were given an early slot in the conference programme to address, among other topics, the reasons why airlines should seriously consider the uptake of

EGNOS, based on [Commission Implementing Regulation \(EU\) 2018/1048 of 18 July 2018](#) (or the PBN Implementing Rule as known to most). The opportunity was also perfect to update the audience on the 4th Call for Grants for EGNOS' Adoption in Civil Aviation, expected to be published during the second half of 2020.

The agenda also included the latest information on data link implementation and ADS-B consultation, [ACNUSA](#), an overview of EUROCONTROL's Network Strategy Plan 2020-2029 and the Continuous Climb and Descent Operations Task Force.

For more information, please visit ERA's [webpage](#).

“ The opportunity was also perfect to update the audience on the 4th Call for Grants for EGNOS' Adoption in Civil Aviation, expected to be published during the second half of 2020 ”



in aviation.

NEW GSA CALL FOR GRANT FOR CIVIL AVIATION



Credits: ESSP

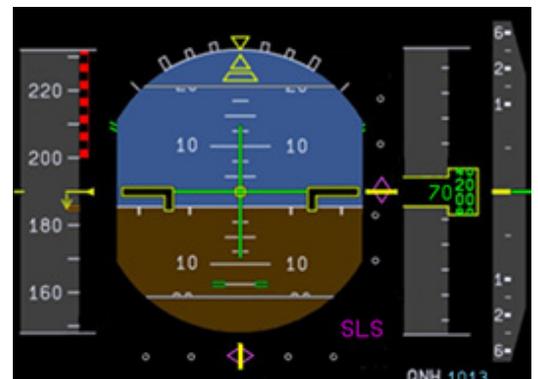
The **European GNSS Agency (GSA)** is planning a new round of their Call for Grants for EGNOS Adoption in Civil Aviation, following the successful experiences of 2014, 2015 and 2018, which altogether provided around 22 million EUR in grants to accelerate the operational implementation of EGNOS in the European aviation market. The new round expects to make € 3,000,000

available for applicants, with the possibility of extending it to € 10,000,000, pending budget availability.

The scope of activities to be funded under this call for proposals will be announced by the time the call is launched, something that shall happen during the second half of 2020.

AIRBUS SLS FUNCTIONALITY

Airbus is now fully into the process of deploying the SLS (SBAS Landing function) function on all its aircraft families. SLS allows flying LPV approaches under EGNOS' coverage. This optional function is already available on the A350 and will soon be available on the A320, A330 and A380 families. The A220 is also capable of flying LPV approaches. Right now, the function is being flight tested on the A320, with a first couple of Multi-Mode Receiver - Flight Management System. As different vendors exist, all the couples should be flight tested by the end of the summer of 2020, to target a first EASA certification for the first configuration on Q4 2020. However, the current COVID-19 crisis has put some uncertainty on this schedule and, therefore, current dates may slightly vary in the near future, depending on flight test aircraft



Credits: Airbus

availability and Airbus' workforce. Nevertheless, since the function is highly ranked in Airbus' priorities, it should be available between Q4 2020 and Q4 2021 on the A320/A330 programs, and in 2022 on the A380 program. Find out more about the function [here](#).

COLLINS AEROSPACE HAS DEVELOPED THE GLU-2100, AN SBAS AND GBAS CAT I CAPABLE MMR



Credits: Collins Aerospace

Collins Aerospace has a long history with Global Navigation Systems, equipping aircraft with the technology to use Global Navigation Satellite Systems (GNSS). In 1995, Collins introduced and certified the first Multi-Mode Receiver (MMR), combining Instrument Landing System (ILS) and GPS. Evolution of MMR capabilities continued with the introduction of the GPS Landing System (GLS), otherwise known as Ground-Based Augmentation System (GBAS), which emerged in 2005, and Satellite Based Augmentation Systems (SBAS), introduced in 2010.

More recently, to support growth of GNSS capabilities, Collins Aerospace has developed the GLU-2100, an SBAS and GBAS Cat I capable MMR. Built on Collins' legacy of industry leading satellite navigation technology, the GLU-2100 was designed with hardware to support upgrades to foreseeable future navigation capabilities, such as SBAS Localizer Performance with Vertical Guidance (LPV), GBAS CAT II/III and Dual-Frequency/Multi-Constellation (DFMC). These new capabilities are enabled through field-loadable software.

As part of these future upgrades, Collins is working closely with the European GNSS Agency (GSA) to support the definition and include DFMC and Advanced Receiver Autonomous Integrity Monitoring (ARAIM) features needed to meet global airspace modernization requirements.

As implemented currently in aircraft, Receiver

Autonomous Integrity Monitoring (RAIM) is defined as an on-board algorithm that constantly checks the integrity of the GNSS solution. The RAIM algorithm compares the measurements from different satellites, and in the case of an inconsistency, allows the receiver to determine and exclude the most likely "failed" satellite. Used since the mid-nineties, RAIM guarantees horizontal error bounds of one nautical mile worldwide, with high availability. However, multiple satellite faults affect the current RAIM reliability. In the context of a single satellite constellation, the average number of visible satellites is 7–8, which does not provide redundancy.

Advanced Receiver Autonomous Integrity Monitoring (ARAIM) is an extension of the RAIM concept to include other constellations, in addition to GPS. ARAIM will integrate GNSS constellations such as Galileo to provide better levels of performance for horizontal and vertical guidance.

To support the ARAIM objective, each GNSS authority will transmit an Integrity Support Message (ISM) to broadcast safety information associated with its own system. The airborne ARAIM algorithm processes this information within the information provided by the GNSS constellation concerned. This enables the MMR to meet safety-required criteria in terms of lateral and vertical guidance.



in aviation.

Availability simulations have shown that ARAIM based on a nominal L1-L5 GPS and E1-E5a Galileo configuration (24 satellites each) would provide global coverage for LPV, providing similar minima to ground infrastructure such as CAT I ILS or GLS. In the frame of the Global ARAIM for Dual-Constellation (GLAD) project, co-funded by GSA, Collins is actively contributing to the maturation of the ARAIM concept by prototyping the critical airborne components into the GLU-2100. Ground experiments were successfully completed demonstrating real-time horizontal and vertical ARAIM performance, with a horizontal precision of 0.3 NM and vertical precision supporting LPV-200. This significant improvement in position integrity underpins the economic (fuel and time), environmental (CO2) and safety benefits required by the aviation industry.

Collins has been additionally awarded by the GSA to develop all DFMC functions into a single aviation receiver, with the inclusion of ARAIM, DFMC and SBAS. This receiver will be compliant with EUROCAE MOPS ED-259, at a sufficient level of maturity to carry out flight tests in a

representative environment. The DFMC/SBAS receiver development project started in November 2019 for a duration of 30 months. It will be concluded with a flight test campaign on various commercial fixed wing and rotorcraft platforms. The GLU-2100 receiver will also support testing activities with EGNOS V3, which is the first operational SBAS system implementing the dual frequency and multi-constellation standard, with both GPS and Galileo constellations. EGNOS V3 aims at replacing EGNOS V2.

As one of the EGNOS V3 compatible terminals, the GLU-2100 will offer improved Safety of Life services over Europe to the Civil Aviation community, and enhanced robustness towards all security threats.

These prototypes are recent achievements of the Collins MMR product line which started more than 20 years ago. Collins Aerospace was the first avionics manufacturer to develop key GNSS navigation capabilities, such as the GPS Landing System and SBAS capable MMR, and is committed to improving global navigation solutions.

EASA CERTIFICATION FOR CLEARVISION WITH SKYLENS

Universal Avionics (UA) announced last month of March, the European Union Aviation Safety Agency (EASA) certification for its ClearVision Enhanced Flight Vision System (EFVS) with SkyLens™ Head-Wearable Display (HWD). ClearVision is a complete EFVS solution providing head-up operations combined with enhanced vision (EVS), synthetic 3D terrain display (SVS) and a unique and optimized Combined Vision System (CVS).

ClearVision interfaces with a variety of display options: head-down flight display systems, traditional fixed Head-Up Display (HUD) systems or wearable devices, such as the “near-to-eye” SkyLens HWD. All of these options offer pilots unprecedented situational awareness of the external environment surrounding the aircraft, enhancing what they can see in degraded visual environments and adverse weather conditions, day or night. UA see the SkyLens high-transparency visor as a cost-effective alternative to traditional



Credits: Universal Avionics

fixed HUDs and enhance the EFVS capabilities with an unlimited field of view.

“The certification of our EFVS with SkyLens is a breakthrough in commercial aviation,” said

Dror Yahav, UA CEO, who emphasised its safety improvements and novelty: "this marks the first civil certification of a HWD and the first EFVS to land solution for line-fit passenger aircraft."

EVS/EFVS in SBAS Operations: In Europe, many operators have already incorporated SBAS capabilities to their fleets because, among other features, the EGNOS Service of Life Service enables RNP APCH LPV approaches down to 200ft minima without radio navigation aids on the ground. Thanks to the vertical guidance provided by LPV procedures, pilots can stabilise their descents in a much easier way. Under degraded meteorological conditions and when visibility is limited, both EFVS (as ClearVision) and SBAS EGNOS significantly increase the situational awareness provided to the pilots, thus allowing the aircrafts to align their course to that of the runway centreline and greatly improving safety while avoiding costly diversions to alternate airports in case of miss-approaches. While EFVS and SBAS EGNOS capabilities are independent, they complement each other: EGNOS improves aircraft positioning through

precision, integrity and continuity to warranty an accurate and safe navigation, while EFVS dramatically improves pilot's awareness of the external environment surrounding the aircraft. Particularly during a final approach, EGNOS enable a 3D trajectory down to 200ft above the threshold while EFVS helps the pilots to acquire and maintain the required visual references to land and operate in degraded visibility conditions. This combination further enhances airlines accessibility to airports.

EFVS is one of the technologies EASA refers to in its proposed future regulation (see [NPA 2018/06](#)), stating "The objective [...] is to modernise the European Union's (EU) aviation regulatory framework applicable to all-weather operations (AWOs) so it ensures the highest level of safety while enabling efficiency gains based on the latest technological advancements. [...] Particular attention was paid to the development of requirements enabling the use of EFVS to the maximum extent possible (e.g. use of EFVS for landing)".





in agriculture.

FARMING BY SATELLITE



The 2020 edition of the [Farming by Satellite Prize](#) is open for applications to promote the use of GNSS and Earth observation in European and African agriculture.

This joint initiative of the European GNSS Agency (GSA) and the European Environment Agency (EEA) includes the 'Special Africa Prize', whose objective is to encourage young Africans to develop satellite-based solutions that are able to satisfy the specific needs and resources of communities and lands in Africa.

Students, young farmers, teams from universities and commercial organisations can submit their innovative ideas to create new, sustainable, and environmentally- friendly solutions using Copernicus, EGNOS and Galileo.

Applicants can take part as individuals or as a team, and are invited to register online before the deadline on June 30th, 2020. A total prize purse of €10K will be distributed among the top four farming applicants the by Satellite Prize.

More information can be found [here](#).

Did you know...?

EGNOS provides free lectures, both in person and remotely, to European Agricultural Universities, so graduate students acquire all the EGNOS-related knowledge required for their future professional activities. The Technical University of Madrid, as well as Ghent University, have already benefitted from this initiative!



Credits: GSA

WEBINAR ABOUT GALILEO, EGNOS AND COPERNICUS FOR AGRICULTURE

If you missed the opportunity of joining the webinar organised by GSA to explain the use cases and applications of Galileo, EGNOS and Copernicus for farming, click [here](#) to access the recorded webinar.

in GNSS.



Credits: GSA

FOURTH GNSS RAW MEASUREMENTS TASKFORCE WORKSHOP

The fourth GNSS Raw Measurements Task Force Workshop took place on 27 and 28 May 2020. It was held online due to the lockdown restrictions in place around Europe. The aim of the GSA's Raw Measurements Task Force is to bridge the knowledge gap between raw measurement users. Click [here](#) to learn more about this event.

Did you know...?

multiple countries in the European Union support their farmers with aids and subsidies for the modernisation of their agricultural machinery with GNSS equipment so they can reduce costs, enhance yields and reduce the environmental impact of their activities. Here are some examples: [Belgium/Flanders](#), [Belgium/Wallonia](#), [Germany](#), [Denmark](#), [Ireland](#), [Lithuania](#), [Netherlands](#) and [Spain](#).



<https://egnos-user-support.essp-sas.eu>

EGNOS applications. Developers platform. Business support.
Information on historical and real-time EGNOS performance. EGNOS Signal in Space (SIS) status. Forecast on SIS availability and EGNOS performance. EDAS information and registration. EGNOS adoption material and tools.

For questions & information

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