EGNOS

EGNOS BULLETIN

Issue 38, Spring'22 Edition

INCLUDING THE EGNOS WORKSHOP 2021 HIGHLIGHTS AND PRESENTATIONS

Credits: Dassault Aviation

EUSPA
European Union Agency for the Space Programme

NAVIGATION MADE IN EUROPE

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EGNOS Workshop 2021

The 10th edition of the EGNOS Workshop brought together nearly 500 participants interested in having first-hand information of the European Satellite-Based Augmentation System (SBAS), EGNOS.

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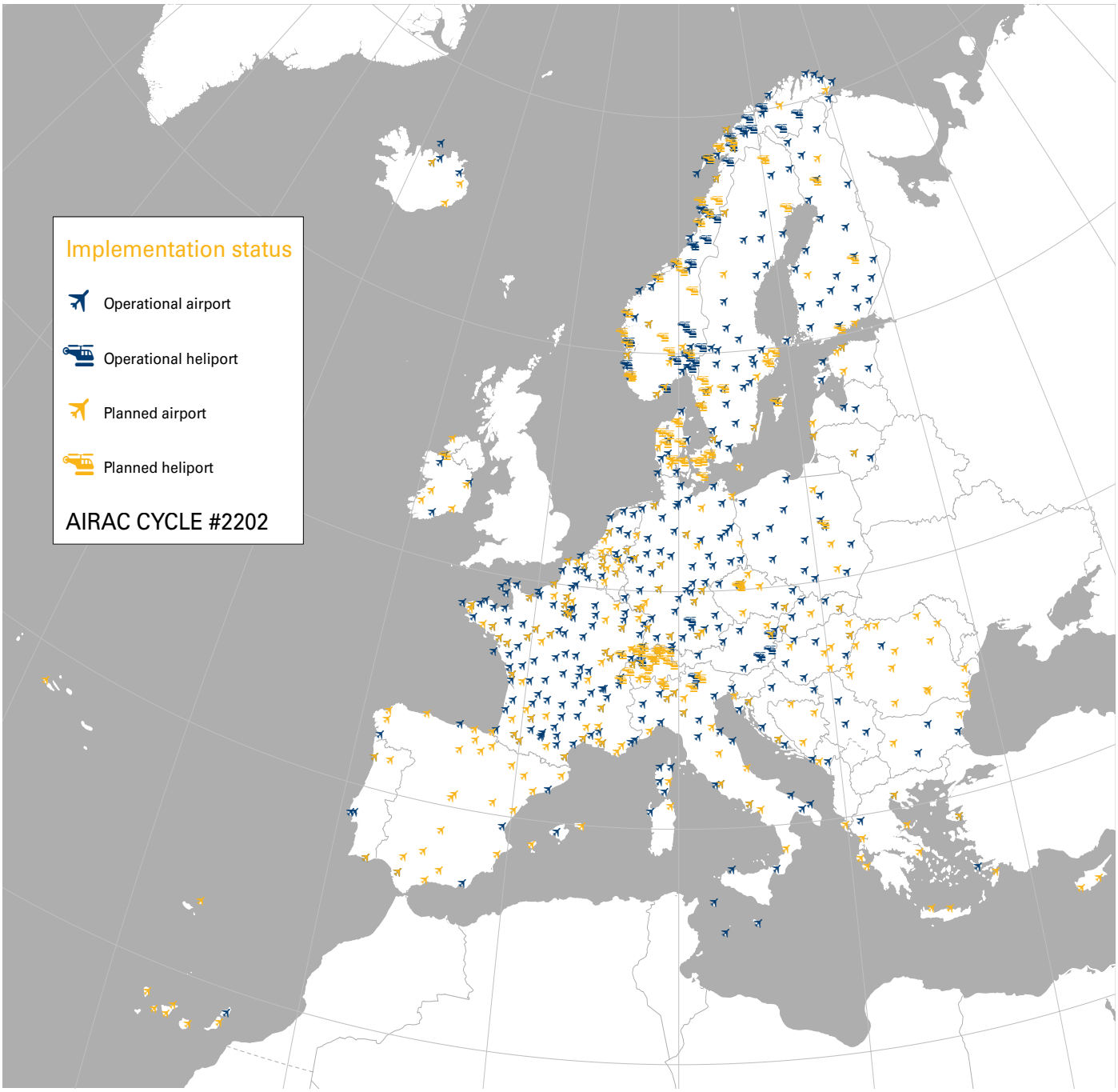
EGNOS implementation



EGNOS in support of approaches to non-instrument runways

General Aviation operations are mainly carried out without an Air Traffic Services (ATS) provider, at aerodromes with a non-instrument runway and an aerodrome operator licensed under a national certification scheme. These characteristics make this type of scenario an ideal candidate to benefit from EGNOS Safety of Life Service, meaning pilots can rely on safer instrument approach procedures at places where it was previously impossible and without investments or maintenance costs on ground infrastructure.

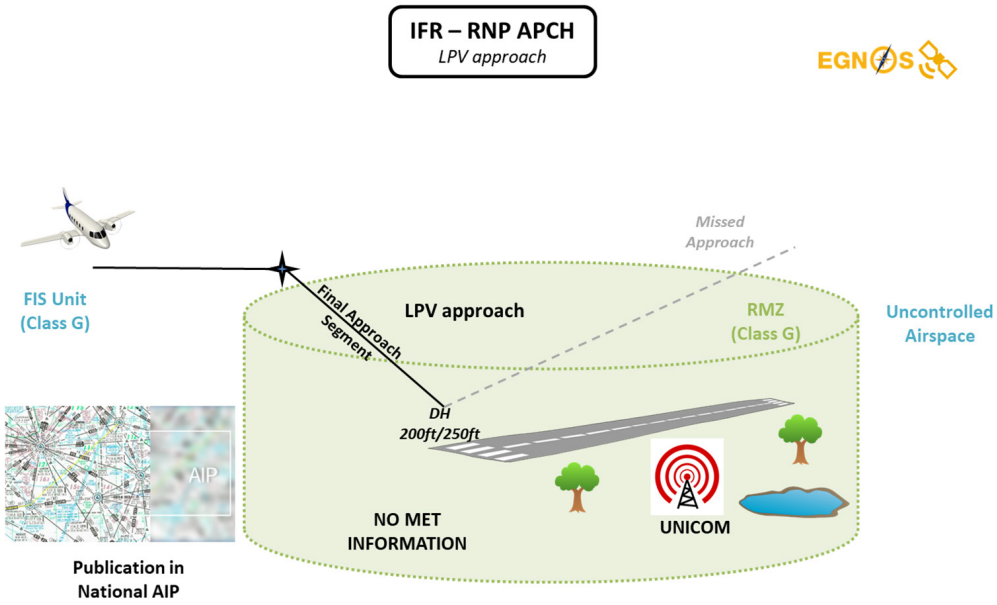
Within the General Aviation Roadmap, EASA has a strategic objective of increasing and facilitating Instrument Flight Rules (IFR) aircraft operations for General Aviation pilots. With this in mind, EUSPA, in cooperation with EASA and ESSP and with the participation of various stakeholders, developed Safety Promotion Material for the implementation of IFP at non-ATC environments (published in December 2019)[1].

Certain areas for improvement were identified where additional support material could be helpful for the General Aviation community to implement GNSS-based instrument approach procedures on non-instrument runways across Europe. In particular, those concerning how to conduct safety assessment-related activities associated with implementing such procedures in General Aviation environments.

Taking all of this into account, EUSPA, in close cooperation with EASA and ESSP and with the participation of various stakeholders within the European GNSS Working Group for General Aviation, developed the "Safety Assessment Guidelines for the implementation of EGNOS-based instrument approaches to non-instrument runways located at aerodromes serving General Aviation" (published in November 2021)[2]. This document is intended to be the reference to facilitate conducting safety assessment-related activities and to ensure safe and proportionate provisions are considered for EGNOS-based approaches at aerodromes serving General Aviation.

The following conclusions from the Safety Assessment Guidelines, related to the implementation of EGNOS-based approach procedures, should be highlighted:

- Any organisation involved in the process could lead the IFP implementation.
- Implementing EGNOS-based approach procedures at non-instrument runways is possible, and there is no need for additional infrastructure.
- AFIS and UNICOM have been identified as the most common ATS service level at aerodromes serving General Aviation.
- An EGNOS Working Agreement (EWA) will be required at General Aviation aerodromes. This will be established between the organisation operationally responsible for the EGNOS-based procedure and ESSP (EGNOS Service Provider) to guarantee the appropriate EGNOS Service provision scheme.



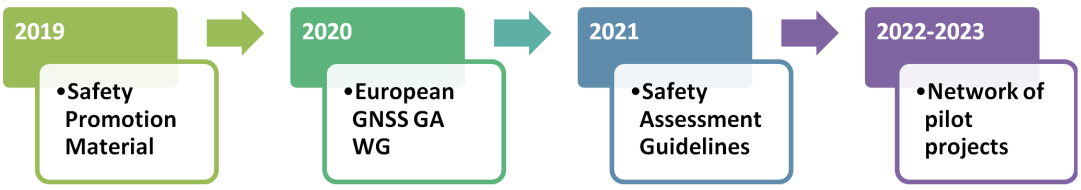
Concept of operations (LVP approach procedure) in a general aviation aerodrome. Source: Safety Assesment Guidelines

Following up on these activities in the General Aviation domain, EUSPA launched a new initiative known as "EUSPA Network of pilot projects" in the different EU Member States in December 2021[3].

This network of pilot projects will consist of a series of specific implementations of EGNOS/LPV approach procedures to General Aviation aerodromes (with non-instrument runways and without any ATS service provider). These will be carried out to gain experience in this type of implementation and identify the specific functionalities/solutions adopted in each scenario to solve encountered implementation blocks.

This will validate the concept of operations and Safety Assessment Guidelines developed and support the creation of national processes and strategies to adopt EGNOS for General Aviation, enabling the smooth implementation of this type of operation in other countries in the future.

In other words, the strategy to accelerate adoption is to facilitate and support the first implementations in as many EU Member States as possible and create real showcases that can be repeated or learnt from.



General Aviation Roadmap

References

[1] GNSS-based_instrument_flight_procedures_implementation_for_general_aviation.pdf (essp-sas.eu)

[2] Safety Assessment Guidelines for GA 1.6 (essp-sas.eu)

[3] EU space initiative to open up new opportunities for General Aviation across the Union | EU Agency for the Space Programme (europa.eu)

EGNOS Success Stories

DASSAULT AVIATION RELIES ON EGNOS AND LPV

Cockpit of the new Falcon 10X
Credits: Dassault Aviation

A brief history of Dassault Aviation

The company's story begins in 1916, with Marcel Dassault inventing the Éclair propeller. Today, Dassault Aviation is a leading aerospace company in over 90 countries across six continents. Dassault designs and builds the family of Falcon business jets and the Rafale fighter jet. The company has a workforce of over 12,000, production facilities in both France and the United States, and a worldwide service network. Since the rollout of the first Falcon 20 in 1963, over 2,650 Falcons have been delivered. The tri-jet and twin-engine lines offer outstanding efficiency and comfort, with ranges from 4,000 NM to 7,500 NM. They include the flagship Falcon 10X, the pioneering Falcon 7X and 8X, the wide-body Falcon 6X, and the versatile Falcon 900LX and 2000LXS. Falcon Customer Service continues to hold the top spot in key business aviation surveys.

Review of the Falcon family and its LPV status

The story of Dassault and LPV originates from the early beginnings of EGNOS-based approaches. The LPV feature was first certified in Dassault's EASy2 Avionics – provided by Honeywell – in June 2011, with Falcon 900EX being the first aircraft model equipped with this Avionics standard. The EGNOS SoL service was introduced in 2011 with

> "Today, LPV is an option available for all in-production Falcon types"

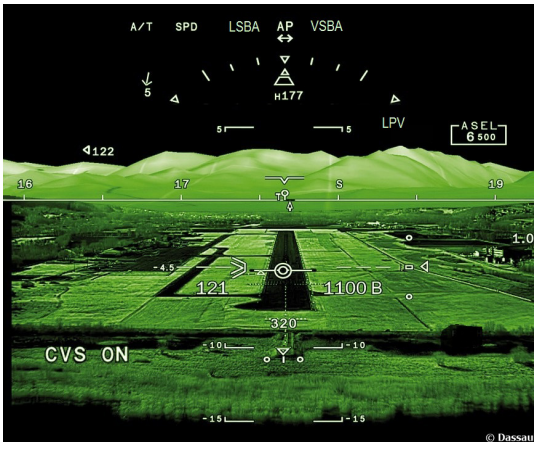
Primary Flight Display when flying a LPV approach
Credits: Dassault Aviation

only APV-I Level of Service, which allowed LPV approaches down to 250ft line of minima. At that time, Dassault's Falcon 900LX was the first aircraft to fly an EGNOS-based approach down to 250ft (performed in Pau, France, early that same year). They went on to take a step further with their Falcon 2000LXS, and in 2006 became the first business jet to fly an Instrument Approach Procedure with a published LPV minima of 200 ft, using the recently declared EGNOS LPV200 Level of Service. The flight was conducted at Paris' Charles de Gaulle Airport as part of initial European LPV200 trials, which also involved Airbus 350 and ATR-700 commercial aircraft.

Today, LPV is an option available for all in-production Falcon types. According to Dassault, almost all of their customers purchase the LPV functionality from the manufacturing line. Various retrofit solutions are also available for older aircraft, and receiving these requests to implement LPV is extremely common.

This demand for LPV comes from the Business Aviation's need to meet their customers' requests. They cannot rely on weather conditions to reach their destinations, and LPV brings instrument approaches with lower minima (200ft) to a broader range of destinations, especially in secondary and regional aerodromes where ILS is not an option. As stated by Alain Boucher, Navigation & Flight Guidance Systems in Dassault, "Better accessibility means fewer go-arounds in approach and less diversion to alternate airports in case of bad weather. This means less fuel burnt. Consequently, direct access to those remote airports also means that the customer can directly fly to the final destination without using other transportation means, as would be the case when landing at a major airport – ILS equipped – maybe hundreds of km away."

In addition, they state that it is also important for their customers to implement SBAS-based ADS-B Out; it is the easiest way to meet ADS-B Out European and US mandates. And since worldwide SBAS systems are interoperable, operators relying on WAAS in the US can also benefit from EGNOS when flying within Europe.



Head Up Display while flying an LPV approach at night with FalconEye combined vision system (CVS)
Credits: Dassault Aviation

Landing with FalconEye at night, full cockpit view. Credits: Dassault Aviation.

The new Falcon 6X and 10X will also count on EGNOS and LPV

LPV option for new orders will also apply to the brand-new models of the Falcon family, the Falcon 6X and Falcon 10X; long-range business jets models featuring the widest cabins on the market, new generation engines for greater performance and fuel efficiency and the latest developments in Flight control & Avionics systems.

On top of that, these new models can be fitted with the business jet world's first Combined Vision System (CVS), known as **FalconEye**, providing flight crews unprecedented situational awareness in all weather conditions, day or night, as a combination of SVS and EFVS.

Considering all of the above, operators purchasing the new 6X and 10X might benefit from LPV and Combined Vision Systems simultaneously, particularly with EFVS. When arriving at LPV decision height, the FalconEye multispectral camera, which can be installed onboard Falcon models, allows the crew to see the runway for landing when this is not possible with the crew's natural vision. EFVS has the capability to extend operations below LPV200/ ILS Cat 1 visibility minima. That is why LPV and EFVS are complementary and particularly interesting for business aviation.

> "That is why LPV and EFVS are complementary and particularly interesting for business aviation."

LPV IMPLEMENTATION AT AIR FRANCE; A STEP CLOSERTOWARDS FULL PBN OPERATIONS

Credits: Air France

Air France is one of the largest airlines in Europe, with an ever-increasing number of annual flights and city pairs possibilities. Over the years, the Operator has expanded its fleet to almost 200 aircraft, including new-generation units such as the A220 and A350. ESSP talked with Laurent Puzenat, CNS Project Manager (Flight Operations) at Air France, to discuss the LPV implementation status on their fleet, the future intended modifications and other specific topics of interest for aviation stakeholders.

> "Every new unit must have SBAS implemented so that LPV procedures can be performed"

In total, more than 200 aircraft comprise the current Air France fleet. These include 19 LPV-capable units: 6 A220s and 13 A350s, and they expect to receive 21 more by the end of the year. Although A220s come with LPV capability as a standard function, the operator is to specifically choose the A350s' LPV capability as an option. When pilots started flying the first LPV procedures, they confirmed that EGNOS approaches were highly stable, reliable and easy to operate, to the extent that this is the preferred type of approach, if available.

Only minor modifications to the training syllabus to pilots were required to obtain the Operational Approval (OA) to fly LPV procedures, as these are designed to be similar to ILS approaches. All in all, pilots are taught the basics of SBAS, LPV, charts and how to read the indicators on the Primary Flight Display (PFD).

From an Airline perspective, getting the OA for the A350s and A220s was extremely easy, as the

solution came fully integrated into the cockpit. Therefore, no particular effort had to be made towards documentation or certification. However, they foresee that this could change if a retrofit solution is implemented, as it may require further changes.

For the rest of the fleet: they are looking forward to implementing LPV on those aircraft that have or will have a solution available in the market. In this regard, they are eagerly awaiting a Supplemental Type Certificate (STC) or a Service Bulletin (SB) for the B777, the B787.

Regarding LPV capability in future aircraft, Air France has a clear policy: every new unit must have SBAS implemented so that LPV procedures can be performed. This motto came about after analysing the benefits of its implementation and understanding the specific constraints that affect Airlines. In fact, one of the major arguments that lead Air France to request LPV on every new aircraft order is the publication of the PBN IR regulation, as it lays out that Operators will use PBN as a standard means of navigation by 2030. SBAS LPV installation allows better minima, provides safety benefits compared to LNAV/VNAV barometric approaches and will benefit from SBAS future deployments, such as Africa. Air France believes SBAS LPV will be installed as a primary function on every new aircraft and not as an option.

Moreover, aircraft flying to the US must comply with the US mandate on ADS-B Out, which can be easily met if SBAS is implemented onboard. It is noteworthy that implementing an SBAS receiver enables the "SBAS NAV" capability, ensuring the transponder will broadcast a more accurate position solution. However, to perform LPV approaches, the Multi-Mode Receiver (MMR) would also have to be properly connected to a suitable Flight Management Computer (FMC) and have a Navigation Database (ND) to allow performing LPV approaches. Although these capabilities can be acquired in separated steps – first "SBAS NAV" and then "LPV" – it is more cost-efficient to implement both at once.

> "SBAS LPV installation allows better minima, provides safety benefits compared to LNAV/VNAV barometric approaches and will benefit from SBAS future deployments"

The future of Air France concerning EGNOS is promising. They are working towards a full-fleet implementation on their aircraft, and almost 40% of their destinations already have some EGNOS-based procedure published, allowing for reduced fuel and CO2 emissions. We will be following up on their implementation process!

Did you know...?

...that the first trial of an MSAS-based flight procedure has been published in Japan? Amakusa Aerodrome – identified by its ICAO code "RDJA" – is the first airfield in the region to test an LP procedure based on MSAS, the Japanese Satellite Based Augmentation System (SBAS). The two LP IACs for RWYs 13 and 31 have been published in an AIP Supplement. Since all SBAS systems in the world are interoperable, any aircraft that is able to process the EGNOS signal can benefit from the rest of the systems in the world, such as MSAS in Japan.

EGNOS CONTRIBUTES TO THE IMPROVEMENT OF AIR QUALITY AND URBAN MOBILITY

Jose Santa from the UPCT shows the prototype of the MECANO projec. Credits: UPCT

Air pollution is a significant risk factor and a trigger for cardiovascular diseases, which remains the leading cause of death in Europe. At the same time, it is necessary to make citizens aware of these risks and use greener technological initiatives that contribute to sustainable development in cities.

An example of this sustainable development is Personal Mobility Vehicles (PMV), such as skates or bicycles, increasingly growing in cities and able to help improve mobility and obtain data about the quality of the air we breathe.

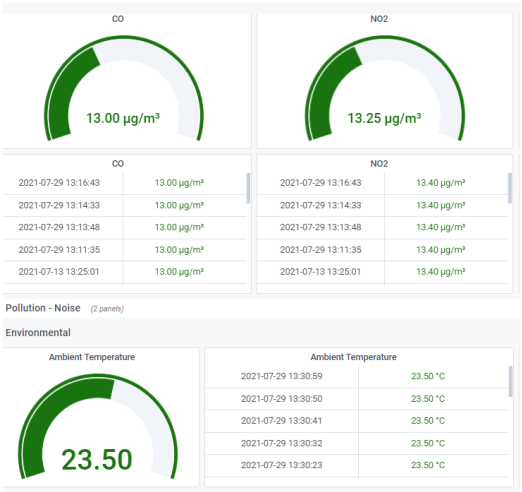
Benefitting from the increased presence of PMV in cities, researchers in the MECANO project (Eco-Efficient Mobility for Connected Citizens, subsidised by the Ministry for the Ecological Transition and the Demographic Challenge) from the Technical University of Cartagena (UPCT) are developing a system architecture for compiling environmental data using low-cost mobile sensor devices equipped in public transport vehicles. The data collected provides real-time information on traffic density, weather, meteorological and air pollutants.

The Cartagena City Council collaborates with the UPCT by offering support to the project and implementing it as a proof of concept. On the other hand, the UPCT has an agreement with the provider of mobility solutions and services, Bird Rides, whose vehicles (scooters) will be used in the deployment phase.

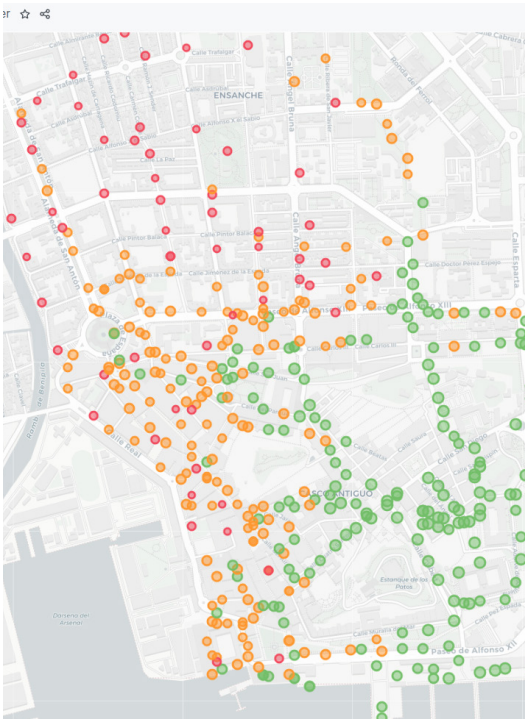
Jose Santa, UPCT researcher and foremost responsible for the MECANO project, states that "mobile sensors act as small weather stations that move around the city of Cartagena in Murcia (Spain). They contribute to transport sustainability, allowing the development of services that optimise mobility, detect the most harmful parameters for the population, recommend healthy routes and help plan urban mobility models in advance".

It is important to note that the data collected by

mobile sensors in cities is georeferenced. EGNOS is used to enhance the positioning technology in the sensor equipment, allowing the values collected from both the environmental sensors and the vehicle's telemetry to be georeferenced more precisely. Specifically, the module integrated into the onboard unit is the Quectel L86-M33.
Jose Santa, who has been working with EGNOS for more than 15 years, states: "Thanks to EGNOS, the position's precision is guaranteed with greater certainty, and the georeferenced values of the prediction and monitoring models we are developing in our calculations of pollution factors in the city, specifically air quality data (CO2, CO, NO, NO2, PMx), noise pollution, solar radiation and climatic factors, are much more accurate".
Therefore, the project is a clear example of integrating different technological solutions (EGNOS positioning, IoT and artificial intelligence) into the smart handling of the environmental and mobility data collected, contributing to a reduced carbon footprint, including its impact on citizens. The conclusions obtained by the UPCT are expected to be extrapolated to other cities, with other mobility and pollution patterns, providing exceptional value in the use of technology in the field of Smart Cities, and also considering the use of other personal mobility vehicles (not only electric scooters), such as bikes and motorcycles.

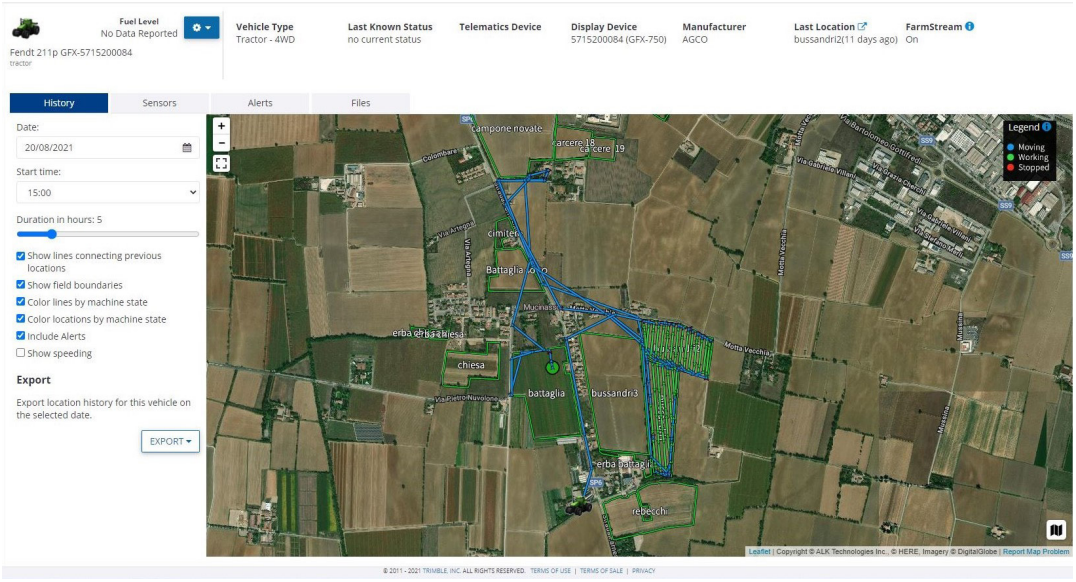


Panel displaying the data collected from the pollution sensors of a particular unit. Credits: UPCT



Data on the quality (coverage) of the wireless network used (LoRa), georeferenced with EGNOS. Credits: UPCT

HOW EGNOS SUPPORTS FLEET MANAGEMENT IN AGRICULTURE



Credits: Trimble

Nowadays, fleet management is a standard solution used to enhance efficiency and productivity in agricultural tasks. This application may contribute to vehicle maintenance, overseeing fuel consumption and fuel costs, driver management, asset utilisation, pass-to-pass planning and the implementation of any program that increases the company's productivity and reduces costs.

Fleet Management solutions can be used by individual farmers owning tractors/harvesters, who are interested in benefitting from the new technologies, farms with large fleets or cooperatives whose technicians manage data for their members.

Trimble, an international company, founded in 1978 with a presence in more than 180 countries, offers solutions based on GNSS technology for different fields of application such as construction, transport or agriculture. In particular, Trimble has a fleet-management tool named FarmStream Fleet (included within the Farmer Core software), a complementary solution for Trimble precision agricultural solutions, such as auto-guidance or ISO controller systems.

EGNOS can be an enabler for the users of the FarmStream Fleet tool, contributing to monitoring the location, status and movement of the tractors in the field. This data can be synchronised with cloud information to support real-time management decisions.

In particular, the FarmStream Fleet has a significant penetration in Italy. Fabio Tucci, from Trimble, explains that "today, EGNOS is the most popular service for entry-level customers in our GFX-350 screen with the NAV-500 receiver. The way to activate it is easy and user-friendly, with an accuracy provided sufficient for many users". Fabio also clarifies that "the use of EGNOS is positive for users, especially in isolated areas with no internet connection".

The testimony of Giulia, a farmer from Piacenza, confirms the positive impact of EGNOS in fleet management. She grows wheat, corn, sunflower, sorghum, and beans. As she stated: "The FarmStream fleet together with EGNOS offers me the possibility of knowing the location of all my vehicles directly from my office in a fast, simple and precise way. This allows me to have control of my entire vehicle fleet at a click".

Talking about EGNOS with… Garmin

GARMIN'S PERSPECTIVE ON EGNOS AND ITS ADOPTION BY THE GENERAL AVIATION COMMUNITY

Credits: Garmin International

The multinational technology company Garmin is known worldwide for manufacturing a wide variety of devices, ranging from day-to-day wearables to high-tech equipment used for safety-critical applications, such as air navigation. Today, Garmin has become an important avionics manufacturer and is a major player within the General Aviation (GA) Community.

Trevor Pegrum, currently working as EMEA & APAC Aftermarket Sales and Marketing Manager at Garmin International, has provided us with their point of view on some of the topics that concern GA users with implementing EGNOS: Are SBAS benefits known to users? What are the limitations of implementing it? Is it really necessary? How much money will it have to invest? This article addresses these matters and provides a general overview of the implications and rationale behind that supports the adoption of the SBAS technology.

As a professional with sound experience in the field, Trevor has been working at Garmin for 16 years. He started as an engineer and then worked in the field of Certification in Europe in coordination with EASA, where he certified AMLs for complex installations. He then moved on to sales and marketing, initially focused on Europe, the Middle

East and Africa only, afterwards expanding to the Asia-pacific region, his current role at Garmin.

Back in 2017, when ESSP interviewed Trevor, he explained there was not enough general knowledge on EGNOS and its benefits amongst end-users, who in many cases did not see the need to implement it. Over recent years, the increasing number of EGNOS-based procedures available in Europe, the recently published regulations (PBN IR and US mandate on ADS-B Out), and the better overall understanding of the system by the Community have made LPV implementation a "mainstream" practice. Nevertheless, there is a clear need to harmonise the use of ADS-B In/Out devices so that they all operate under the same standard, preventing them from displaying misleading information, or none at all, and causing a safety threat for airspace users.

> "Garmin's goal is not to charge customers for paperwork"

There are three possibilities of EGNOS implementation that result in different capabilities:

- **SBAS Capability:** the GNSS receiver is able to process the SBAS signal and enhance the performance of the mounted receiver, which must be certified against the (E)TSO 145/146. This functionality on its own does not enable to conduct LPV approaches.
- **SBAS-based ADS-B Out:** SBAS enhances the navigation solution broadcasted by the aircraft's transponder. For that purpose, the navigation solution input used to transmit of positioning information must come from a certified SBAS capable receiver. This functionality on its own does not enable to conduct LPV approaches either.
- **LPV Capability:** using an SBAS-capable GNSS receiver, a certified navigation database and a suitable Flight Management Computer, the aircraft can guide the pilot throughout the descent profile and perform an LPV approach procedure.

When the EGNOS Safety of Life Service was initially declared operational, the costs associated with any of these implementations were extremely high, with GA users required to undergo a series of certifications for each aircraft model, which added substantial expense to the process as a whole. Today, it is possible to certify generic Supplemental Type Certificates (STCs), known as AMLs, pioneered by Garmin, that apply to several aircraft models. As a result, the operator's costs for acquiring LPV capability have been reduced to one third. Users can now implement a basic LPV solution for a few thousand dollars without the need for any additional certification process to be tackled.

Garmin was the first company to certify AMLs against EASA, and reducing the expense associated with LPV implementation for GA operators entailed a major milestone.

GTN 750Xi device
Credits: Garmin International

Within the extensive avionics solutions portfolio that Garmin offers, SBAS-capable avionics can be found in Flight decks & displays and Navigation & radio equipment, and as STCs for LPV implementation on several different aircraft models. Users wishing to customise their cockpits may refer to the Navigation & Radios equipment section, where various modular devices can be found (e.g. GTN 750Xi, GTN 650Xi or the new GPS175). Moreover, the end-user can also request integrated solutions if a full-cockpit installation is preferred. These can be found on the Flight Decks & Displays section (e.g. G1000 NXi). Moreover, Garmin STCs for LPV implementation are displayed on the STC/SB Tool of the EGNOS User Support Website.

It is noteworthy that all the new Garmin transponders can process the EGNOS signal today, so if the receiver is SBAS-capable, the enhanced position solution will be broadcasted via ADS-B Out. Additionally, most of their devices come as AMLs, thus bringing the possibility of equipping to a broader audience.

When a potential user is interested in implementing SBAS, ADS-B Out or LPV Capability, they recommend opting for the complete kit, which is regarded as the most efficient economically. In fact, users requesting a full LPV implementation (including SBAS-Based ADS-B Out and LPV) can save around 30% of costs compared to users adopting ADS-B Out first and then LPV in a second step. Extrapolating the same rationale, Regional Aviation (RA) can expect 20% savings when implementing LPV capability and ADS-B Out at once.

Did you know that there are different ways end-customers can discuss any concerns with Garmin? Take a look to the "book an expert" service.

The AMLs – combined with the wide variety and versatile range of possibilities that allow each piece of LPV avionics to be eligible by several aircraft models – reduce costs and time, and can be applied to approximately 700 different aircraft, offering a unique opportunity to equip the European fleet. Today, Garmin estimates that half of GA IFR aircraft currently have LPV capability and envisions a bright future for the adoption and implementation of EGNOS in the mid-term.

Did you know...?

…which are the countries that must comply with PBN IR? Can conventional navigation procedures be used after 6 June 2030? Check this EASA FAQ page to find the answers to these and more questions about the PBN IR.

EGNOS services highlights

THE EGNOS ENVIRONMENTAL TOOL FOR AVIATION IS NOW PUBLISHED

HOME » RESOURCES & TOOLS » EBCAST TOOL » EBCAST TOOL ENVIRONMENTAL ASSESSMENT

EBCAST TOOL Environmental Assessment

Though it is well known that the direct benefit provided by EGNOS is an enhanced position solution when compared against GPS alone, other derived side effects contribute to making EGNOS a valuable and eco-friendly solution for Airports and Operators.

Over the years, ESSP has been studying the implications of using EGNOS beyond the mere operational credit by understanding how this could be translated into fuel and CO2 emissions savings. To date, several scenarios where EGNOS brings an added value have been identified, and a dedicated tool has been recently published so that users can quantify these benefits on their particular case; the Environmental Assessment Tool. The different scenarios are:

- **Closer Alternate**: The vast network of EGNOS-based procedures published in Europe contributes to having more destinations available with PA procedures.
- **Missed Approaches**: EGNOS approaches allow having a decision height as low as 200ft AGL, thus increasing accessibility in poor weather conditions.
- **Track Reduction**: Several locations have been identified where, thanks to the publication of EGNOS-based approaches, inbound traffic could reduce the distance flown to reach the runway.

After the user introduces certain input information, this free-of-charge tool calculates the fuel and CO2 savings associated with implementing EGNOS in that specific case. As a result, it provides a means to measure EGNOS' environmental benefits quantitatively.

What's new?
Since the last bulletin...

EGNOS WORKING AGREEMENTS SIGNED (EWA)

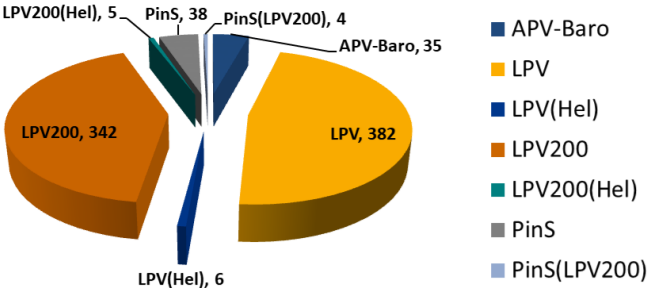
The following EWAs have been signed in the last quarter:

Notodden Lufthavn	**Denmark**
City of Mikkeli	**Finland**
BSAA	**Sweden**

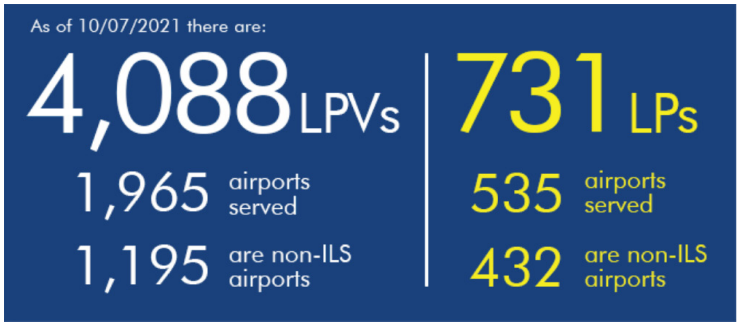
LPV, LPV-200, PinS & APV Baro procedures published (including AIRAC cycle 2022 #02– 24/02/2022)

As of AIRAC Cycle #2201 (January 2022), all EU member states have EGNOS-based procedures published on at least one airport in their territory. This is a remarkable milestone in adopting EGNOS service in aviation and increases accessibility to Air Operators equipped with LPV capability. They now have more options to choose from when performing an approach at these destinations. In the future, EGNOS is expected to be adopted at many more destinations, so stay tuned for upcoming Bulletins' publication to follow up on the process!

Next graph shows, the number of procedures LPV, LPV-200, PinS, APV-Baro, LPV-Hel, LPV200-Hel and PinS-LPV200. The total number is **812**



FAA PROCEDURES



EGNOS Workshop 2021

A review of the EGNOS Annual Workshop 2021

The 10th edition of the EGNOS Workshop brought together nearly 500 participants interested in having first-hand information of the European Satellite-Based Augmentation System (SBAS), EGNOS. Organised by the EU Agency for the Space Programme (EUSPA) and the EGNOS Service Provider (ESSP), this one-day online session provided insights into the status and roadmap of EGNOS services, its development, and its implementation in fields such as aviation, maritime, rail and agriculture. If you missed it, or just want to relive it again, all the contents are available here.

The workshop kicked off with a welcome speech by EUSPA Executive Director, Rodrigo da Costa, who highlighted a major change for EGNOS, in line with the new EU Space Programme framework. "The transition into the EUSPA came with an enlarged scope of responsibilities reinforcing, in particular, our mission for EGNOS, one of the EU Space Programme founding components. We are the Exploitation Manager and now system prime of the EGNOS system in operation", said da Costa. 2021 marked the 10th anniversary of the EGNOS Safety of Life service. The service was declared operational in March 2011, enabling approaches down to LPV (Localiser Performance with Vertical guidance) minima at airports across Europe. In her welcoming speech Charlotte Neyret, new ESSP CEO, remarked: "10 years have passed since EGNOS Safety of Life entered into service for the aviation sector, and as the PBN IR Regulation (2018) states, by 2024, all-instrumental runway ends in Europe must have an RNP APCH procedure to LPV minima published, so I am confident that

this figure of +700 EGNOS–enabled procedures for around 400 airports will continue to grow."

Several EGNOS use cases in aviation were presented. For instance, the first transcontinental flight using SBAS LPV approaches at both origin and destination airport. On September 12th, 2020, Finnair's pilots set a flight plan from Helsinki Vantaa Airport to New York JFK to land on runway 4 with an LPV approach. The approach and landing were uneventful and carried out under optimal visual conditions. On September 13th, after a 24-hour layover at New York and using the same airbus A350, Finnair performed a cargo flight landing in Helsinki airport using EGNOS.

EGNOS SOL SERVICE 2011 – 2021

The EGNOS Workshop also included sessions fully dedicated to other market segments where EGNOS is also achieving significant penetration, thanks to the participation of speakers specialised in agriculture, maritime and rail market segments. EGNOS has demonstrated being an enabler for farmers who look to invest in precision farming. Around 85% of tractors in Europe using GNSS are using EGNOS corrections. Coupled with imagery and in-situ data by Copernicus, EGNOS's trusted precision allows for solutions such Variable-Rate Technology (VRT), a technique that automates the application of fertilisers, chemical sprays, and seeds to a given piece of land.

EGNOS's corrections are already making a difference in the maritime and inland waterways sector. Some Member States chose EGNOS as the source of corrections to be retransmitted over IALA Radio beacons and AIS stations. Moreover, EUSPA is currently developing a new EGNOS service dedicated to the maritime community that will complement and serve as an alternative to the local DGNSS networks deployed along the European coasts.

In rail, chipset and receiver manufacturers are already developing devices and modules that combine signals from multiple constellations while integrating EGNOS corrections. Mission studies are advancing towards defining a dedicated EGNOS service for rail safety-critical applications and using EGNSS within non-safety critical applications to achieve a better performance in the field of asset tracking is steadily increasing.

The EGNOS Workshop was an outstanding opportunity to connect with Europe's SBAS users, catch up on the GNSS latest developments, share success stories, and exchange views. Entrepreneurs, SMEs, space industry experts, and institutional stakeholders from a broad range of industries comprising aviation, maritime, rail, and agriculture joined the event. Keep on reading to get an overview of all the topics addressed.

EGNOS programme update

This section focused on reporting on the current status of the EGNOS programme.

At the beginning of this session, Jean-Marc Piéplu, Head of EGNOS Services Department at EUSPA, provided an update of the programme status, highlighting the improvements in EGNOS during the first ten years of SoL service and showing the Exploitation roadmap for the next ten years. His presentation is available here.

Roberto Roldán, Mission Performance Manager at ESSP, subsequently reviewed the status of EGNOS services (Open Service, Safety of Life and EDAS services) and their performance results over the last year. His presentation is available here.

Fiammetta Diani, Head of Market Development at EUSPA, next introduced the EGNOS market and service strategy, focusing on the new EGNOS users and their needs in air, sea and land, and the EGNOS contribution to the EU Green Deal. Her presentation is available here.

Finally, Miguel Ángel Sánchez, Service Adoption and Support Manager at ESSP, presented the EGNOS User's Satisfaction Survey results across the different EGNOS Services and markets application segments as the basis for improvement processes that trigger action plans and potential EGNOS mission evolutions. His presentation is available here.

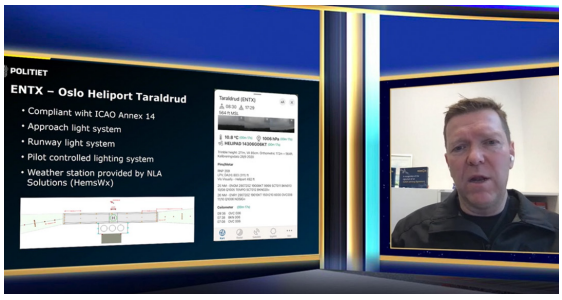
Successful EGNOS implementation stories in aviation

HUNGARY: PBN IMPLEMENTATION STATUS AND PLANS

Dr Rita Somogyi, Head of Strategy and Project Management at HungaroControl, provided an overview of the PBN implementation in Hungary from the signing of the EGNOS Working Agreement (EWA) back in 2016 to date, demonstrating the effort placed on publishing EGNOS-based approaches. They started with an APV-I procedure at their major airport in Budapest (LHBP) and continued with the remaining airports in the country. Today, they already have 12 LPV200 and 6 APV-I procedures published at eight different destinations and have plans to publish more in the coming years. Her presentation is available through this link.

THE NORWEGIAN POLICE AIR SUPPORT UNIT USING EGNOS AT THE NATIONAL EMERGENCY RESPONSE CENTRE AT TARALDRUD (ENTX - CLOSE TO OSLO)

Gunnar Arnekleiv, Superintendent and Chief pilot at the Norwegian National Police Air Support Unit (ASU), presented their LPV implementation progress with their helicopter-only fleet, operating 24/7 mainly at Taraldrud heliport (ENTX), where two EGNOS-based PinS procedures to LPV200 minima line are published. These procedures allow the ASU to perform missions to support local police and transport contingency units by providing reliable vertical guidance during the approach, thus increasing safety in their operations. His presentation is available through this link.



FOKKER PERSPECTIVE ON SBAS: A DEMANDED SOLUTION

Frans van de Pol, director of Engineering at Fokker Services, provided insights into Fokker's approvals and certificates, highlighting their Part 21, Part 145 and CAMO approvals and their various Supplemental Type Certificates (STCs) for multiple aircraft types and authorities. Their innovative solutions for aircraft owners and operations offer a wide range of products, including the possibility of implementing EGNOS on several aircraft types.

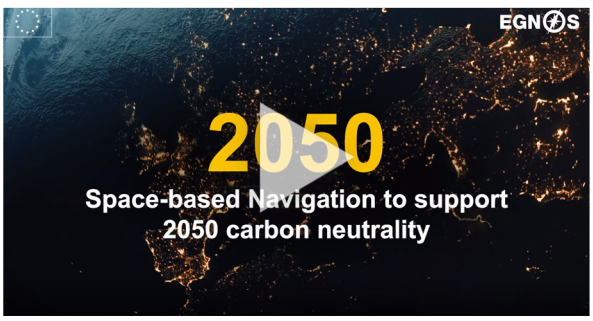
Their SLS (LPV) CMA-5024 equipment was highlighted for being a complete and cost-effective standalone solution developed in partnership with CMC Esterline. Yet other implementations from OEMs were addressed, such as the FreeFlight Systems FF1203C and the CMA-3024. His presentation can be found at this link.

EGNOS Safety of Life service for aviation

EGNOS IN AVIATION: SERVICE PROVISION AND IMPLEMENTATION STATUS

Yáiza Rubio from ESSP provided an overview of the EGNOS SoL Service provision, the commitment values established in the EGNOS SoL SDD v3.4 for the APV-I and LPV200 service levels and the definition of the EGNOS Working Agreements and its historical evolution, reaching 100+ in 2021.
In the second place, Sergio Cabrera from ESSP started with a summary of the main benefits of the EGNOS service for air operators from the safety, operational and economic perspective. Following this, Sergio also reviewed some figures on the historical evolution of LPV procedures implementation at European aerodromes and LPV equipage onboard European aircraft. The presentation ended with a description of the available adoption tools in EGNOS User Support Website for aviation users. Their presentation is available here.

SPACE-BASED NAVIGATION TO SUPPORT 2050 CARBON NEUTRALITY

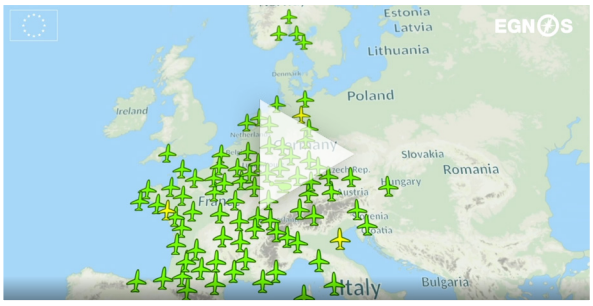


FIRST TRANSOCEANIC ROUNDTRIP USING SBAS - FINNAIR'S ROUNDTRIP FROM HELSINKI TO NEW YORK

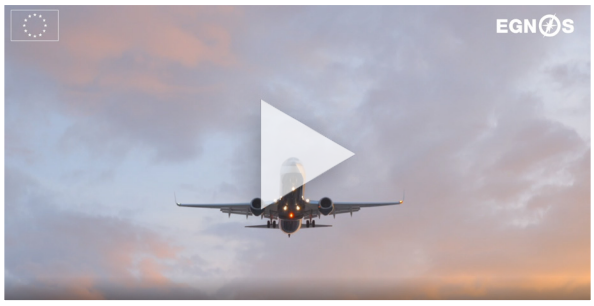
EASA'S ACTIVITIES TOWARDS EGNOS-BASED OPERATIONS

Manuel Rivas – Manager of the Air Traffic Management Oversight Section at EASA – explained EASA's activities towards EGNOS-based operations. This sub-session provided an overview of the evolution of PBN, including the rulemaking supporting its implementation, such as the PBN IR, the certification activities and standardisation of the implementation activities. His presentation is available here.

LPV IMPLEMENTATION EVOLUTION



SBAS/LPV SOLUTIONS AVAILABLE FOR AIRCRAFT ON THE EGNOS USER SUPPORT WEBSITE



EGNOS Multimodal Adoption

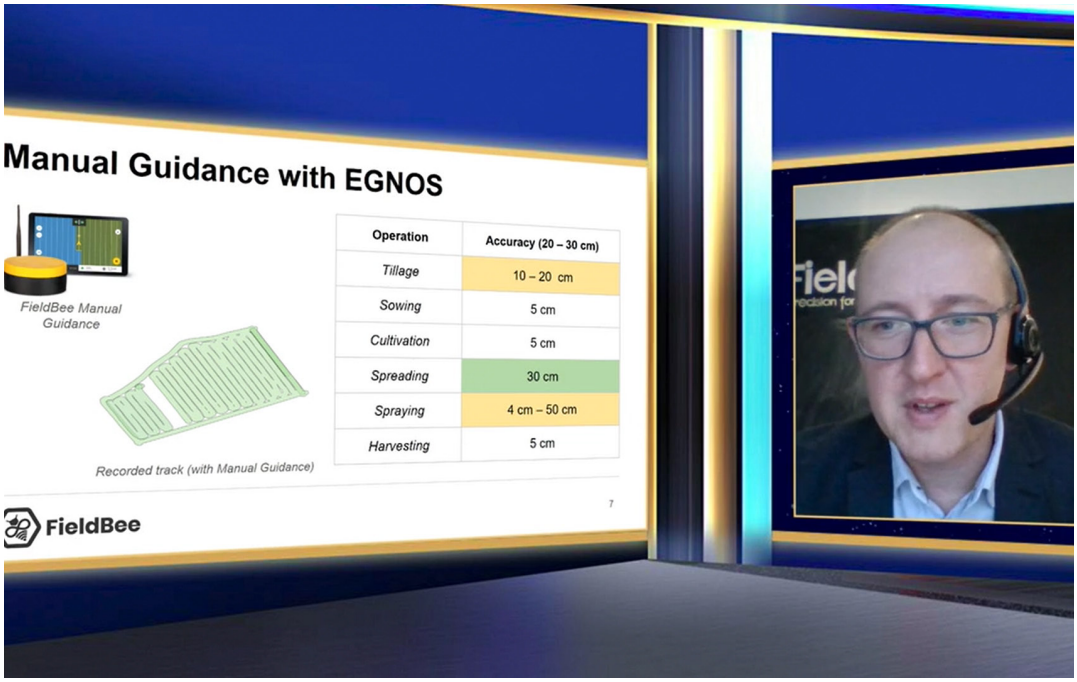
MARKET STATUS AND ADOPTION PLAN

In this session, Virginia Antón from ESSP presented the current status of the GNSS market and the EGNOS multimodal adoption plan.
Different market segments were covered in the presentation, such as aviation, where the main objective is to encourage air operators and aerodromes to implement LPV approaches. Also discussed was the upcoming declaration of a new maritime service and the work ongoing in rail to introduce EGNOS corrections in ERMTS. Regarding geomatics and agriculture, the support for precision farming and surveying activities was mentioned.
Finally, a number of ideas were highlighted to foster EGNOS adoption, and some questions from users regarding the tools developed to showcase EGNOS benefits were answered. Her presentation is available here.

EDAS FOR ADDED VALUE APPLICATIONS

The current status of the EDAS service was presented by Jorge Morán from ESSP. He first introduced the concept of EDAS and the main services provided, explaining the differences between them. As he mentioned, all the information is available in the EDAS Service Definition Document.
The following section focused on the users who access the EDAS service. The type of active users and the companies which access regularly were listed. The users were split per segment and according to their needs (e.g. professional, R&D, and commercial).
Lastly, a number of applications of EDAS use cases were presented, providing examples of how EDAS can benefit the users. His presentation is available here.

HOW ARE EUROPEAN FARMERS WORKING WITH FIELDBEE USING EGNOS?



Alexey Bogatyryov, from FieldBee, explained how EU farmers work with FieldBee using EGNOS. The FieldBee system consists of an external GNSS receiver compatible with EGNOS and RTK, making the solution affordable, updatable and modular.

First of all, Alexey explained the accuracy requirements for the different field operations (tillage, sowing, cultivation, spreading, spraying and harvesting) in navigating manually vs autopilot mode.

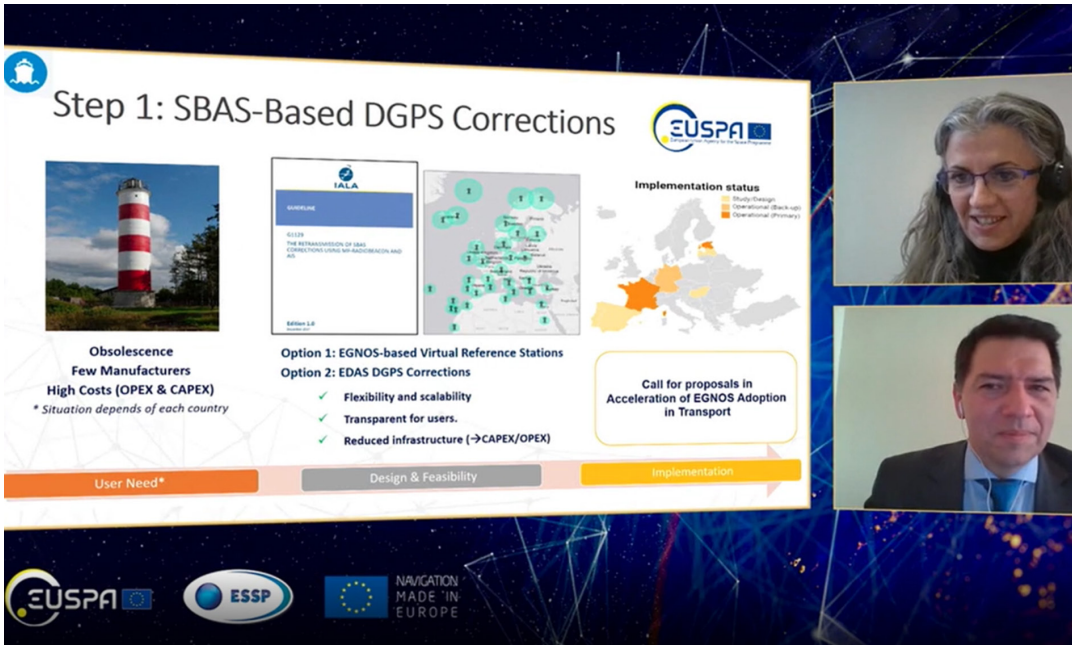
Finally, in the Q&A section, Alexey highlighted how EGNOS provides sub-metric accuracy and 20-30 cm pass-to-pass accuracy without base stations, providing autonomous fieldwork when correction service is unavailable. His presentation is available here.

Did you know...?

… that last 17 January ESSP and GSC presented a face-to-face practical Workshop in the Polytechnic University (UPM) of Madrid, as part of the Precision Agriculture Course?

The objective of the workshop was to learn about the European Space Programs (Galileo, EGNOS and Copernicus) in order to consider their practical use in the agricultural activities and projects of the UPM. During the practical session, teachers and students of UPM had the opportunity to learn how to configure and manage themselves EGNOS receivers in a practical way, led by GNSS Receiver Expert from ESSP.

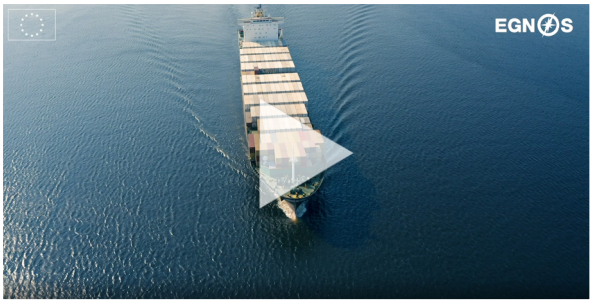
SERVICE DEVELOPMENT STATUS IN THE MARITIME DOMAIN



The next presentation was carried out by Silvia Porfili and Manuel López, from EUSPA, who provided an overview of the service development status in the maritime domain. Silvia presented the three-step approach for introducing EGNOS in the maritime market segment. Manuel described the first step, consisting of the EGNOS-based DGPS corrections retransmission using existing infrastructure, highlighting the publication of IALA 1129 guidelines and the operational implementations in France and Estonia.

Silvia focused on the second step, which is based on EGNOS v2 Maritime Service. In this case, receivers must follow the IEC standard under development. Manuel then briefly discussed the user segment readiness: receiver guidelines were finished in 2021, and work is ongoing concerning the IEC test specification standard foreseen by 2023. There will also be notifications to warn maritime users about predicted EGNOS unavailability. Their joint presentation is available here.

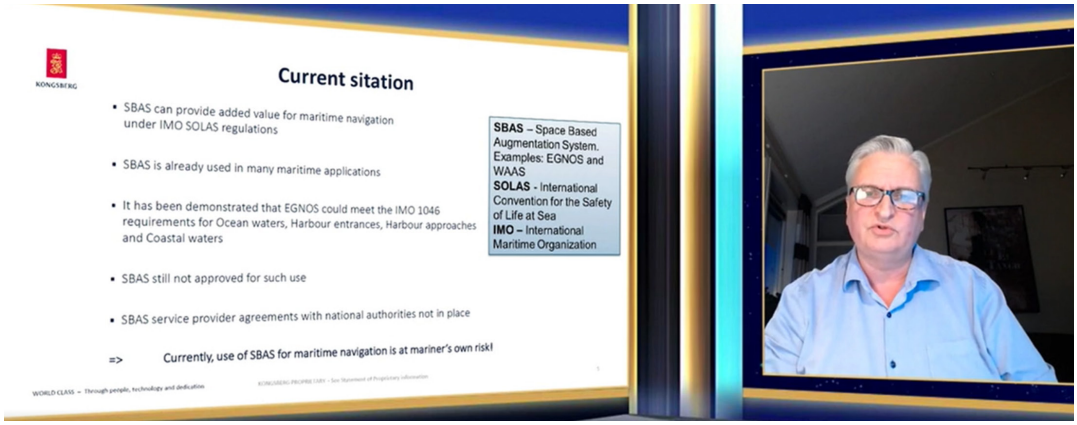
EUROPEAN MARITIME AND INLAND WATERWAYS AUTHORITIES ALREADY USING EGNOS



Did you know...?

…IALA wishes to have a clear understanding of which GNSS Augmentation services are being offered for use by maritime stakeholders. For that reason, any appropriate Authority or Organisation providing GNSS augmentation services for maritime use are encourage to submit (using R.1022 form available here) a formal declaration of their service as being adequate for maritime navigation.

EGNOS IN THE MARITIME DOMAIN

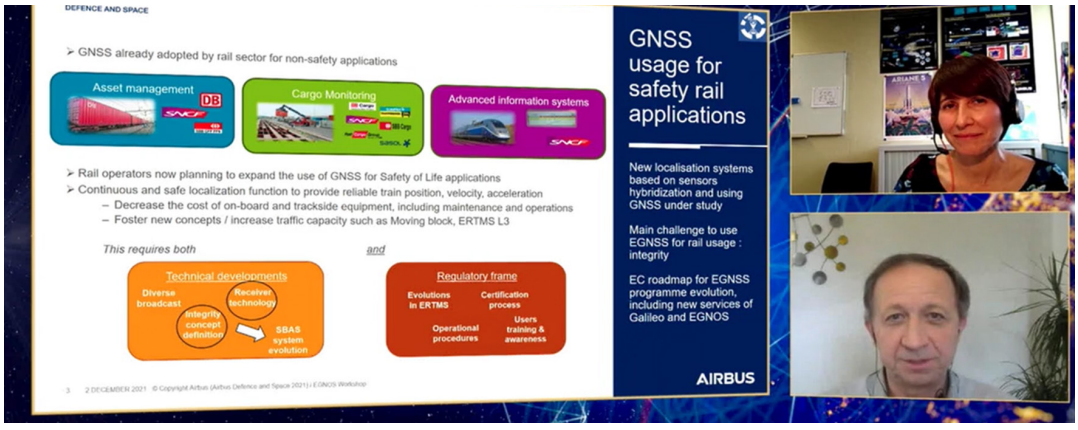


Coming from Kongsberg Seatex AS, Stig Erik Christiansen provided an overview of the use of EGNOS in maritime and inland waterways, which perfectly complemented the previous EUSPA presentation.

Some of the interesting topics addressed were the retransmission of EGNOS corrections through maritime radio beacons and the doubts within the maritime community regarding current infrastructure, with EGNOS being a good candidate for providing this community with augmentation. SBAS, which is already used in several maritime applications, can provide added value for maritime navigation under IMO SOLAS regulations.

Stig Erik also pointed to the future, referring to the need for a DFMC SBAS test standard for maritime equipment to be ready well before the service becomes operational. His presentation is available here.

EGNOS MISSION STUDIES FOR RAIL (EGNSS-R PROJECT)



Pierrick Grandjean and Catalina Rodríguez from AIRBUS debriefed on the EGNOS mission studies for rail, funded by the European Commission and technically supervised by EUSPA, focusing on the European GNSS Navigation Safety Services for Rail Project (EGNSS-R).

The EGNSS-R proposal is a continuous and safe localisation function for providing reliable train positions, velocity and acceleration. The project recommends implementing a multisensory architecture relying on EGNOS augmented GNSS, complemented by inertial sensors, wheel encoders and a digital track map.

In summary, they are confident that with an integrity commitment at a pseudo-range level, open for use by train localisation solutions, EGNOS will enable safety of life operations for the rail community. Their presentation is available here.

APPLICATION OF GNSS FOR OPTIMISATION OF FREIGHT WAGON DISPOSITION AT DB CARGO

Sören Linse, from DB Cargo, presented the Wagon Intelligence project, consisting of optimising freight wagon disposition using GNSS tracking devices.

More than 62,000 DB Cargo's freight wagons are equipped with telematics devices, which assist the transformation of analogue assets into digital assets to build a digital twin through a wide variety of dashboards and apps. Telematics devices use GNSS receivers and antennas with data transfer over a mobile network to a central IoT cloud. Sören commented that the position data is optimised using EGNOS, and the main challenge is to improve accuracy and availability without increasing energy consumption. His presentation is available here.

Did you know...?

...Europe's Rail partnership, the successor to the current Shift2Rail Joint Undertaking and the largest European rail research and innovation programme, came into force on the 30 November 2021.

SBAS in the World

SBAS GLOBAL STATUS

Starting with an overview of the SBAS concept, Joseph Dennis from FAA explained the objectives and tasks of the SBAS Interoperability Working Group (IWG). He then discussed the main SBAS benefits for airlines and ANSPs. He subsequently reviewed the evolution of the systems in the world, considering the current and future worldwide coverage, publication of LPV procedures and the coming SBAS DFMC concept. An important subject that Joseph wanted to address before concluding was SBAS equipage onboard, including the different SBAS-capable receiver classes and standards. Finally, he concluded by describing the benefits of SBAS and reviewing all available systems in the world. His presentation is available here.

Awards

SBAS GLOBAL STATUS

The EGNOS awards ceremony took place at the end of this virtual EGNOS Workshop 2021. These awards intend to give special recognition to those ANSPs or organisations with whom an EGNOS Working Agreement has been signed due to a first publication of an EGNOS-based procedure under their scope.
This year's recipients were the Cyprus Civil Aviation and the Norwegian National Police. The former was accepted by Ioannis Theofilou, Senior Air Trafiic Controller Officer, Head of Cyprus Civil Aviation Procedures Design Unit, and the latter by Gunnar Arnekleiv, Norwegian National Police Superintendent/Chief Pilot.

Upcoming Events

AERO FRIEDRICHSHAFEN 2022

27 - 30 April

Celebrating their 30th Anniversary within the General Aviation Community, the AERO Friedrichshafen event represents a world-leading trade show that gathers many assistants interested in avionics, aircraft maintenance and services and many other innovation technologies every year for General Aviation. Various areas will be covered in the scheduled conferences, and assistants will be able to attend to the avionics avenue or the E-Flight-EXPO, among other areas.

EBACE 2022

23 - 25 May

EBACE2022 is the place to experience new and future-forward aviation technologies, including small high-tech aircraft through ultra-modern intercontinental jets, advanced air mobility and eVTOL aircraft, state-of-the-art avionics, and much more from all of the top aircraft manufacturers.
23 to 25 of May 2022, Geneva (Switzerland).

WORLD ATM CONGRESS 2022

21 - 23 June

A new World ATM Congress, the most important Air Navigation Services Providers (ANSPs) congress globally, will be held again in Madrid between 21 and 23 June 2022.
Through a partnership between CANSO BV and the Air Traffic Control Association (ATCA), the event will showcase the latest developments in Air Traffic Management, Communications, Navigation and Surveillance, providing an excellent opportunity for worldwide ANSPs and the ATM Industry to meet. Visitors will have the chance to walk the exhibition and enjoy many free conferences.
EGNOS will be present at the EURO VILLAGE stand, together with EC, EUSPA and other European Agencies.

EGNOS

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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EUSPA European Union Agency for the Space Programme

ESSP

NAVIGATION MADE IN EUROPE