EGNOS BULLETIN

Issue 37, Autumn'21 Edition

Credits: Norwegian National Police

EUSPA European Union Agency for the Space Programme

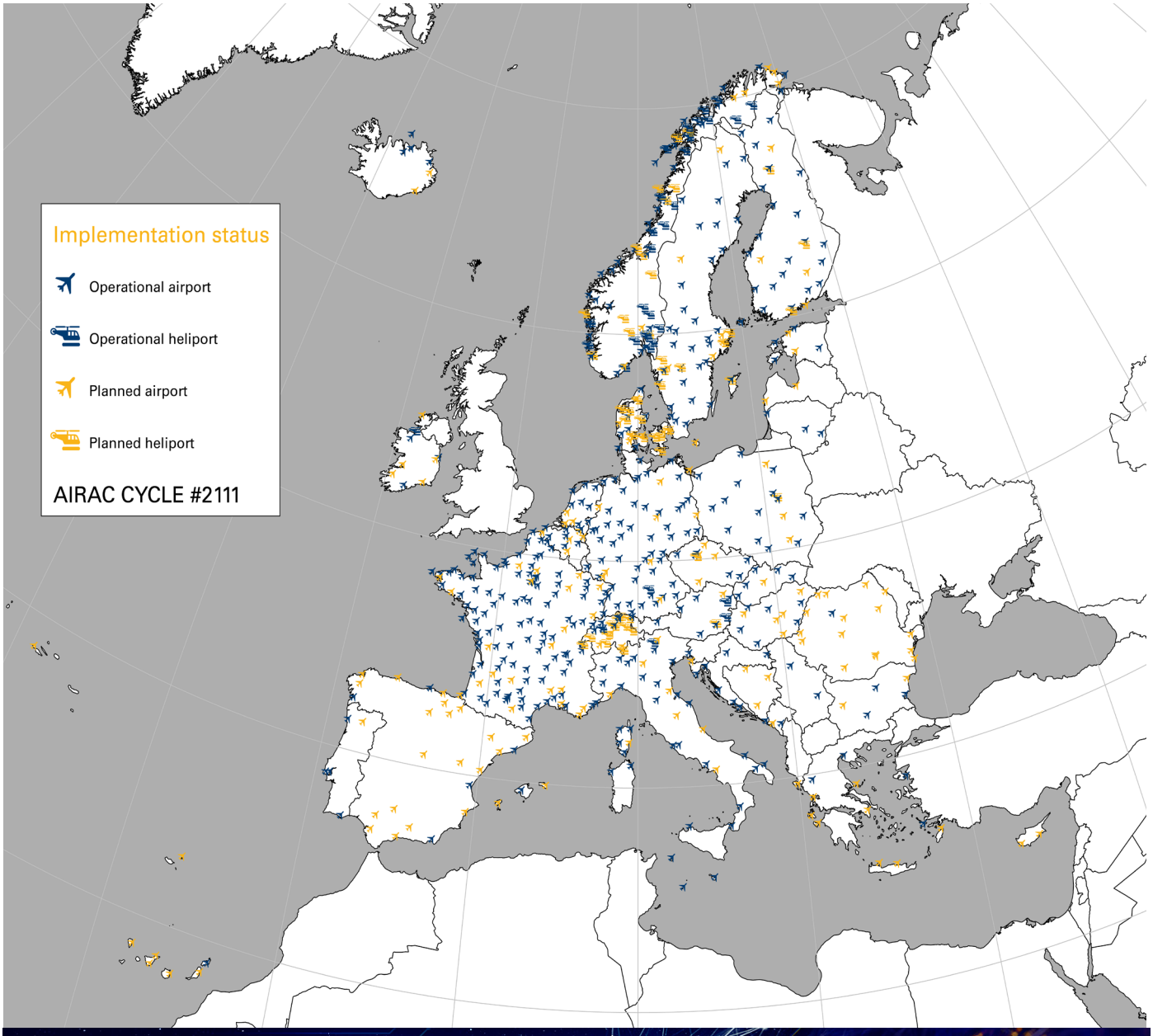
NAVIGATION MADE IN EUROPE

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

ESSP

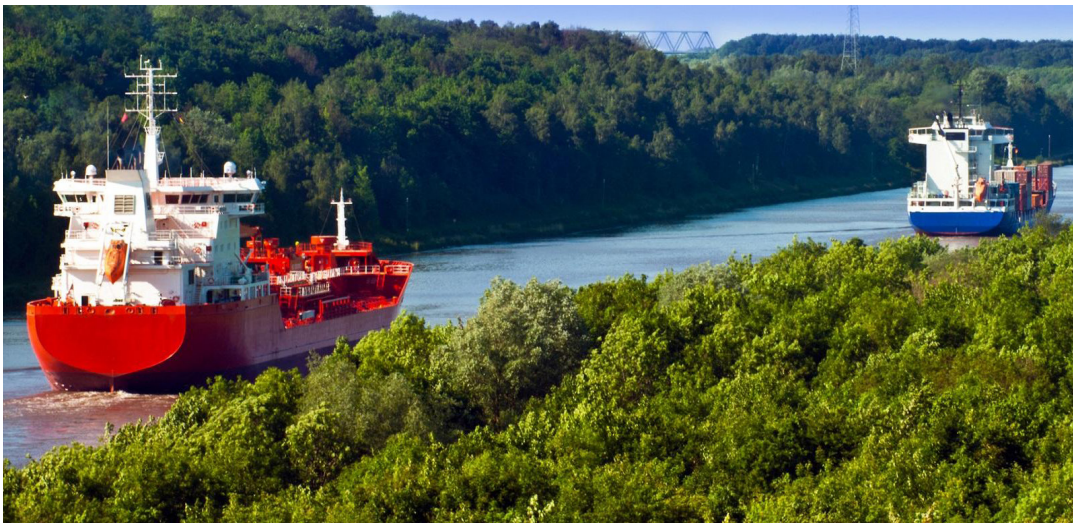
https://www.essp-sas.eu/

EGNOS implementation



The use of EGNOS SIS in the German DGNSS radio beacon system

Germany has vast experience in the transmission of DGPS corrections for maritime usage. German DGPS infrastructure has faced some obsolescence problems in the last years; thus, the German Federal Waterways and Shipping Administration (WSV) decided to fully renew their radio beacon network choosing the Virtual Reference Stations (VRS) concept. The German DGNSS service uses EGNOS SiS as a local source of GPS corrections, providing system redundancy and improving the overall availability of the DGNSS services to users.



Credits: WSV

Background history

Germany has been providing a DGPS radio beacon service for maritime usage for more than twenty years. The DGPS service followed a classical approach, according to IALA, providing GPS corrections within the maritime radio beacon band (283.5 – 325.0 kHz). The GPS L1 C/A-Code corrections were generated from local on-site reference receivers. Furthermore, the GPS corrections were monitored, and integrity was checked to inform users in case of satellite failures or if the service was outside the defined performance specifications. Because most of the hardware and software of the DGPS system was installed around 1995, the whole service was getting more challenging to run and maintain.

In addition, it was thought that the provision of augmentation information for future new GNSS signals from GPS, Galileo, GLONASS or Beidou might also be necessary. Therefore, a re-engineering and further development of the existing maritime DGPS service towards a modernised DGNSS service was considered necessary to meet future maritime requirements [1].

In this regard, IALA developed a recommendation [2] on the future of DGNSS, which identified new concepts to re-engineer the existing radio beacon DGPS. In addition, a new IALA Guideline was issued on the Performance and Monitoring of DGNSS Services [3], which enables re-engineering based on classical and network approaches.

The two concepts allow the following functionalities:

- Hardware and software replacement
- The use of a modular software solution based on COTS (Commercial off-the-shelf) receiver technology
- SBAS integration (existing SBAS, such as WAAS or EGNOS could offer a low-cost solution to service providers)
- The use of Virtual Reference Stations

VRS concept: the German recapitalization option

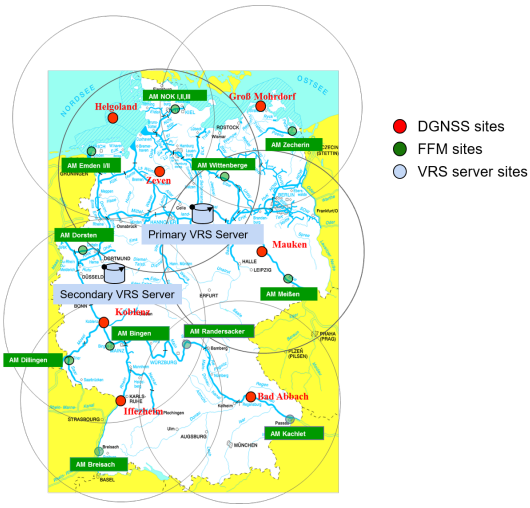
Several reasons made Germany decide to use the Virtual Reference Station (VRS) concept, namely the possibility of using standardised hardware and software and integrating future GNSS signals easily. Additionally, raw data could be used from national surveying administrations.

Other driving factors in choosing VRS were the expected performance enhancements in accuracy, integrity, availability and continuity. Accuracy could be improved in specific areas of interest (harbours, regions with high accuracy requirements). Integrity monitoring functionality could be improved by using a Pre-Broadcast-Monitoring process, which allows the use of EGNOS SiS as a local backup solution to improve the overall availability and continuity of the DGNSS service.

> "The German DGNSS service uses EGNOS SiS as an additional source of GPS corrections to enable local backup functionality and improve the overall availability of the DGNSS services for users"

Moreover, the VRS concept supports the e-Navigation architecture, which separates functions into different services. This means that observation and GNSS correction generation could be separated from the transmission technology (MF, VHF or local hotspots).

Between 2016 and 2019, Germany re-capitalized the entire German radio beacon network, consisting of a total of seven DGNSS sites, as shown in this figure.



Credits: WSV

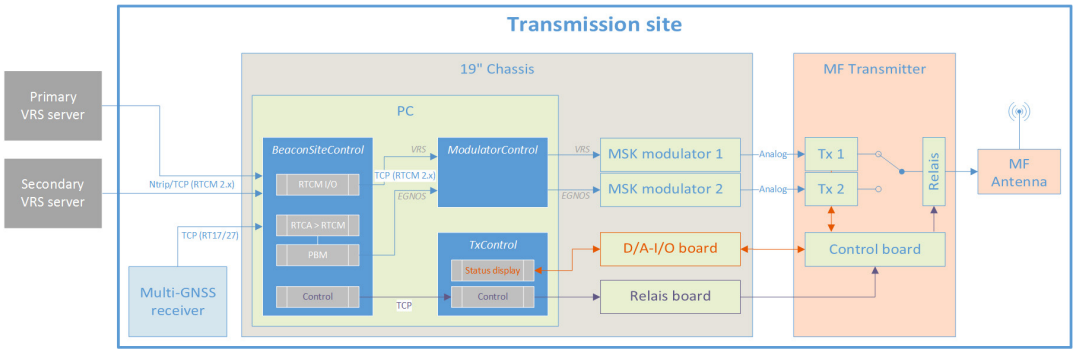
The new WSV DGNSS service is based on a centralised data processing approach applying the VRS concept. The primary correction data source of the WSV DGNSS transmission is the Alberding Beacon.net software, which runs on two independent server facilities (in Koblenz and Magdeburg), generating individualised DGNSS VRS corrections for each transmission site. The correction data are delivered from the VRS servers to the DGNSS transmission sites via a proprietary network.

EGNOS usage as an additional source of GPS corrections

The German DGNSS service uses EGNOS SiS as an additional source of GPS corrections to enable local backup functionality and improve the overall availability of the DGNSS services for users. Thus, network interruptions can be easily managed. Each DGNSS transmission site is equipped with a backup GNSS receiver capable of outputting raw EGNOS (SBAS) data in RTCA format along with raw GNSS observation data to the Alberding Beacon Site Control (BSC) software running on a local computer. The software converts EGNOS RTCA data into RTCM 2.3 format (EGNOS VRS corrections) and uses the raw GNSS observations

DGNSS site at the Baltic Sea (Groß Mohrdorf) Credits: WSV

from the local receiver to carry out Pre-Broadcast integrity Monitoring (PBM) of the corrections.
The Beacon Site Control automatically switches to EGNOS input if no DGNSS VRS data is available from the central VRS servers. Alternatively, the software can be configured to switch to EGNOS input at regular intervals for user-defined periods (e.g., every night for 2 hours). It is also possible to force the transmission of EGNOS VRS data, instead of DGNSS VRS corrections, by sending the appropriate command from the Beacon Site Control software to the transmitter relay via the Transmitter Control. This switches the active transmitter (Tx1/Tx2) connected to the MF antenna and requires manual intervention (configuration change) by the service operator.
The hardware and software components at the beacon stations, as well as the data flow between them, are shown in the figure below:



German DGNSS System architecture based on VRS and local EGNOS-SIS backup Credits: WSV

IALA: International Association of Maritime Aids to Navigation and Lighthouse Authorities
WSV: German Federal Waterways and Shipping Administration

References
[1] M. Hoppe, J. Bäckstedt, "Recapitalization of the MF radio beacon system based on VRS", IALA conference La Coruna, 2014
[2] IALA Recommendation R-135, "The Future of DGNSS", 07 December 2012
[3] IALA Guideline G-1112, "Performance and Monitoring of DGNSS Services in the Frequency Band 283.5-325 kHz, 29 May 2015
[4] Tamás Horváth, "EGNOS VRS Performance Test at WSV", Alberding GmbH, 2017

EGNOS Success Stories

EGNOS SUPPORTS SAMPLE PLOT POSITIONING IN THE ITALIAN NATIONAL FOREST INVENTORY

Forestry Carabinieri (Calabria field surveys crew) Credits: CREA

Forest inventories aim at quantifying and describing the forest resources of a region or country. In particular, they contribute to biomass estimation and climate change mitigation.

A field survey of the third Italian National Inventory of Forests and Forest Carbon Reservoirs (INFC2015) was carried out by the Carabinieri Command for Forest, Environmental and Agri-food protection with the scientific supervision of the Research Centre for Forestry and Wood belonging to CREA (Council for Agricultural Research and Economics) in Trento, Italy.

The inventory was completed during the first months of 2020 using airborne digital orthophotos to classify the forest's macro-categories (wood-not-wood, forest, grassland, crops, etc.). Theoretical geographical coordinates originating from a sample design were used for photointerpretation. Therefore, GNSS was an essential tool in validating the classification made in the field by assigning the closest position to the theoretical one.

Antonio Floris, from CREA, says: "We have been users of EGNOS in the forest for several years now (since it became available on GIS-class receivers), because we need precise positioning in real-time, without the 'traditional' real-time differential corrections, which is often very difficult to achieve in mountainous and forest environments."

Due to operational difficulties in obtaining real-time GNSS differential corrections from ground reference stations, CREA researchers decided to use the EGNOS augmentation system as a recommended option. The fifty field crews were given specific guidelines on configuring EGNOS corrections in their receivers. Additionally, they were also briefed on the particular procedures and services needed when using a Web-GIS platform and a dedicated mobile application.

Antonio Floris, from CREA, says: "EGNOS corrections have helped to improve the uncertainty of positioning by up to four times, compared to uncorrected positioning. In addition, the combined use of orthophotos and EGNOS strongly assists in obtaining reliable and accurate data collection surveys that contribute to decision making in climate change mitigation."

EGNOS USED IN VALTRA GUIDE SOLUTIONS

Credits: Valtra

Valtra is a Finnish company that manufactures tractors and is part of the AgCo group. In 2021, coinciding with its 70th anniversary, Valtra has introduced new 5th generation products that are fully equipped to operate intelligently, always keeping in mind the principle of maximum simplicity of use that characterizes the brand. The wide range of products covers the extensive power needs of farmers and livestock breeders and those of companies outside the sector specialising in municipal services or airport maintenance.

The technological solutions include the "Valtra Guide" system, which provides users with all the information they need in an easy way. The Valtra Guide system is an intelligent farming tool that is compatible with a wide range of correction signals, including EGNOS, and is adapted to each client by selecting the most suitable receiver, accuracy level or correction signal for each job or operation and updating the accuracy of the user's guidance system at any time.

Rafael Millan is the expert in the smart farming platform that simplifies the management of mobile and stationary assets and the data needed to run a profitable agricultural application. Rafael confirms that: "EGNOS in Valtra Guide allows precise and constant driving at all times, everywhere, and for every job, being an affordable and ideal system for spraying, tilling, fertilizing and in poor visibility conditions or at night. Using Valtra Guide with EGNOS helps save time and money while helping to make the job easier and improving decision-making."

EGNOS can be configured on Valtra G, N, T and S tractor series models equipped with the "Valtra Guide" system, allowing the selection of the required correction signal. The system will enable you to switch between the different correction signals available in the Valtra Guide system, making the EGNOS configuration simple and easy.

Rafael Millan confirms that: "EGNOS is perfectly integrated into the Valtra Guide, as the components work very satisfactory together with an easy-to-use terminal and numerous steering sensitivity and drift compensation settings, both for steering corrections and for facing the line of work. EGNOS offers good performance, even in work with ISOBUS implements where centimetre precision is not required."

EGNOS in the Valtra guide can be considered the preferred low-cost entry technology for precision farming. It reduces the workload and improves efficiency in the field in an easy way.

Therefore, Valtra continues recommending EGNOS to its network of users due to its benefits, not only in cost and time savings, but also in fuel, fertilisers, seeds and other inputs, contributing to the sustainability of the environment and the efficiency in their farming activities.

QUICK AIR JET CHARTER

LPV approach at EDDK RWY 24 Credits: QuickAir

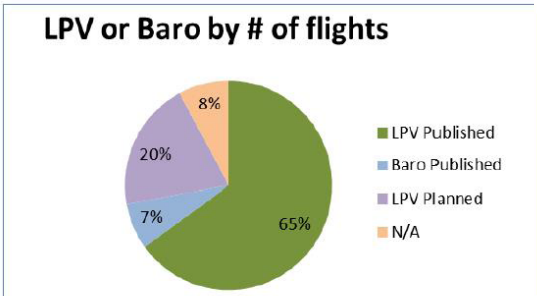
Quick Air Jet Charter GmbH is a company that has mainly focused on air ambulance flights ever since it was established back in 1992 at the Cologne Bonn International Airport. Since then, the company has grown significantly, and in 2018 they started a fleet renewal process to satisfy the ever-growing number of requirements that needed to be met to deliver such a particular and vital service. As a result, they added three modern and efficient Learjet 45 XR aircraft that add up to the three Learjet 55, three Learjet 35 and the Learjet 36 that were already part of the fleet, enabling Quick Air to deliver the service they envisioned, including the transport of adult, children and neonatal critical care patients on long-range intercontinental flights.

Air ambulance is a demanding service to deliver; there is no time for mistakes, and every process must be optimised to ensure no time is wasted while a patient is waiting. This is taken very seriously at Quick Air. Their professionals receive training by performing flight and fuel planning, overflight and landing permit requests, handling requests, security checks, weather forecasts, etc., at an extremely high pace to ensure the complete operation is performed as safely and quickly as possible. Moreover, having a proper, efficient and reliable approach procedure as LPV available at the destination airport and on-board is crucial to increase the chances of landing at the desired

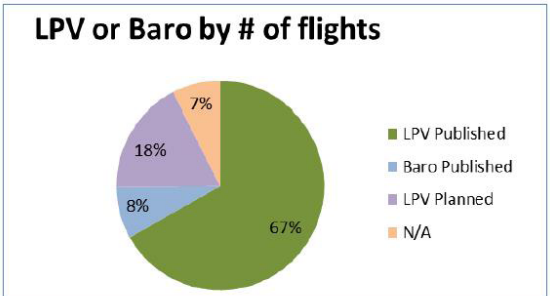
Did you know...?

…the Swiss manufacturer, Heart Aerospace, is developing a full-electric aircraft that will contribute to environmentally friendly aviation? The ES-19 is a 19-seat regional aircraft prototype for which several European airlines, such as Finnair, have shown interest in potential purchases through the signing of LOI -Letters Of Intend-. The first delivery is expected for 2026. With short-range aircraft under threat from other modes of transport, the ES-19 is the best solution to an issue that is becoming increasingly relevant over time.

location and time, despite weather conditions. This is one of the reasons why this company chose to incorporate the LPV capability on their new Learjet 45XR. After assessing the great benefits of this capability, Quick Air requested ESSP a free-of-charge Traffic Assessment, analysing the possibilities of implementing LPV in the remaining fleet and its actual benefits based on their European destinations and the number of flights to each of these destinations. Referring to the STC/SB Tool published on the EGNOS User Support Website, it appears that the Learjet 35 also has an LPV solution available on the market. Therefore, the study was conducted for both the Learjet 35 and the Learjet 45XR. The results were outstanding, and amongst the best cases ESSP has ever studied:



- **72%** of Quick Air's LJ45 European flights land at destinations with at least x1 procedure authorised for SBAS guidance.
- **92%** of Quick Air's LJ45 European flights are planned to be performed to EGNOS destinations by 2024.



- **75%** of Quick Air's LJ35 European flights land at destinations with at least x1 procedure authorised for SBAS guidance.
- **93%** of Quick Air's LJ35 European flights are planned to be performed to EGNOS destinations by 2024.

In light of these figures, Quick Air is looking forward to implementing LPV on the rest of their fleet and flying to a growing number of LPV destinations which are expected to be published shortly.

Gerald Kleindienst, NPFO at Quick Air Jet Charter, said: "We see a clear advantage in LPV approaches enabling us to access minor airports with difficult territorial conditions, which in the past could have only been approached via visual or NDB approach, requiring a much higher ceiling and visibility. In fact, concerning this matter, ILS is a great improvement, but due to the position of the ground stations, the displays are prone to interferences. Therefore, LPV as a satellite-based system shows much higher stability.

In addition, LPV significantly lowers the workload for pilots, as it rarely remains necessary to change the NAV sources between en-route, approach and missed approach. At Quick Air, 80% of our approaches are LPVs because pilots love them."

Did you know...?

…that Rockwell Collins has a new EVS sensor for the A320?

"Have you heard about the new Rockwell Collins' EVS sensor for the A320 family? As you can see on their press release, Collins Aerospace has been selected to integrate their Vision Sensor into Airbus' Enhanced Flight Vision System (EFVS) to increase situational awareness and, thus, safety. Refer to the link above for further details".

NORWEGIAN NATIONAL POLICE AIR SUPPORT UNIT AT ENTX

The Air Support Unit of the Norwegian National Police is implementing state of the art EGNOS-based PinS approach procedures down to LPV minima for its heliport at the new National Emergency Response Centre at Taraldrud, near Oslo.

Credits: Norwegian National Police

The Norwegian National Police Air Support Unit is part of the Norwegian Police's national contingency units consisting of the bomb squad, hostage negotiators, the intervention team and the air support unit. All units are located at a new National Emergency Response Centre, which entered in operations at the end of 2020, situated in Taraldrud, to the south of the Norwegian capital, Oslo. The Air Support Unit provides observation, surveillance, search for missing persons, transport of police resources and special operations.

The Emergency Response Centre has its heliport, known as ENTX in ICAO designation, featuring a short runway. The Norwegian Police has implemented all the necessary elements to facilitate its use in poor weather conditions. These elements comprise an approach lighting system in the runway, a helicopter approach path indicator (HAPI), Standard Instrumental Departure (SID) procedures from the runway and instrumental approach procedures in both runway directions that include EGNOS-based Point in Space –PinS- procedures that use the EGNOS Safety of Life (SoL) LPV-200 service level, which greatly enhances operations with lower minima compared to the also available LNAV procedures.

> "EGNOS enables Approaches with Vertical Guidance (APV) based on satellite navigation, without any heliport-specific navaid equipment on the ground"

The Air Support Unit operates three Leonardo AW169 helicopters based on ENTX. Two of them, one used for transport and the other for surveillance, are ready to be used 24/7/365 to ensure the highest operational availability for police missions. The AW169 is certified to conduct RNP APCH procedures down to LPV minima (Localiser Performance with Vertical Guidance), using Satellite Based Augmentation System (SBAS). LPV capability is standard for this helicopter, and an updated navigation database service is required to enable PBN capabilities to the Flight Management System (FMS) to optimise its use.

EGNOS enables Approaches with Vertical Guidance (APV) based on satellite navigation, without any heliport-specific navaid equipment on the ground. Additionally, it allows the pilot to use a constant descent rate down to a theoretical decision height as low as 200 ft. aboveground using the LPV procedures based on the EGNOS LPV-200 service level. In this specific case, and due to the challenging environment, with high powerlines and rugged terrain very close to the heliport, this service level provides enough lateral and vertical protection to establish the decision height at 311 ft.

These obstacles were the main reason behind using the LPV-200 service level, which enables Category I precision approaches based on the EGNOS Safety-of-Life Service, resulting from the flight procedures development process approved by the Norwegian Civil Aviation Authority. It is important to highlight that, as a request from the Norwegian CAA, the EGNOS service provider developed and implemented a Service Provision Scheme tailored for this kind of operations, defined in the EGNOS Working Agreement with the Norwegian National Police Air Support Unit.

The Police Superintendent/Chief pilot, Gunnar

Credits: Norwegian National Police

Arnekleiv, confirmed that "The Air Support Unit has already taken advantage of the departures as well as the PinS approaches on several occasions during live missions. The LPV approaches ensure a safe return to the base in order to restore preparedness after missions."

The nearby presence of the fjord means frequent periods with layered fog at ENTX. Therefore, the procedures were designed to "proceed visually" to the runway from the PinS point, with visibility or runway visual range as low as 800 m. In these conditions, "proceed visually" is a necessity, much safer and operationally ready than the alternative "proceed VFR", which requires far more visibility (indeed, Visual Meteorology Conditions). The visibility reduction caused by layers of fog also makes LPV an invaluable help for pilots. "The difference is huge, comparing LPV versus LNAV-minima." In addition, LNAV does not provide any vertical guidance to pilots.

Although the Air Support Unit is based at the Emergency Centre, it is allowed to use public LPV procedures published at other airports for operations, even outside the airport's regular operational hours, due to its security role. "LPV allows us to be self-contained."

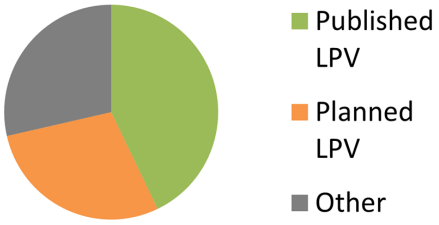
This is an interesting example of how EGNOS signals and services provide benefits for citizens; in this case, by supporting the missions of police helicopters in Norway.

Credits: Norwegian National Police

Did you know...?

IAGOS is a European Research Infrastructure for global observations of atmospheric composition from commercial aircraft. IAGOS delivers a time and spatially resolved multicomponent dataset on Essential Climate Variables (ECV) and Air Pollutants. IAGOS data are provided in near real-time for the COPERNICUS Atmosphere Monitoring Service (CAMS).

DANISH AIR TRANSPORT



Percentage of LPV destinations
Credits: CIRIUM routes data

Based in Denmark and with more than 25 destinations, DAT is a leading European operator that connects some of the greatest hubs in continental Europe.

Considering the operational benefits LPV provides to its users, and with almost 50% of DAT's destinations currently having published LPV procedures and more expected in the future, DAT has been keen on implementing LPV capability on their fleet, as it has helped to reduce the number of delays, diversions and cancellations (DDCs) in poor weather conditions or where only conventional approach procedures are published at the destination airdrome. As a result, DAT requested LPV capability on two of their ATR 72-600s from the production line and they retrofitted 1 ATR 72-202 and 1 ATR 42-300 to implement the LPV capability via a Supplemental Type Certificate (STC). A total of four aircraft out of their 16 ATRs are currently capable of using EGNOS-based approach procedures, and they look forward to implementing it on the remaining fleet.

Credits: DAT

The process started when DAT decided to study how to provide additional operational benefits to the crew. As a system alone, it was clear that SBAS-based ADS-B Out would not provide operational improvements. Consequently, from the first design sketch, DAT's primary goal was to modify their aircraft to implement LPV capability and unify the FMSs. The design organisation selected to carry out the aircraft modifications was assigned in 2019, but it was not until February 2021 that the STC was approved, and the first prototype was finished. This lag was due to the significant delays associated with the COVID-19 crisis, which forced all parties to put a great deal of effort into developing the solution. Once the STC was approved, the remaining steps were easier.

Currently, their LPV-capable aircraft fly to Billund, Kajaani and Pantelleria airports, among others. Concerning the latter, DAT has numerous flights per year that can land thanks to the published LPV procedures, as the other available minima lines are conventional approaches, requiring adequate visibility conditions up to a higher altitude.

Furthermore, DAT confirms that EGNOS procedures are highly appreciated by pilots, who have given positive feedback and mentioned that the performance of LPV procedures resembles that of an ILS; they find it easy and very useful, especially when there are no other published precision approach procedures at the destination or the ILS CAT-I procedure is under maintenance. Having EGNOS LPV procedures in place ensures that flights can continue to be carried out in these situations, and DAT expects to use them more frequently in the future.

Did you know...?

Environmental measurements collected from ground, sea or air monitoring networks by in situ sensors help Copernicus produce and enrich its Services and products. Copernicus In Situ Component, managed by the EEA, coordinates collaboration between stakeholders, promotes data availability and analyses needs and trends to set the way forward for data integration.

Accurate positioning is a key factor to improve the data quality of environmental observations. EGNSS can help enhance the existing observations networks used by Copernicus services or help build new ones by providing positional precision.

Talking about EGNOS with… Fintraffic ANS

Helsinki Airport
Credits: Fintraffic ANS

Let's start with a brief summary of Fintraffic ANS.

"Fintraffic is the State-owned special assignment group that facilitates mobility on land, air and sea. Its mission is to provide the world's best traffic management and a traffic ecosystem service in Finland to enable the safest, smoothest, and most environmentally friendly traffic in the world.

Fintraffic ANS is one of Fintraffic's subsidiaries that provide air navigation services, including en-route services, as well as aerodrome control services and approach control services for 22 airports in Finland. Fintraffic ANS employs about 440 professionals". Representatives from Finntraffic told us about their experience with EGNOS.

Tell our readers about Finnish airspace: How is it organised and managed? What are its main characteristics? What is the role of Fintraffic ANS?

"Finnish airspace is managed according to national airspace policy and practices described in ASM Operations Manual. Finland has an integrated civil-military ATM system without permanently segregated military airspace. Segregation of airspace for military use is done based on actual needs. Principles of Flexible Use of Airspace are being applied, and ACC sectors are managed dynamically according to traffic needs. Development has been directed by the frequently updated strategy of navigation and surveillance systems. PBN airspace was implemented throughout the country in 2014. Free Route Airspace above FL095 was implemented in 2015 in co-operation with other NEFAB –North European Functional Airspace Block- States.

The majority of airports in Finland are owned and managed by Finavia. Finavia's network of airports consists of 20 airports across the country. Helsinki Airport is the main airport and leading European long-distance and transit hub. Two of the airports solely serve military and general aviation operations. The others primarily serve passenger operations, but some airports also have a military base combined with them.

Fintraffic ANS operates the Area Traffic Control Centre Finland (ATCC Finland) and the Helsinki air traffic control unit and provides air traffic control and flight information services at airports. Services of Fintraffic ANS also include technical air navigation services and various ancillary air

navigation services."

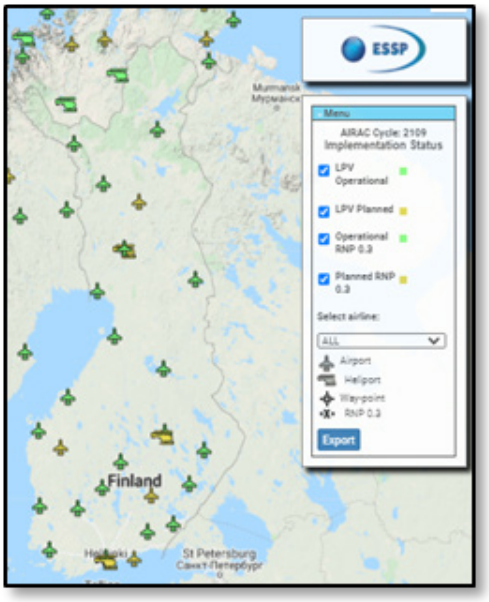
Let's dig into the history of Fintraffic ANS with EGNOS/LPV: What were the first steps? What is the current status? Future developments?

"Finland has been among the first countries in Europe implementing GNSS-based flight procedures, supporting airspace users to benefit from its modern fleets and the investments made in it. The first GPS-based RNAV approach procedures in Finland were implemented over 15 years ago, initially as non-precision approach procedures. Since 2014, there has been an RNP approach to LNAV minima available for every instrument runway end in the country. The introduction of vertically guided RNP approach procedures started in 2012. At that time, they were mainly in the form of APV BaroVNAV (LNAV/VNAV) according to user requests, even though also the first two EGNOS based LPV procedures were implemented at Joensuu Airport with the support of the GSA-granted ACCEPTA project in 2013.

User interest in LPV approaches has risen in the last few years. Before, mainly just LNAV and LNAV/VNAV were requested. Some years ago, in 2017, the extensive introduction of LPV in Finland had not yet started, but there were quite a few RNP approaches to LNAV/VNAV available. The decision to enable the use of EGNOS for LNAV/VNAV was a significant quick win at that time, making it possible for aircraft approved for SBAS operations to use the widely available vertically guided approach procedures. Of course, even more operational benefits can be reached with LPV procedures.

> "The decision to enable the use of EGNOS for LNAV/VNAV was a significant quick win at that time, making it possible for aircraft approved for SBAS operations to use the widely available vertically guided approach procedures"

In accordance with the objectives of the PBN IR and following recent user requests, the large-scale introduction of LPV procedures has recently been carried out and was completed in April 2021. At this stage, the introduction of new LPV procedures has been relatively easy. In practice, it has just been the addition of LPV minima to the already existing RNP approach procedures. Consequently, no changes to the airspace concept itself have been needed at this point.



Finnish LPV Implementation
Source: EGNOS User Support Website

At this stage, LPV procedures have been defined to use the EGNOS APV-I service level. Interests for the LPV-200 service level have also been expressed, but the main concern has been the continuity of LPV-200. In the geographical location of Finland, there are still significant differences between the continuity performances of APV-I and LPV-200.

As part of the Finnish PBN transition plan, still subject to state approval, there is a roadmap defined for decommissioning conventional navaids. This has already been done at six airports where PBN capability is now obligatory. At those airports, incorporating PBN capability is required, although ILS is still available in addition to RNP approach procedures. It has been noted that PBN IR recommends decommissioning ILS Cat-I by 2030 if it is not necessary to keep it in operation for contingency. However, the continuity performance of LPV-200 is not sufficient to maintain the same service level. This situation is expected to improve significantly with the new EGNOS System Release v2.4.2B deployment, which will introduce two new RIMS –Kiev (Ukraine) and Kuusamo (Finland) stations- and therefore, extend APV-I and LPV-200 service areas. Further improvements will probably come with the availability of EGNOS V3, which is eagerly awaited."

How was the publication process of LPV

procedures –or the introduction of LPV minima in former RNP charts- during 2020 and 2021? Was it a challenge for the company –especially considering that it happened during the COVID-19 crisis-?

"The implementation decision was based on user requests. The COVID crisis has definitely had an impact on available resources, like everywhere in aviation. However, the expertise and long experience of the Fintraffic ANS flight procedure design team in PBN, along with advanced tools and refined design processes, enables its customers to design PBN procedures in a very cost-effective way. As part of the flight validation activities, the flight inspection team of Fintraffic ANS has developed specific tools to validate the defined FAS data blocks and ensure adequate signal reception and performance. The almost simultaneous implementation of several procedures allowed savings in the cost of the validation database and the most effective execution of the actual flights in terms of flight time."

From your point of view, what are the main benefits of EGNOS/LPV for Fintraffic ANS and Finnish aviation?

"EGNOS/LPV provides the best possible minima and the possibility of a vertically-guided approach procedure for runway ends not equipped with ILS. At most Finnish airports, the ILS is installed for only one runway end. On the user side, the number of operations with LPV capable aircraft is constantly increasing, but there are still a significant number of aircraft without LPV capability. However, having the procedures available can also support operators in their considerations for potential avionics upgrades and future fleet developments."

Any other topic in relation to EGNOS/LPV that you would like to address? Feel free to share your thoughts.

"A project co-organised by several ministries, authorities and state operators has assessed the feasibility of establishing a Low-Level Route network to Finland, with associated approach procedures to uncontrolled aerodromes and landing sites. The feasibility study was completed very recently, and no implementation decisions have been made for the time being. The study, however, recommends planning for RNP 0.3 routes and RNP approaches, potentially also using EGNOS, if such an implementation decision is made. Fintraffic ANS is now prepared to design and implement RNP approach procedures also for smaller, uncontrolled aerodromes. This offers huge possibilities that Fintraffic ANS can effectively support by providing streamlined processes, tools and experience in PBN."

> "EGNOS/LPV provides the best possible minima and the possibility of a vertically-guided approach procedure for runway ends not equipped with ILS"

> "Fintraffic ANS is now prepared to design and implement RNP approach procedures also for smaller, uncontrolled aerodromes"

Credits: Fintraffic ANS

EGNOS services highlights

EGNOS SERVICE IMPLEMENTATION ROADMAPS: NEW VERSION 5.0 RELEASED

The new version of the EGNOS Service Implementation Roadmaps (v5.0) was published in July 2021 and is available in the corresponding section of the EGNOS User Support website! The EGNOS Service Implementation Roadmaps provide a high-level overview of the evolutions planned for the coming years in each of the EGNOS Services provided: Safety of Life (SoL), Open Service (OS) and EGNOS Data Access Service (EDAS). These are some of the relevant EGNOS milestones included in our new release:

- New EGNOS System Releases to be deployed.
- Optimisation of satellite and ionospheric monitoring algorithms, improving the system's robustness against very specific events.
- New RIMS in Kiev and Kuusamo, extending the EGNOS Service Area to eastern regions.

We invite you to explore the upcoming evolutions described in the Service Implementation Roadmaps. You can access this information online or download the content in PDF format. Do not hesitate to contact the EGNOS helpdesk if you have any questions.
Pdf version only available for registered users

NEW UPDATE ON AGRICULTURAL TOOLS IN EGNOS USER SUPPORT WEBSITE

Do you know how much CO2 emissions could be avoided in agriculture thanks to EGNOS? Thanks to the EASE and GEAR update, it is now possible to discover the CO2 savings in some typical agricultural activities.
EASE (Egnos sAvingS in agriculturE) is a tool that provides farmers with cost-benefit analyses on the introduction of EGNOS for machinery guidance, and GEAR (eGnos dEmonstrator for AgRriculture) is an interactive virtual demonstrator to show the benefits of EGNOS.
Both tools, available on the EGNOS User Support Website, now can inform about savings in carbon emissions when using EGNOS compared to other technologies.

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

EGNOS WORKING AGREEMENTS SIGNED (EWA)

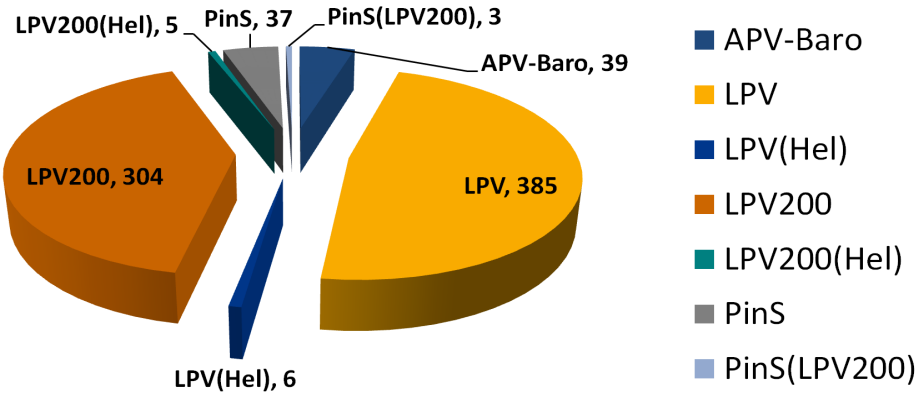
The following EWAs have been signed in the last quarter:

Sunnhorland Lufthamn AS **Norway**

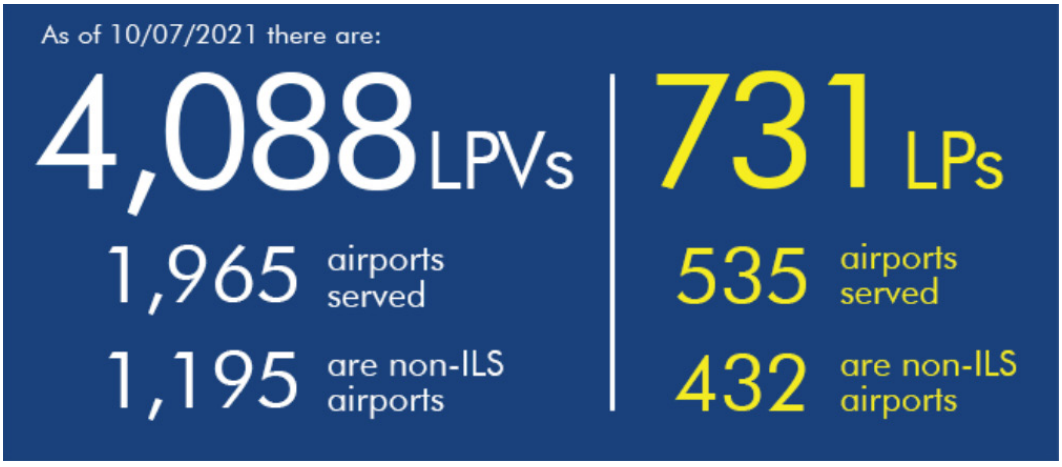
This makes the establishment of EWA number 100 since the first one in 2011

LPV, LPV-200, PINS & APV BARO PROCEDURES PUBLISHED (INCLUDING AIRAC CYCLE 2021 #11– 04/11/2021)

Next graph shows, the number of procedures LPV, LPV-200, PinS, APV-Baro, LPV-Hel, LPV200-Hel and PinS-LPV200. The total number is **779**



FAA PROCEDURES AS 7 OCTOBER 2021



What's going on...

in aviation.

COLLINS

Credits: Collins

To date, the EGNOS Safety of Life service offers the possibility to perform LPV approach procedures with a Decision Height (DH) as low as 200 ft. However, when using Enhanced Vision Systems (EVS) technologies in conjunction with SBAS, it is possible to obtain "operational credit" and thus exceed the defined DH levels, as indicated in the current EU Regulation on Air Operations.

Since EVS technologies provide the pilot with an augmented reality view of the runway's environment regardless of weather conditions, it could allow descents down to 100 ft for LPV200 operations and 200 ft for APV-I and NPA operations performed as Continuous Descent Operations (CDO), without having to request any special approval and keeping the DH unchanged. The benefits are remarkable for the operator but and the passengers, the environment, and the airports. Airlines can provide their service with fewer unexpected Delays, Diversions and Cancellations (DDCs), reduce their associated costs and ensure their passengers arrive at their destination at the expected slot, even under poor visibility conditions.

In addition, a Special Approval (SPA) makes it possible to obtain further operational benefits that reduce the required RVR, provided the eligibility conditions are met.

The new AWO regulation (All Weather Operations) will extend these operational benefits when the EU accepts it as a Decision, which is expected by Q2 2022. The new term EFVS (Enhanced Flight Vision System) extends the previous EVS to align it with FAA regulations. Improved operations include EFVS200, EFVS-A and EFVS-L. On the one hand, EFVS200 will allow descents down to 200 ft without special approval on suitable runways. On the other hand, EFVS-A will allow descents down to 100 ft and EFVS-L descents to touchdown, both subject to Special Approval. EGNOS LPV capability enables all new EFVS operations.

The SBAS/LPV and the Enhanced Vision Systems are key components of the increasingly important concept of All-Weather Operations, which brings together complementary technologies to help aviation significantly reduce the costs and environmental impact resulting from the operational disruption caused by low-visibility conditions. SBAS LPV supports the Instrument segment of the approach to 200' DA and is then complemented by EFVS, which supports the visual segment of the approach down to EFVS-A (100') or EFVS-L (0'). The combination of SBAS/LPV and EFVS provides unprecedented approach capability without relying on conventional ground infrastructure such as ILS.

"The SBAS/LPV and the Enhanced Vision Systems are key components of the increasingly important concept of All-Weather Operations, which brings together complementary technologies to help aviation significantly reduce the costs and environmental impact"

in aviation.

SUGUS

Credits: SuguS project

SuguS is an EC project aimed at boosting the use of European GNSS (EGNOS and Galileo) in support of Unmanned Aircraft System (UAS) operations, in both Open and Specific categories. It started in December 2019 and ended in summer 2021.

It capitalises the results of previous EGNSS projects, capturing the needs of U-space service providers and UAS operators in complex operations such as Beyond Visual Line-of-Sight and urban environments. The gap analysis between already implemented EGNSS elements and user needs are an input to perform the impact analysis in the Service Provision layer of both Galileo and EGNOS, and then propose a Service Provision Scheme that facilitates the optimal integration of EGNSS operational added value in UAS operations, and more specifically, SORA compliance in the Specific Category, which eases the approval by the competent aviation authorities.

The definition of an Application Programming Interface (API) for EGNSS that can be used by U-space service providers, UAS systems designers/developers, and integrated into existing commercial solutions, will expedite mission preparation and eventual flight authorisation.

A set of awareness-raising actions will be complemented by the contribution to standardisation and regulatory activities to maximise the potential for implementing SuguS solutions.

WEBINARS TO PROMOTE EGNOS SAFETY OF LIFE (SoL)

The European Satellite Services Provider (ESSP) is organising a series of webinars to coincide with the 10th anniversary of the EGNOS Safety of Life Service. The first webinar took place on June 16th 2021, showing how the implementation of EGNOS has progressed over the last decade, from the first published LPV procedure to the almost 800 procedures available today. In addition, a brief overview of the STC and SB solutions available to equip EGNOS was given through a demonstration of the STC/SB tool available for free on the EGNOS User Support Website.

The second webinar organised on October 6th 2021, focused on a more detailed overview of this STC/SB tool and how to use it, providing real examples and search queries that may be of interest to users. Additional information is provided for each specific aircraft model, which stakeholders can use to find details on available solutions to implement on-board LPV capability.

Visit the Webinar section in the EGNOS User Support Website and stay tuned for upcoming webinars!

in aviation.

THE WORLD ATM CONGRESS

From 26-28 October, ESSP attended the World ATM Congress, an annual event taking place in Madrid, Spain, which brings together Air Navigation Services Providers (ANSPs) and other major stakeholders in the aviation industry in a rich environment prone to networking opportunities through more than 250 exhibitors and 9500 attendees.

The EGNOS stand was the centre of attention for many visitors who wanted to familiarise themselves with EGNOS and its advantages. They had the opportunity to fly a real LPV approach procedure with a virtual reality flight simulator of the EGNOS-capable A321 NEO, which helped them understand what it is like to perform these procedures.

It was a great opportunity to meet people face to face again and strengthen relationships. See you next year!

in geomatics.

FIG WORKING WEEK

The FIG Working Week 2021 "Smart Surveyors for Land and Water Management" is a global event that took place virtually from 21-25 June 2021. The event fosters cooperation and education between scientific, private and public organisations, which is crucial for smart surveying. EGNOS was present in this event to showcase its advantages. At the same time, information on the latest GNSS and mapping technologies and organisations involved in the context of land and water surveys was collected to increase the network of contacts interested in the EGNOS service and the Copernicus Programme.

GEOSPATIAL WORLD FORUM

The Geospatial World Forum took place from 20-22 October in Zaanstad, The Netherlands. The event's mission is to re-connect the supply and demand for geospatial capabilities across economic sectors through solution-based thematic programmes, high-level roundtable meetings, workshops, training and various after-hours social gatherings. The event provided an opportunity to learn what the EU satellite navigation systems (EGNSS) and the Copernicus Programme can offer for geomatics and mapping activities. GNSS is one of the key geomatics technologies supporting geospatial data alongside Geographic Information Systems (GIS), Earth Observation and Remote Sensing. In particular, EGNSS would contribute to managing natural areas, maintaining utility networks, inventory and control of assets, sampling field campaigns and determining perimeters and areas. In combination with Copernicus data, which provides context and information about on the state of the territory, EGNSS could help provide georeferenced data for more reliable and quality information.

in maritime.

EGNOS BENEFITS FOR MARITIME HIGHLIGHTED AT TRANSNAV CONFERENCE

The 14th International Conference on Marine Navigation and Safety of Sea Transportation was held online from 16 to 18 June 2021.
EGNOS was the main topic of two of the GNSS expert panel discussions, co-chaired by EUSPA Market Development Technology Officer, Prof. Manuel Lopez. One of these presentations was the "Evolution of SBAS/EGNOS Enabled Devices in Maritime", which provided an analysis of the number of onboard devices, mainly devoted to navigation, and of AIS transponders that are SBAS-compatible. The study behind this paper shows that SBAS capability is included in 94% of approved satellite navigation devices for SOLAS vessels and 89% of non-SOLAS satellite navigation devices. However, these implementations are not certified according to a maritime test standard, as such a standard has not been developed yet. The International Electrotechnical Commission (IEC) has recently approved a new work item to prepare such a standard within the next two years, which will provide a common pathway for the implementation of SBAS maritime receivers.
During this round table, participants also had the opportunity to learn about the performance of EGNOS at high latitudes and, more specifically, along the Finnish coast, through the presentation of the document "EGNOS Performance Along Finnish Coast". This study highlights the suitability of EGNOS along the border of its coverage area, showing an average accuracy of 0.815 meters in the Gulf of Finland.
For more information, please visit the EUSPA newsroom here.

in rail.

CONNECTING EUROPE EXPRESS

The European Union has declared 2021 as the European Year of Rail, planning a series of activities to highlight the benefits of rail transport. As part of these activities, a special EU train called Connecting Europe Express travelled across Europe, from Lisbon on 2 September to Paris on 7 October 2021, stopping in more than 100 cities in 26 countries.
The role of Connecting Europe Express was to give us a better understanding of the challenges that European rail must overcome to become the mode of choice for passengers and businesses and showcase the benefits of rail as a sustainable, safe and comfortable mode of transport. The initiative is part of the European Green Deal, which aims to support clean, cheap and healthy forms of private and public transport to achieve a 90% reduction in transport emissions by 2050.
The exhibition linked to Connecting Europe Express showcased a selection of railway infrastructure projects along the route of this train funded by the EU's Connecting Europe Facility programme. The Connecting Europe Facility (CEF) is a key EU funding instrument to support investments in the construction of new transport infrastructure in Europe or the rehabilitation and upgrading of existing infrastructure.
To follow this exciting journey across Europe in real time, the train was equipped with a Galileo and EGNOS-enabled device, transmitting the position obtained via both European Navigation Satellite Services. EGNOS and Galileo are an integral part of the Digital Rail agenda. Click here to find out more.

Upcoming Events

METSTRADE 2021

16 - 18 Nov

The METSTRADE Show, the world's largest trade exhibition for marine equipment, materials and systems, will once again bring the industry together in Amsterdam this year. In addition to the overall leisure marine industry, this event offers three specialised sectors: Superyachts, Marinas and Yards and Composites. METSTRADE 2021 will have a special and unique design following COVID-19 protocols. The result will be a robust, safe, easy-to-navigate and successful exhibition showcasing the best of world-class marine products from around the world.

As in previous editions, EGNOS will be located in Hall 1, stand 01.500.

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