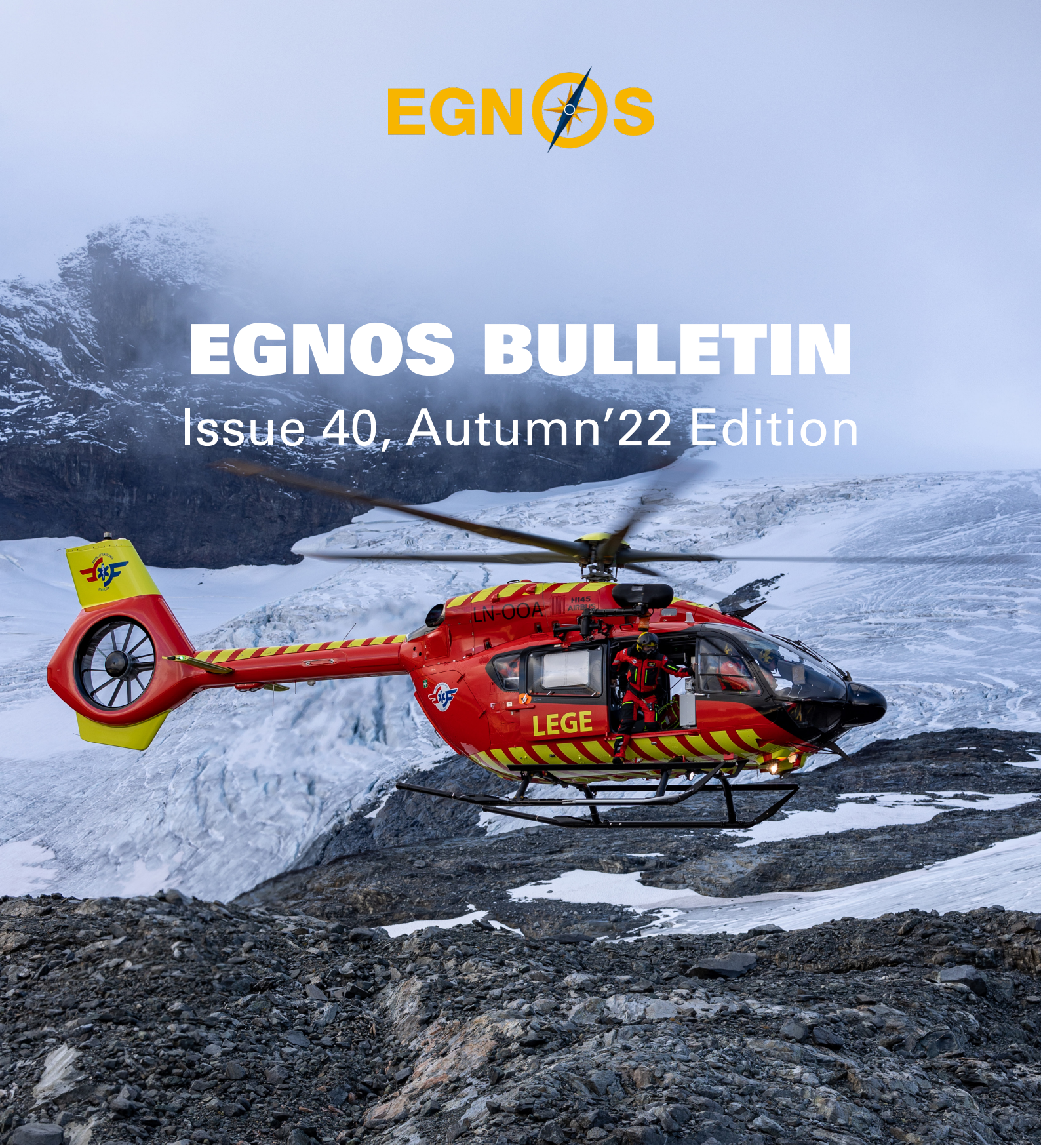
EGNOS

EGNOS BULLETIN

Issue 40, Autumn'22 Edition



Credits: Norsk Luftambulanse

EUSPA
European Union Agency for the Space Programme

NAVIGATION MADE IN EUROPE

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

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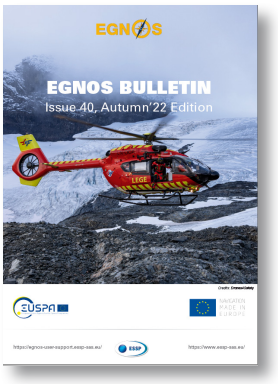

Cover Story

Talking about EGNOS with… Norsk Luftambulanse (Norwegian Air Ambulance)

Norsk Luftambulanse (NLA) is a non-profit organisation that works to move advanced life-saving medical treatment out to the patient. More than 300,000 members and companies support the mission and are taking part in the charity's work to develop the air ambulance service to become even better. They have been pioneers in using EGNOS for rotorcraft procedures in several countries, and we have had the opportunity to talk with Lars Amdal, pilot and project manager at NLA, to learn about their experience and feedback.

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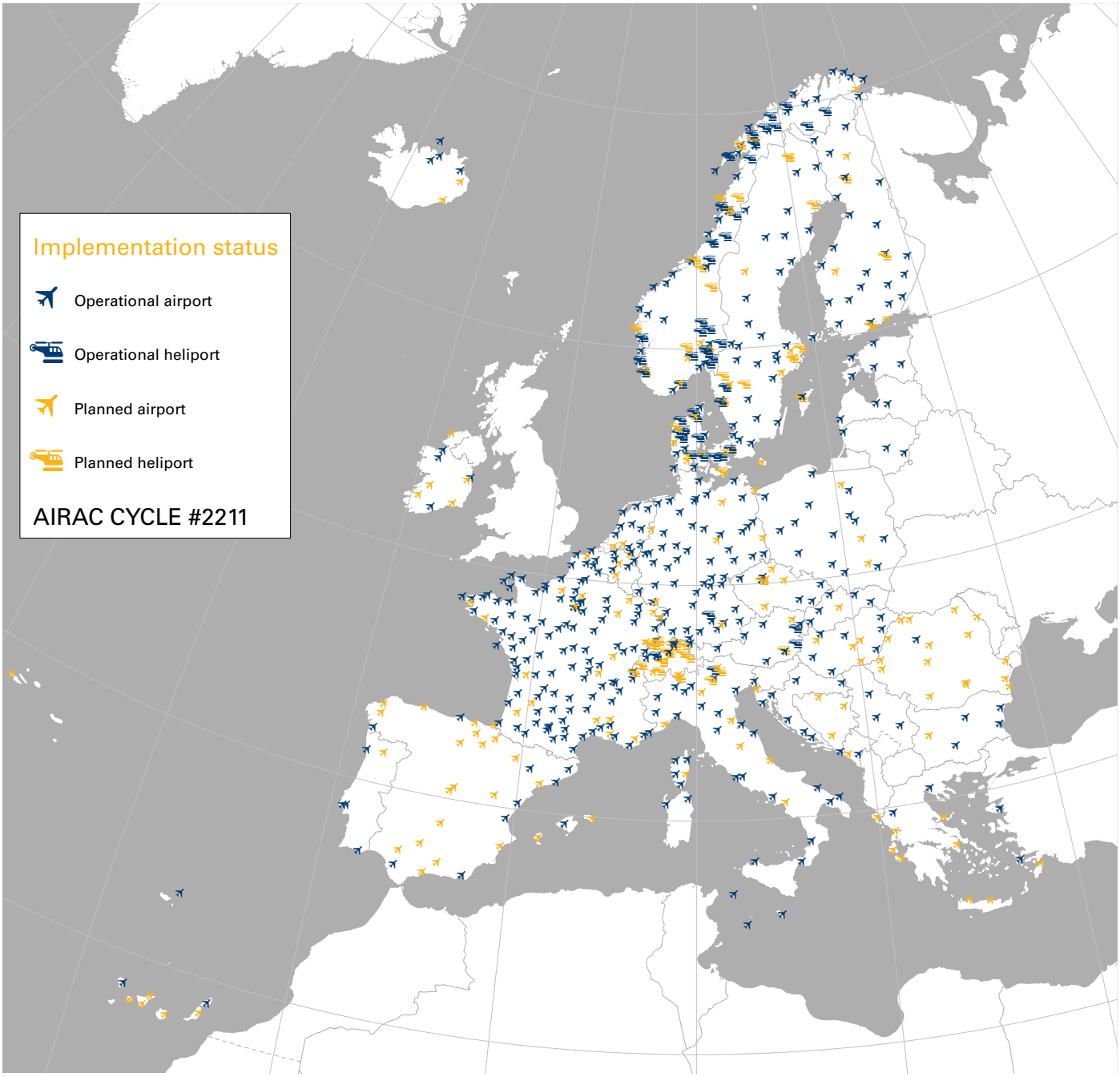
EGNOS implementation



EGNOS Success Stories

NETJETS BENEFITS FROM LPV AND EFVS

Credits: NetJets

NetJets started in the US, launching its fractional ownership concept in 1986 and bringing it to Europe in 1996. Currently, the European fleet consists of 109 aircraft encompassing Phenom 300, Citation XLS, Citation Latitude, Challenger 350, Falcon 2000EX, Global 5000 & 6000 types, with the Challenger 650 to be added soon. NetJets operates in a wide range of worldwide destinations, from large international airports to small VFR airports.

NetJets and LPV

Their history with EGNOS started as far back as 2010 with their involvement in the "ACCelerating EGNOS AdoPTion in Aviation" (ACCEPTA) and "Filling the gap in GNSS Advanced Procedures and oPerations" (FilGAPP) projects for retrofitting a Hawker aircraft with LPV and developing an advanced RNP curved approach leading to LPV final. Currently, their EGNOS and LPV capable fleet consist of Phenom 300, Citation Latitude, Challenger 350, and Global 5000 and 6000 types. When asked about their feedback on LPV approaches, they say that "LPV gives a greater degree of accuracy when compared to a standard GNSS approach, giving lower minima. It also improves safety as the glidepath is not affected by low temperature or incorrect altimeter settings, which can impact standard GNSS approaches. LPV gives the possibility of having a similar approach minima to an ILS at smaller aerodromes where it would not be financially viable to install an ILS, and also maintains the ILS minima when an ILS is inoperative at larger aerodromes, giving a more robust operation."

Currently, they have no plans to retrofit aircraft, but they confirm that all new fleets will be equipped with LPV. When talking about the future of EGNOS and LPV in air navigation, they would foresee LPV being combined with more advanced approaches such as Advanced RNP and RNP (AR), giving approaches with a reduced noise footprint and improving access to aerodromes with a challenging terrain environment.

> "When talking about the future of EGNOS and LPV in air navigation, they would foresee LPV being combined with more advanced approaches such as Advanced RNP and RNP (AR)"

Credits: NetJets

EFVS operations

NetJets's Bombardier Global 5000 and 6000 fleets have EFVS installed from the production line, which was obtained to enhance safety and improve aerodrome accessibility. NetJets gets operational credit for EFVS-A operations and, as such, is approved to reduce the required RVR for an LPV or ILS approach from 550m down to 350 m and to reduce the height where the runway must be visible to the naked eye from 200 ft down to 100 ft. Their main feedback is that EFVS allows aerodrome accessibility and minima improvement without needing to upgrade the ILS and runway lighting systems to CAT-II or CAT-III levels. It also allows these reduced minima when using LPV approaches that are not yet capable of supporting CAT-II or CAT-III operations. Pilots feel EFVS during LPV approaches works seamlessly, exactly as with EFVS during an ILS approach.

> "LPV with EGNOS provided a big leap forward in terms of the minima and level of safety provided by GNSS approaches, without the need for additional ground infrastructure"

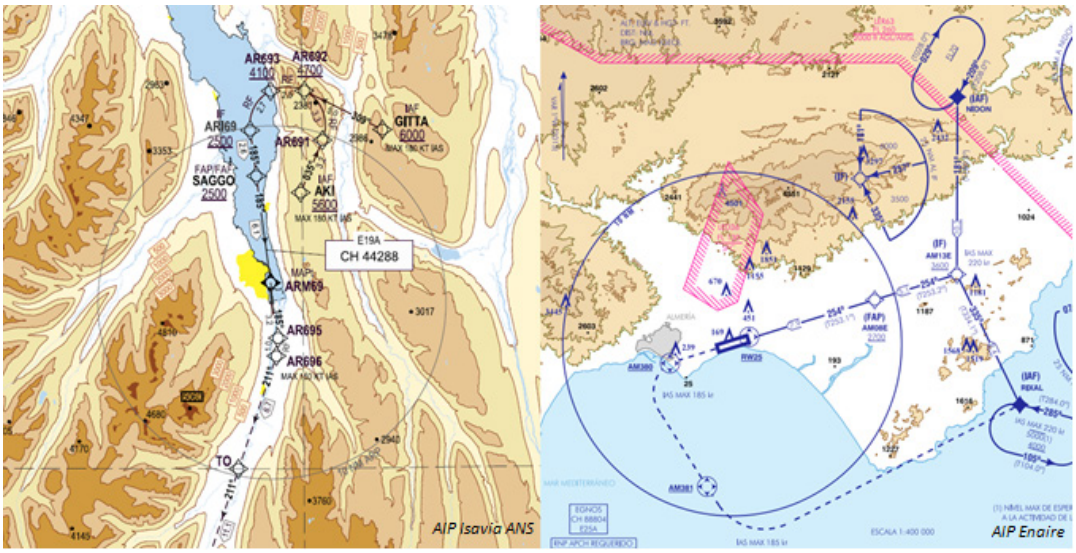
Their experience confirms that the combination of EFVS and LPV improves the probability of the customer reaching their desired destination and can be used at a larger range of destinations since there is no requirement for ground infrastructure. In conclusion, they express that "LPV with EGNOS provided a big leap forward in terms of the minima and level of safety provided by GNSS approaches, without the need for additional ground infrastructure. The addition of EFVS takes this a step further without onerous additional requirements."

Did you know...?

The European regulatory framework for All-Weather Operations (AWO) has recently been updated across the domains of air operations, aerodromes, aircrew, airworthiness and ATM/ANS; and became fully applicable as of 30 October 2022. This new regulatory framework introduces provisions which allow for the integration and use of new technologies and operational procedures to support AWOs. Among these are provisions that will enable new EFVS operations, which, combined with SBAS operations, will enhance safety and increase aerodrome accessibility without needing ground infrastructure.

PRELIMINARY ENVIRONMENTAL ASSESSMENTS AT ALMERÍA (SPAIN) AND AKUREYRI (ICELAND) AIRPORTS

Transforming aviation towards a more environmentally friendly transport mode is a key priority for the segment right now, accelerated by the European Green Deal. Greenhouse Gas (GHG) emissions, carbon footprint and noise levels are some elements which aviation aims to reduce. For this reason, ANSPs are implementing greener solutions into their skies simultaneously as air operators use more efficient operational flight techniques that contribute to that purpose.



Credits: ESSP

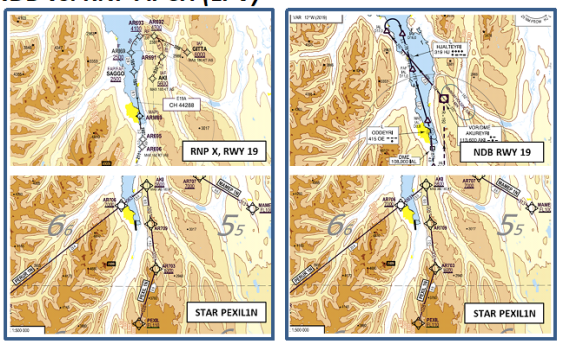
Particular examples of these practices have been proven theoretically in two preliminary studies for modelled flights arriving at Almería airport in Spain and Akureyri airport in Iceland. In those locations, the environmental contribution of EGNOS-based approach procedures, in combination with the most efficient descending techniques, has been compared with the use of conventional navaids – both NDB and ILS – together with conventional operational techniques. For that purpose, a first assessment of fuel consumption, emissions and noise figures was generated based on theoretical flights performed with different aircraft models using the IMPACT tool from Eurocontrol. Initial results show that the combined use of optimal aircraft performance – CDO and PBN flight procedure design techniques as a whole, with EGNOS being one of the key enablers of this navigation concept – entails an improvement compared with conventional navigation.

The following assessments demonstrate that when comparing the best scenario, which includes best practices such as the use of RNP procedures and CDO techniques, against the most conventional scenario, NDB/ILS and step-down fix, an air operator arriving from the south of Akureyri or Almería is potentially able to fly less distance and therefore save fuel, decrease GHG emissions and also reduce the area affected by noise. This study may be performed for other specific scenarios in the future.

Preliminary estimations at Akureyri (BIAR), Iceland

NDB vs. RNP APCH (LPV)

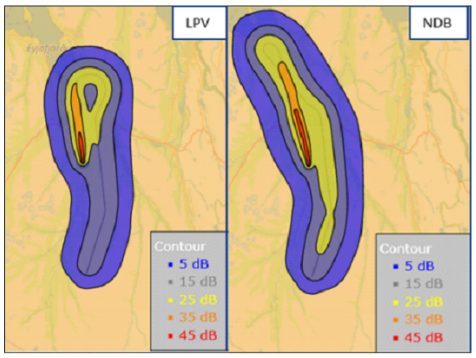
Credits: ESSP



Track reduction

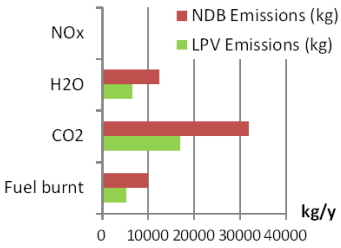
Compared Flight Procedures (STAR+APP)	Flight distance (NM)	Distance reduction
STAR PEXIL1N + RNP X RWY 19	43	-20.4%
STAR PEXIL1N + NDB RWY 19	54	

Noise reduction



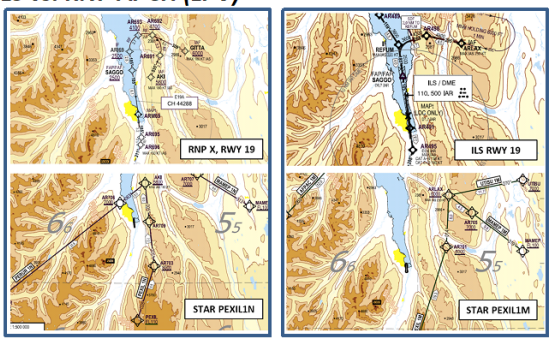
Emissions reduction

Emissions reduction LPV & CDO vs NDB & Step-down	
NOx	-47.3%
H2O	-46.8%
CO2	-46.8%
Fuel Burnt	-46.8%



ILS vs. RNP APCH (LPV)

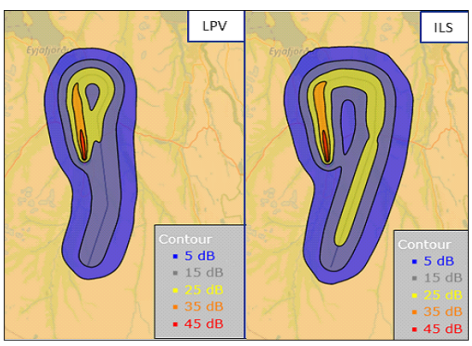
Credits: ESSP



Track reduction

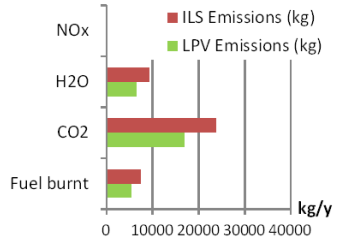
Compared Flight Procedures (STAR+APP)	Flight distance (NM)	Distance reduction
STAR PEXIL1N + RNP X RWY 19	43	-6.5%
STAR PEXIL1M + ILS RWY 19	46	

Noise reduction



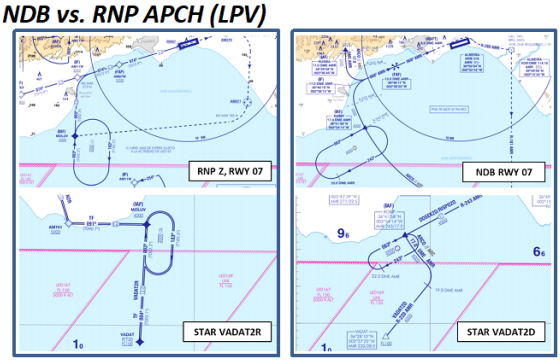
Emissions reduction

Emissions reduction LPV & CDO vs ILS & Step-down	
NOx	-18.6%
H2O	-28.9%
CO2	-28.9%
Fuel Burnt	-28.9%



Preliminary estimations at Almería (LEAM), Spain

NDB vs. RNP APCH (LPV)



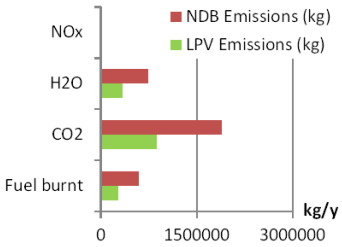
Track reduction

Compared Flight Procedures (STAR+APP)	Flight distance (NM)	Distance reduction
STAR VADAT2R + RNP Z RWY 07	31	-6.1%
STAR VADAT2D + NDB RWY 07	33	

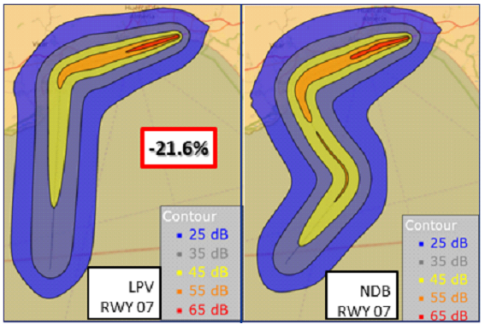
Credits: ESSP

Emissions reduction

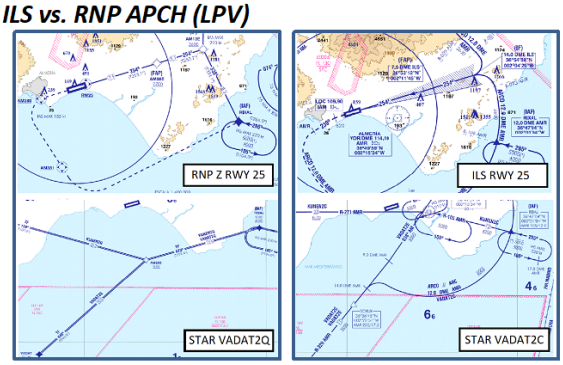
Emissions reduction LPV & CDO vs NDB & Step-down	
NOx	-69.9%
H2O	-53.9%
CO2	-53.9%
Fuel Burnt	-53.9%



Noise reduction



ILS vs. RNP APCH (LPV)



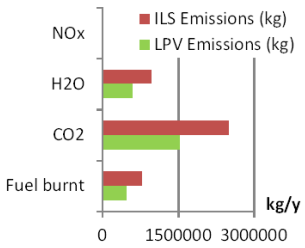
Track reduction

Compared Flight Procedures (STAR+APP)	Flight distance (NM)	Distance reduction
STAR VADAT2Q + RNP Z RWY 25	57	-10.9%
STAR VADAT2C + ILS RWY 25	64	

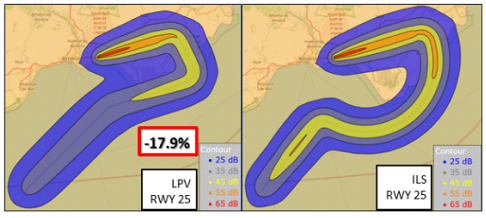
Credits: ESSP

Emissions reduction

Emissions reduction LPV & CDO vs NDB & Step-down	
NOx	-48.9%
H2O	-38.5%
CO2	-38.5%
Fuel Burnt	-38.5%



Noise reduction



Finally, consulting the environmental tool on fuel and emissions savings thanks to EGNOS is recommended. This is available in the EBCAST section of the EGNOS User Support Website to get estimated calculations based on your specific scenario.

NEW LPV SOLUTION FOR B737NG AIRCRAFT DEVELOPED BY FOKKER SERVICES WITH ASL AIRLINES FRANCE

Credits: Fokker Services

The Boeing 737NG is one of the most used aircraft models in Europe, with a total of over 1500 units and representing 12.61% of the European fleet during 2022. However, operators willing to implement LPV capability with Fokker Services' avionics did not have the chance, as the company's solution was under development. This has now changed, as Fokker Services has recently made available an LPV solution for this setup that opens the door for operators to upgrade their fleet with this new modification.

Amongst the various air operators that have B737NG on their fleet, ASL Airlines France stands out for having cooperated as a partner with Fokker Services for the development of this modification, which will enable pilots to perform LPV approach procedures down to 200ft Above Ground Level (AGL). Together with the ever-increasing publication of LPV approach procedures in Europe, acquiring this capability can be key for the operator, as it enables a wider range of possibilities and destinations while potentially reducing the number of Delays, Diversions and Cancellations (DDCs).

> "[Flying LPV procedures] it is as easy to fly an LPV approach as an ILS approach"

Fokker Services has confirmed that the solution developed has an ILS look-a-like interface, as that is what pilots are normally most used to and eases their training and learning curve to the extent that flying LPV procedures can be as simple as ILS procedures. ASL Airlines France confirms this, adding that "it is as easy to fly an LPV approach as an ILS approach" with Fokker Services' solution. In fact, looking to the future, training course costs and times can be reduced as it is being introduced as a normal practice for future operations.

In this regard, the PBN IR regulation establishes that all instrumental runway ends in Europe shall publish LPV approach procedures by 2024, as it is expected that PBN will be regarded as the "normal means" of navigation by 2030. Subsequently, it is expected that countries will decommission "old" nav-aids that are not needed to provide the same level of approach procedures availability at airports, thus reducing costs and maintenance activities. As a result, operators flying in Europe will need fleets with aircraft that match the requirements set to their destination airports.

In other words, LPV capability will be required to maintain regular operations.

Fokker Services' solution is considered "standalone" as it does not require changes to the aircraft's existing avionics architecture yet offers the same minima as ILS CAT-I procedures. If required, Fokker Services even offers the possibility of incorporating LPV capability during a scheduled downtime to minimize the time the aircraft is on the ground.

You can refer directly to Fokker Services to retrieve further information/details in this regard.

URBAN MOBILITY ENABLED BY EGNOS

Credits: Lime

Lime, the world's largest shared electric personal mobility vehicle company, uses EGNOS to improve positioning in scooters and electric bikes. Their fully electric fleet benefits from this European Space Programme and contributes to building greener cities and reducing carbon emissions.

Lime provides convenient and reliable short-term rentals of electric bikes and scooters in more than 200 cities in nearly 30 countries across five continents. The affordable price encourages citizens to choose these personal mobility vehicles over other transportation systems and promotes behavioural change in favour of environmentally friendly mobility.

EGNOS supports urban mobility solutions by making location measurements more accurate, available and reliable. Lime electric personal mobility vehicles are equipped with GNSS receivers configured with EGNOS. As explained by Arturo Romo de Vivar, Operations Associate, "EGNOS is activated in the entire fleet to improve the positioning accuracy, which is very important for us, not only to track the vehicles and find them but also to monitor market behaviour and design new strategies". The vehicle's battery feeds the GNSS receiver, which sends the positioning coordinates every five minutes. This positioning is supported by EGNOS and complies with Lime's requirements to track vehicles and monitor real-time information. This way, the collected location data are processed and analysed to predict demand, create more or new parking areas, optimise vehicle maintenance, and comply with city regulations, among other things. Arturo remarks that "positioning is crucial to deliver a high-quality service," and they are satisfied with EGNOS because it provides added value to their product at no cost at all.

Smart mobility applications have increased in recent years to make cities more sustainable and resilient. EGNOS has become a driver to achieving the European Green Deal objectives and making Europe climate-neutral by 2050.

OPTIMISING IRRIGATION THANKS TO EGNOS

EGNOS improves the geographical position of the GNSS modules in pivots, contributing to more efficient irrigation.

The AgroBee-L is a radio system based on modules that control the valves and other irrigation elements and read the sensors and meters. The AgroBee-L GNSS, available on the market since 2017, contains a GNSS module, configured with EGNOS by default, allowing it to locate the position of the pivot on a map and its direction of movement, making the system capable of applying variable irrigation depending on the needs of any crop section.

Sistemes Electrònics Progrés is the company that designed this product. Since 1985, they have been dedicated to irrigation solutions, covering the whole value chain from design and manufacturing to the commercial phase. They are market leaders in Spain and Portugal and have already supported the automatisation of many agricultural exploitation installations with more than 150,000 pieces of equipment.

The GNSS antenna is integrated into the upper part of the module to ensure the correct operation of the system and good radio communications. It is designed to be installed on top of a post on the last tower of the pivot to avoid any interaction with the rest of the structure, which may affect the performance of the communications. With this, a correct position is achieved, guaranteeing communication between the GNSS module and the coordinator.

Credits: Sistemes Electrònics Progrés

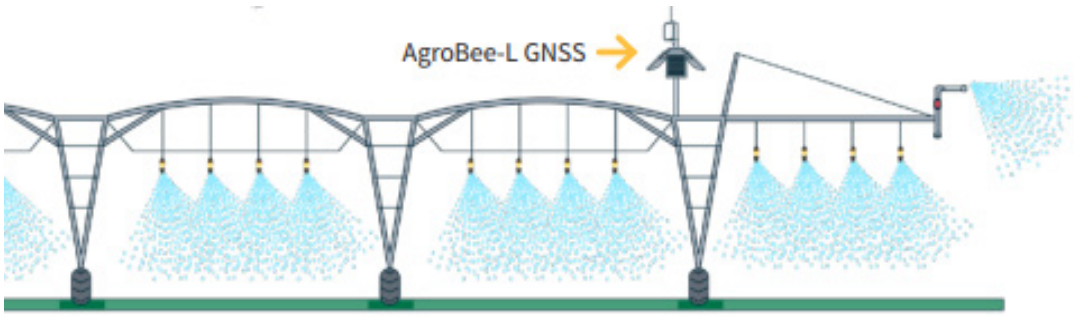


Figure 1: AgroBee-L GNSS

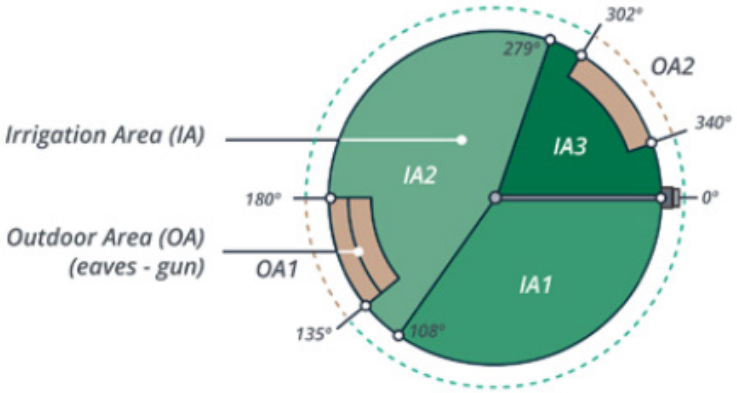
To initially set up the AgroBee-L GNSS module, the centre point coordinates must be provided to the system. Once the centre point is correctly positioned and with the GNSS antenna duly placed on the opposite end of the pivot, Progrés's algorithms calculate the pivot position at each moment, allowing fine-tuning of the irrigation (see Figure 2).

Did you know...?

EGNOS is now present at SmartAgrihubs to showcase the advantages of the service to the agricultural community.

SmartAgrihubs is a Horizon 2020 instrument that brings together a consortium of over 164 partners in the European agri-food sector. Its objective is to promote and facilitate digitalisation in AgriFood using "The SmartAgrihubs Innovation Portal," where they provide access to state-of-the-art digital technology, knowledge and experiences.

EGNOS has been registered as a Competence Center to provide information about this service, user guidelines and digital agricultural tools to support farmers using this technology.

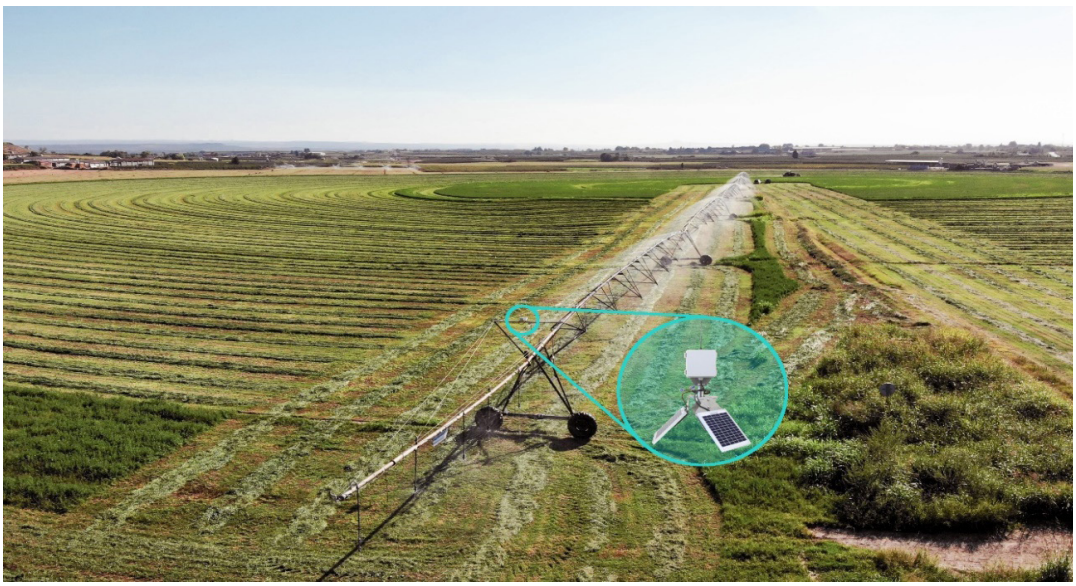


Credits: Sistemes Electrònics Progrés

Figure 2: Operating scheme of the AgroBee-L GNSS system

This system contributes to environmental sustainability, optimising the water use and extending the equipment's lifetime. Using renewable energy through solar panels to power the GNSS module allows the energy to be stored in the supercapacitors and avoids replacing the batteries.

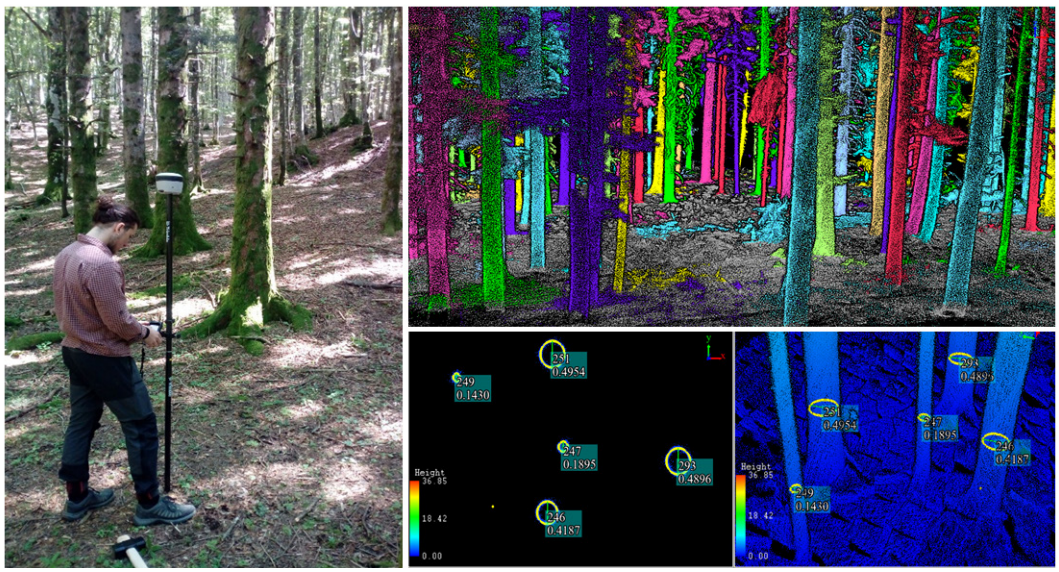
Although EGNOS is mainly used in circular pivots, it can also be employed in linear pivots and in other automatic irrigation systems to improve the accuracy of positioning. As Dani Tarragó (R&D engineer at Progrés) explains, "EGNOS provides additional value to the system at no cost at all". This is also confirmed by the owner of the field in the picture (Figure 3). They use a pivot with a 300-metre radius and are equipped with EGNOS. The farmer is satisfied with the solution, remarking that "EGNOS improves the accuracy of the system, optimising field production and saving costs". The GNSS module allows the pivot to stop/start, vary the speed and determine the amount of irrigation (time or volume) depending on the position improved by EGNOS. That is an example of how EGNOS supports agriculture.



Credits: Sistemes Electrònics Progrés

Figure 3: Pivot equipped with EGNOS in 30-hectares field crop in Lleida

EGNOS SUPPORTS VIRTUAL TRAINING FOR FOREST MANAGERS



Credits: D.R.E.AM. Italia

D.R.E.AM. Italia is a cooperative operating in the Italian agricultural-forestry sector for more than 40 years.

LIFE GoProFor is one of their ongoing projects. This EU-funded project which aims to identify and disseminate good practices and tools for the management and conservation of forest habitats' biodiversity within the Natura 2000 Network (N2000N), as well as to raise the level of awareness, knowledge and skills of all those who influence, through their activities, the conservation of forest habitats and species. The training was one of the project's key activities, devoted to instructing Italian N2000N site managers, forestry technicians and professionals, forestry companies and owners, naturalists, biologists and public institutions through the application of the Index of Biodiversity Potential (IBP) and marteloscope generation in each training area.

It is for marteloscopes that LIFE GoProFor tested the use of EGNOS differential corrections.

Marteloscopes are one-hectare large forest areas, especially set up to allow users to operate virtual tree marking and to visualise the results of their choices, thus increasing their awareness of the effects of silvicultural choices applied with tree selection.

It is necessary to define an area, preferably square-shaped and divided into four quadrants, to set up a marteloscope. It is, therefore, necessary to identify and geolocalise the vertices, the centre of the marteloscope, and the centres of the four quadrants. Every single plant with a diameter greater than 7.5 cm must then be geolocated and numbered. Finally, for each plant, numerous measurements will be taken, such as diameter, total height and insertion of the crown, distance and azimuth from the centre of the reference quadrant, microhabitat and quality of retractable assortments.

So far, for the geolocation of marteloscopes

vertices and trees, D.R.E.AM. normally uses a GNSS receiver and terrestrial LaserScann technologies. Last June, they decided to test EGNOS to implement a marteloscope in Val di Sella in collaboration with the Forest Service of Trento Province. The objective was to evaluate the use of EGNOS to improve its GNSS measurements in replacement of other more expensive systems used so far. The forest stand in question was a mixed high forest of Beech, White Fir, Scots Pine, Spruce and Mountain Maple, with an irregular structure and 478 plants/ha. Trees have an average diameter of 25 cm and an average height of 20 metres.

The positions of the vertices of the marteloscope were measured using a Trimble R2 GNSS receiver with EGNOS service enabled. The results, set out in the following table, show that EGNOS provided successful values concerning the accuracy expected for the georeferencing of the marteloscope. The horizontal deviations are almost always around one metre, which means enough accuracy for these specific tasks.

Vertices	X	Y	Z	Horizontal accuracy	Vertical accuracy	Correction	Number of satellites
C0	2240803105	5101745721	1141937	0.993	2.085	EGNOS	7
V1	2240758328	5101798174	1176196	0.772	1.048	EGNOS	7
V2	2240754586	5101751929	1147637	0.914	2.065	EGNOS	6
V3	2240753965	5101697385	1130282	1.086	2.559	EGNOS	7
V4	2240800905	5101692794	1126300	1.193	2.431	EGNOS	7
V5	2240851774	5101692214	1131339	1.017	1.453	EGNOS	7
V6	2240851546	5101741790	1148876	0.837	1.382	EGNOS	7
V7	2240855423	5101792990	1171599	1.118	2.232	EGNOS	7
V8	2240808575	5101795490	1167148	0.846	1.622	EGNOS	7

Marcello Miozzo, Project Manager of LIFE GoProFor project and Technical Director at D.R.E.AM. Italia, declared: "This test was very useful to seriously consider the use of EGNOS corrections for the establishment of future marteloscopes, both for its free use, but above all for the good level of positioning reliability."

Did you know...?

While the exploitation of EGNOS is the responsibility of the EU Agency for the Space Programme (EUSPA), its services are delivered by the EGNOS service provider under a contract with EUSPA. On 7 September, EUSPA formally announced that it had signed its new EGNOS service provider contract with European Satellite Services Provider (ESSP) for the next 10 years.

EDAS Ntrip receivers' performance positioning along motorways

During the first week of June 2022 in Spain, a vehicle was driven from Madrid to Córdoba and then from Malaga to Madrid. The purpose was to analyse EDAS (EGNOS Data Access Service) service benefits in the geo-positioning of vehicles on standard European roads in situations where any road structure could shadow EGNOS SiS. Figure 1 shows the complete data campaign route where two receivers were configured to use EDAS to compute RTK (related to distance[1]) positions

Credits: ESSP

Figure 1 Complete data campaign route

[1] *https://egnos-user-support.essp-sas.eu/new_egnos_ops/resources-tools/edas-dgnss-coverage-map*

(fed by RTCM 3.1 mountpoint), using as reference the Ranging Integrity Monitoring Stations (RIMS) located at Malaga's airport. The "real" trajectory was obtained in post-processing using high-precision techniques. An L1 RF signal recorder was used to get GPS standalone and EGNOS solutions and to replay these signals to the receivers to obtain GPS and EGNOS performances. Finally, horizontal and vertical position errors (HPE and VPE) were computed as a comparison between the navigation position (EGNOS, GPS or EDAS) and the "real" trajectory.

Credits: ESSP

Figure 5 Antenna on roof (left) and Receiver's location in the car's trunk

The results were outstanding. Table 1 shows the receivers' availability (% of the time with valid Position-Velocity-Time (PVT)) when configured in EDAS Ntrip, EGNOS and GPS Standalone.
The results show that EDAS DGNSS can be used highly confidently as a primary or backup navigation system. Overall, EDAS obtained 94.1% availability and EGNOS 84%, with an HPE using both corrections of 1.5 m. The availability and HPE will depend on the receiver model, which could have some variations. This was one of the objectives of the test; to demonstrate that different market segment receivers could have different performances, but EDAS is still present to navigate when road structures could shadow the EGNOS signal from space.

ROUTE	RECEIVER	RTCM	VALID PVT AVAILABILITY [%] / HPE P95% [m]					
			EDAS		EGNOS SiS		GPS	
MADRID --> CORDOBA (300 km to 137 km from RIMS)	1	3.1	91.6	1.2	97.3	1.1	98.6	2.0
	2	3.1	99.2	1.3	93.2	1.3	97.0	2.1
TOTAL			95.4	1.2	95.2	1.2	97.8	2.0
MALAGA-->MADRID (8 km to 440 km from RIMS)	1	3.1	86.3	1.8	84.9	1.6	98.8	2.0
	2	3.1	99.3	1.6	60.8	2.0	98.3	2.0
TOTAL			92.8	1.7	72.8	1.8	98.5	2.0
TOTAL MOTORWAY			**94.1**	**1.5**	**84.0**	**1.5**	**98.2**	**2.0**

Table 1 PVT availability and Horizontal Position Error results

Figure 4 represents a vehicle circulating on a standard European road (3.50 m width), where the overall HPE percentile 95th receiver is indicated from the centre of the vehicle onto the left lane of the motorway, showing the benefits of EDAS DGNSS in this environment.
At a glance, and considering all the data provided by the receivers, EDAS DGNSS can be used to geo-position or locate a vehicle on motorways by reducing the HPE and increasing the corrections' availability when road structure, mountains, etc., could shadow EGNOS. Also, using both services together by the receiver results in successful navigation.

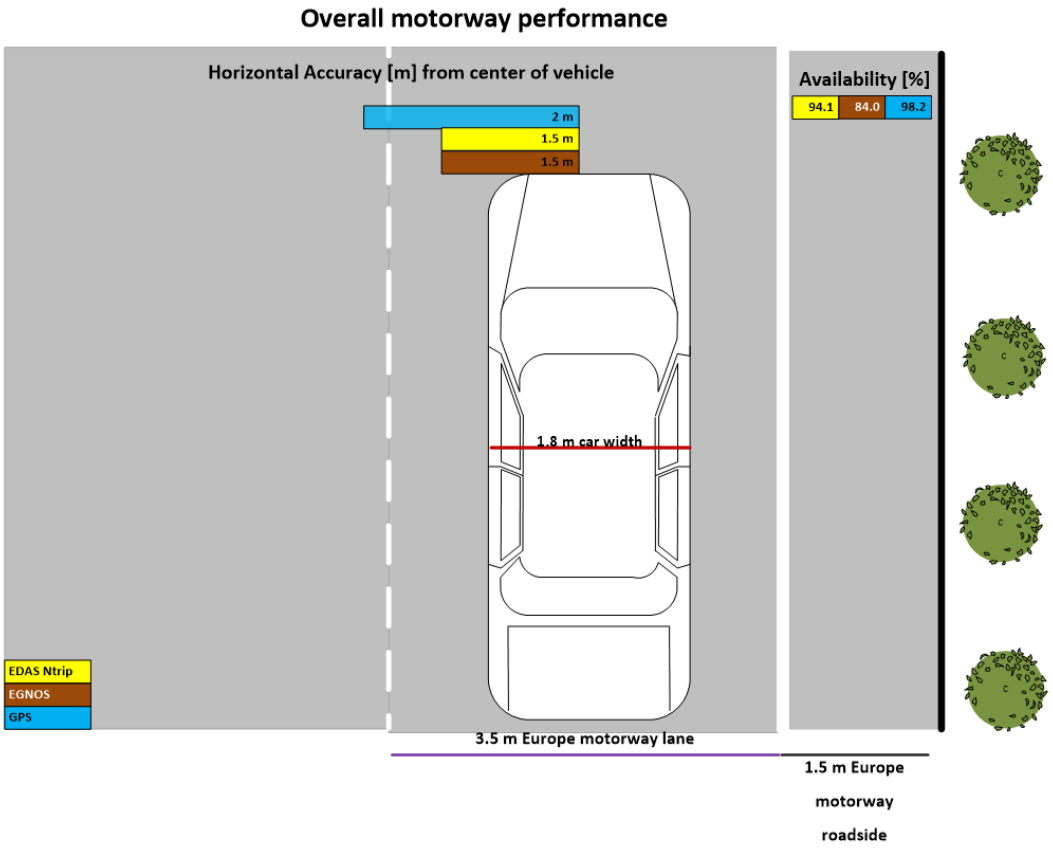


Figure 4 Overall motorway availability & accuracy representation

Did you know...?

The Bulgarian Association of Information Technologies (BAIT) has uploaded information about EGNOS to their website so that Bulgarian farmers can read about it and try using it.
BAIT is the largest, most representative and most influential professional organisation in Bulgaria's information and communication technologies field. Through their National Technology Transfer Office, they facilitate the process of technology transfer between innovators, researchers and users of innovations in practice, fostering communication between entrepreneurs, companies in the ICT sector, business organisations and universities in Bulgaria and all over the world.

Talking about EGNOS with… Norsk Luftambulanse (Norwegian Air Ambulance)

Norsk Luftambulanse (NLA) is a non-profit organisation that works to move advanced life-saving medical treatment out to the patient. More than 300,000 members and companies support the mission and are taking part in the charity's work to develop the air ambulance service to become even better. They have been pioneers in using EGNOS for rotorcraft procedures in several countries, and we have had the opportunity to talk with Lars Amdal, pilot and project manager at NLA, to learn about their experience and feedback.

Credits: Norsk Luftambulanse

Let us start with a brief introduction to Norsk Luftambulanse. Tell us about the history of the company and its operations.

"It all started 35 years ago, in 1978, with one helicopter. Now, in 2022, the fleet has grown to 25 helicopters operating in 13 bases in Norway and four in Denmark. It was initially developed from a private initiative, with the first helicopter to become a private operator owned by a foundation and under a 10-year government contract.

Our services are characterised by high quality and experience, and the government, patients and foundation highly appreciate that. One of the keys to accomplishing that outcome is our experience in IFR operations, which is badly needed for bad weather conditions in Denmark and Norway. We

are one of the few rotorcraft operators with that distinguished capability."

How did EGNOS and LPV come to NLA's operations?

"When I started working at the company in 2002, we used to fly BO-105 helicopters without IFR capability. We saw the need for increased safety and to go for IFR-certified helicopters and pilots. When we had the tools and resources, we needed the procedures, and we proactively started its design. In 2006 we had the first PinS procedure down to LNAV minimums published at Stavanger Hospital. Today, we have more than 100 PinS procedures.

> "Our plans for the long term are to upgrade LNAV procedures and connect low-level routes, both RNP1 and RNP0.3, and transition to more effective routings for easier use"

Our first Satellite-Based Augmentation Systems (SBAS) procedure started as part of the PROUD SESAR project in 2015. That project aimed to evaluate the possibility of establishing a PinS procedure based on EGNOS in a hospital in Oslo. That represented an important step from LNAV procedures; our orography has mountains, deep fiords, etc., and LNAV minimums did not meet the requirements for our operations – sometimes, LPV is even 100 ft lower than LNAV minimums.

Then we started the EGNOS Working Agreement (EWA) signatory process. It was not easy because we, as rotorcraft operators, were pioneers in the signature of an EWA, which ANSPs commonly use. But in the end, the effort was worth it; it is a Safety of Life service, and we see the need for it."

Where does NLA operate? Which are NLA's bases and network? Is EGNOS available at those bases?

"We operate Point in Space procedures to our bases across Norway, of which more than half have LPV minimums – 60% to 65%. We even have an LPV procedure on the edges of the service area close to the Russian border in the northeast part of Norway, which was outside the initial service area. It works really well, and we have had no issues with availability and continuity.

In addition, we have ten operational procedures in Denmark, and they all have LPV minimums. We worked really hard on the certification and approval of these procedures.

Credits: Norsk Luftambulanse

Our plans for the long term are to upgrade LNAV procedures and connect low-level routes, both RNP1 and RNP0.3, and transition to more effective routings for easier use for the pilots. Keeping the crews' workload as low as possible is an overall goal for the whole operation."

Now tell us about the fleet. How many types of aircraft/rotorcrafts does NLA use? Are they EGNOS-capable?

"In 2002, we started replacing the older helicopters with IFR-certified helicopters with autopilot, which is essential for our operations; our pilots operate single pilot, accompanied by a technical crewmember that assists the pilot with the operation. Our first real IFR helicopter

Credits: Norsk Luftambulanse

was the EC135 and later the EC145. When we started the IFR era, we had three 135s and 145s; none were SBAS-capable. They worked very well in operation at the time; however, when SBAS became available, a retrofit was necessary, which was done with the support of the GSA PIONEERS project for the Danish operation. In 2018 we signed another contract in Norway, and we changed the whole fleet with the newer H135, H145 and AW139, which were all SBAS-certified and ready for EGNOS-based operations, such as PinS LPV and RNP0.3 routes and RF-legs."

Any pilots' feedback on EGNOS and LPV?

"This morning, I had a conversation with one of the pilots that work in Norway, and he asked me for the status of a new procedure that will be operational soon because he needed it in the operations. They are generally really happy with EGNOS-based PinS procedures; they want to fly safely when the weather is bad. They are impatient for new procedures, and we feel their satisfaction when they come back from a mission and they complete it because of the IFR capability. Everything is thanks to the procedures, and it is rewarding to see the final result of all the work behind it."

Finally, please feel free to share your thoughts about EGNOS and LPV.

"It all started with the EGNOS Working Agreement. Today we are at the finish line. We can receive the NOTAMs and get the SBAS channel, but it has been a long journey and it has taken a lot of time and energy. Since EGNOS for aviation is a Safety of Life (SoL) service, it is important to have the agreement and to maintain some bureaucracy; we need to trust the signal, and we really do.

Our job focuses on the benefit for the patients, which is different from commercial operators, who benefit from the passenger. The service we provide is included in the Norwegian tax system and is free of charge, but we want to have the quality and regularity the patient would have when flying an airliner; that is why we have IFR operations and are continuously improving."

Lars Amdal, helicopter pilot at NLA

Lars Amdal is a 54-year-old helicopter pilot with more than 30 years of experience and 8,000 flying hours. He has worked for the Norwegian Air Force, flying Bell 412 and Lynx helicopters for the coast guard. In addition, he has also been an airline pilot for eight years at SAS flying, Boeing 737. At NLA, he has flown their H135 and H145 since 2002. He is also a type rating instructor and examiner and has been deeply involved in PBN as a project manager since 2012. Finally, he is a great cross-country skier!

EGNOS Services highlights

NEW EDAS SDD V2.3 PUBLICATION

The new version of the Service Definition Document (SDD) for EGNOS Data Access Service (EDAS) has just been released!

Marking ten years since its service declaration in 2012, EDAS continues to be a key EGNOS service supporting ground-based access to EGNOS data. Through a collection of services that have been evolving and increasing during this decade of data provision, the information is accessible to registered users through the Internet and oriented towards different application domains.

Retransmission of DGPS corrections in the maritime sector based on EDAS (IALA beacons) or surveying and mapping activities in agriculture are part of the success stories accomplished during this time.

In this new release of the SDD, the document has been updated to reflect the latest changes, including Iceland becoming an EGNOS participant member. Additionally, the SDD captures the GSA transition to the European Union Agency for the Space Programme (EUSPA) after the adoption in 2021 of the Regulation establishing the new EU Space Programme. In addition, the document provides up-to-date EDAS performances, which, as observed, excel and exceed the commitments described in the SDD.

You can access this information in its online version or download the content in PDF format. Do not hesitate to contact our Helpdesk if you have any questions.

WE WANT TO HEAR FROM END USERS LIKE YOU: THE EGNOS SURVEY IS NOW OPEN

The EGNOS User Satisfaction Survey is now open! This is your chance to tell us what you think about the programme and share your thoughts on how we can make the service even better.

EUSPA's mission is to link space to user needs. But to do that, we need to hear from you. The EGNOS User Satisfaction Survey is your chance to tell us what you think about the programme and share your thoughts on how to improve the service even more.

"The survey collects a range of valuable information from users like you," says EUSPA Executive Director Rodrigo da Costa. "From your perception of and expectations for Galileo and EGNOS to suggestions for improvements, this is a unique opportunity to share your thoughts and ideas."

Addressing specific market segments

For the first time, the survey combines EGNOS and Galileo with harmonised structures for users who want to assess both services. While filling in the survey, you will be asked to select which European GNSS (EGNSS) system you are interested in by providing feedback. Here you may choose "EGNOS", "Galileo", or both.

It addresses a specific market segment, including aviation and drones, maritime and inland waterways, rail, road and automotive, agriculture – and more. Start by selecting the segment (or segments) most important to you or your company, then answer a few simple questions – that is all there is to it.

The survey also covers all EGNOS services, including the Open Service, Safety of Life Service and EGNOS Data Access Service (EDAS); it asks about the EGNOS service provider's (ESSP) management of user interfaces.

Ready to get started? You can take the User Satisfaction Survey here.

Make a BIG difference in a short time

Although the survey will only take a few minutes of your time, your input will make a big difference to the evolution of the EU Space Programme. We look forward to receiving your feedback, which we will use to improve EGNOS to better meet your evolving needs.

The survey results will be compiled into reports and made available to the public next year. The results of last year's survey can be found in the EGNOS User Satisfaction section of the EGNOS User Support Website here.

EGNOS DOCUMENTATION NOTIFICATION SUBSCRIPTION SERVICE

The EGNOS documentation subscription website feature will enable you to manage your subscriptions to official EGNOS documentation. Find it on the upper-right corner of the website, next to the Register/My Account button – check it out here!

Since 2018 you have been able to quickly select the EGNOS documentation of interest to you without registering on the website: just provide your e-mail address and select the EGNOS documents for which you want to modify your subscriptions.

Stay tuned for new documentation releases in your specific area of interest by subscribing to the following notifications:

Documents

- EGNOS Service Definition Documents describing the characteristics, terms and conditions of access to the corresponding EGNOS service offered to users. The SDD also contains updated information about the EGNOS system architecture and Signal-In-Space (SIS) characteristics, the achieved service performance, EGNOS interfaces with users, as well as information on the technical and organisational framework established at the European level for the provision of the service…
- Service implementation roadmaps providing the status and evolution of EGNOS Services.
- Service Notices to promptly notify important changes or relevant information related to EGNOS Services.

Reports

- Yearly Reports outlining the main performance of different EGNOS services and describing activities and achievements from the previous year.
- Monthly Performance Reports that every month, describe the performance achieved in the previous month.

Moreover, you can also be notified of new EGNOS bulletin releases. Take this opportunity to subscribe to the publications of interest to you!

AVIATION DASHBOARD

The Aviation Dashboard, available under the Aviation Portal section of the website, aims to display EGNOS-integrated information relevant to the Aviation community, although all users can access it.

This dashboard, designed in coordination with European Air Navigation Service Providers (ANSPs), shows, on a single page, the status of the EGNOS operational GEO satellites, information about planned and active EGNOS outages, service degradations and real-time performance on airports with published EGNOS-based procedures. In addition, it provides easy access to documentation relevant to the EGNOS aviation community.

If your organisation is implementing or planning to implement EGNOS-based procedures and does not yet have an EGNOS Working Agreement signed with ESSP, please contact egnos-working-agreement@essp-sas.eu, and we will be pleased to assist you with this process.

For additional questions related to EGNOS or its services, please contact egnos-helpdesk@essp-sas.eu or dial +34 911 236 555 (H24/7).

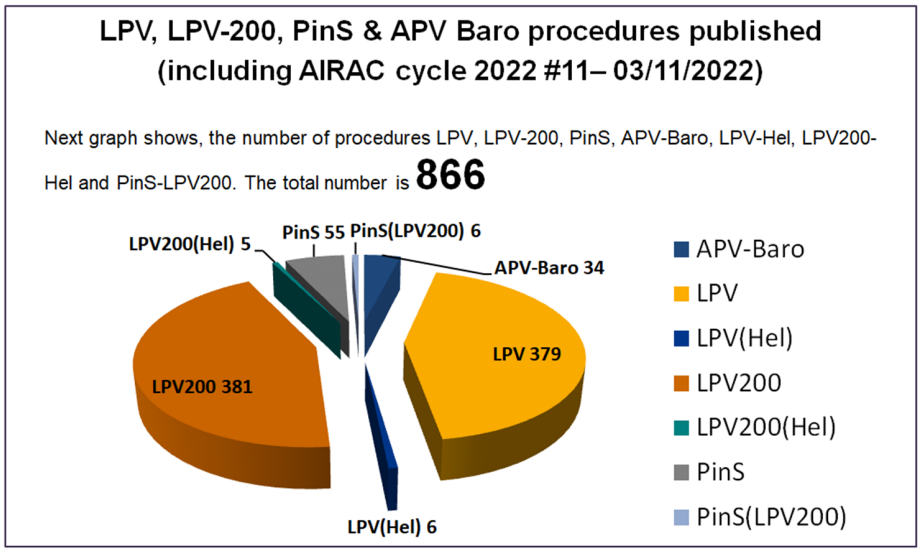
What's new?
Since the last bulletin...

EGNOS WORKING AGREEMENTS SIGNED (EWA)

The following EWAs have been signed in the last quarter:

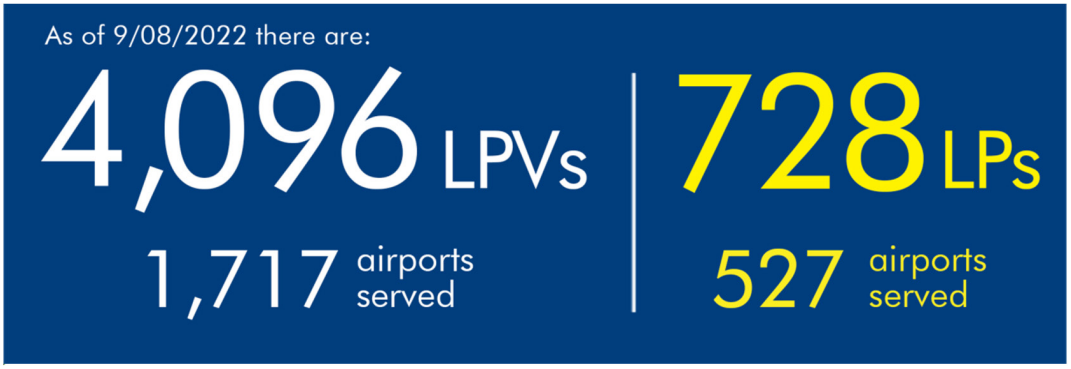
SPASU (Swedish Police Air Support Unit) **Sweden**

LPV, LPV-200, PINS & APV BARO PROCEDURES PUBLISHED (INCLUDING AIRAC CYCLE 2022 #11 - 03/11/2022)



FAA PROCEDURES

Courtesy of the FAA WAAS Team.



SBAS in the world

EGNOS FOR AFRICA

In June of this year, the European Space Agency (ESA) and the Agency for Aerial Navigation Safety in Africa and Madagascar (ASECNA) agreed to a technical support agreement to support their new SBAS based on Europe's European Geostationary Navigation Overlay Service (EGNOS) technology. The initial operational capabilities of the system are anticipated to start being used in 2025. The agreement was signed at ESA's offices in Paris, with Louis Bakienon, Director of the ASECNA SBAS Programme, and Josef Aschbacher, ESA Director-General, doing the signing.

This step reinforces the ASECNA international agreement signed with the European Union in 2018 on satellite navigation and access to EGNOS technology. ESA will deploy a team of around ten experts, providing technical support focused on ground infrastructure for the SBAS. At the same time, the French space agency, the National Centre for Space Studies (CNES), will advise on the engineering of the demonstrator, the space segment, and performance.

The introduction of satellite-based augmentation infrastructure will improve navigation operations for all phases of flight, from en route down to precision approaches, and surveillance operations as well, as it will provide a source of position for terminal and surface surveillance.

KASS SATELLITE IN SOUTH KOREA

South Korea successfully launched the first satellite for the Korea Augmentation Satellite System (KASS). The satellite was properly launched on Thursday, 21 June, from Guiana Space Centre in Kourou in French Guiana. The KASS system will improve the accuracy and reliability of the Global Positioning System (GPS) signals and better ensure flight safety. The system will improve GPS positioning error to 1.0 to 1.6 metres from the current 15-22 metre level in real-time. The government plans to begin a pilot service before its full-fledged operation next year.

Did you know...?

On 8 September 2022, the first RNP Instrument Approach Chart with LPV minimums was published in India. It is enabled by GAGAN, the Indian SBAS, and is available in the AIP for Kishangarh airport (ICAO code VIKG) on runways 05 and 23.

What's going on...

in aviation.

EGNOS FOR A GREENER AVIATION

With the presentation of the third and final webinar, "EGNOS for a greener aviation," on 24 November, ESSP will conclude this year's series of webinars. The webinar will centre on how EGNOS can support European aviation in becoming more environmentally sustainable by cutting down on fuel usage and greenhouse gas emissions. Don't miss it! Register here.

ERA GENERAL ASSEMBLY 2022

Over 300 delegates from European regional aviation leaders and key industry figures gathered in Vilamoura, Portugal, over the three days (11–13 October 2022) of the ERA General Assembly. The event is the main European congress on regional aviation and is a great opportunity to increase awareness of the benefits of EGNOS for civil aviation.

Attendees at the ERA Operations Group meeting, taking place in parallel to the event, were briefed by ESSP and EUSPA on the status of the current European satellite navigation programmes and the role of EGNOS in the PBN Implementing Rule in a combined session with authorities (EASA) and industry (Collins Aerospace). It was a great opportunity to make regional operators aware of their need for EGNOS and LPV in a future full PBN environment where LPV is the main enabler of CAT-I operations.

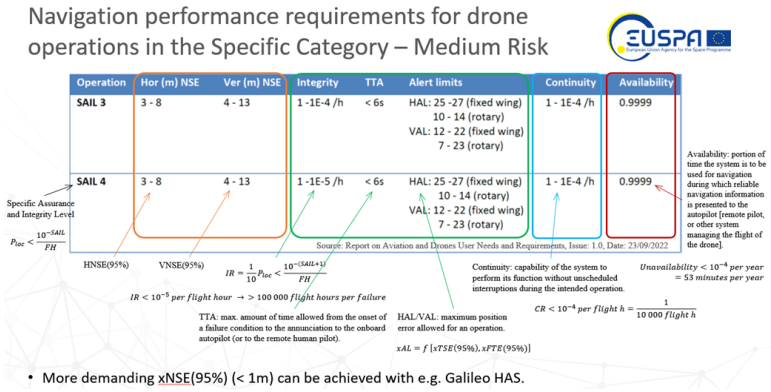
in aviation.

MRO EUROPE

MRO Europe took place this year from 18 to 20 October at ExCeL (Exhibition Centre London) London. MRO Europe is the premier event in the region for the commercial air transport maintenance, repair, and overhaul industry. MRO Europe provided a world-class venue for all the participants involved in the MRO sector. We exchanged ideas and best practices, shared experiences, debated issues and challenges, and gathered new knowledge.

ESSP attended the two-day exhibitor panel and contacted all the different stakeholders to review and exchange views on the status of EGNOS implementation within the industry and explore the new solutions available in the market.

USER CONSULTATION PLATFORM (UCP) – AVIATION & DRONES



Source: EUSPA presentation at the UCP. Here.

The UCP session for aviation and drones took part on 3 October in Prague as part of the European Space Week and gathered a generous number of representatives from both sectors to pool ideas, concerns and lessons learned for a general evaluation. As usual, it was organised to give users the leading voice, so several companies were invited to share their experience using E-GNSS and gather ideal requirements for future systems developments.

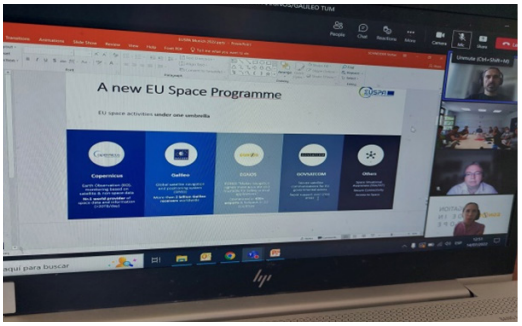
In drones, EGNOS was mentioned as a reliable positioning source that could meet future potential requirements for drones in a specific category with medium or high risk. The need to develop a specific service for drones was brought to the table, and representatives discussed these requirements. Two separate proposals were created for rotorcraft and fixed-wing, and they were shared during the following European Space Week.

In aviation, the status and future of Dual Frequency Multi Constellation (DFMC) were mentioned, as it was noted that it would be developed as soon as possible. Then Airbus provided an update on the status of their LPV solutions for their aircraft models and informed attendees that more solutions are to come very soon. Helicopter procedures were also mentioned, particularly in Italy, where a number of them are being developed, and there are plans to publish some EGNOS-based PinS procedures soon.

in agriculture.

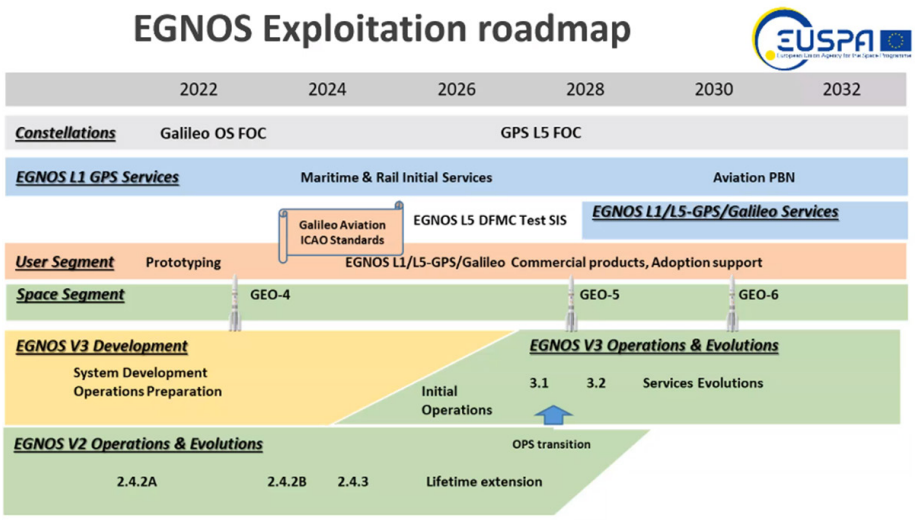
EGNSS LECTURE FOR TECHNICAL UNIVERSITY OF MUNICH

On 14 July, there was a lecture about European Space Programmes at the School of Life Sciences at the Technical University of Munich.
This event brought together EUSPA, ESSP and GSC representatives, who gave information about the EUSPA mission, EGNOS and Galileo services. The session took place virtually and concluded with a section for questions and answers to resolve the doubts of students from the course "positioning and navigation for off-road vehicles".



in maritime.

UCP - MARITIME & FISHERIES

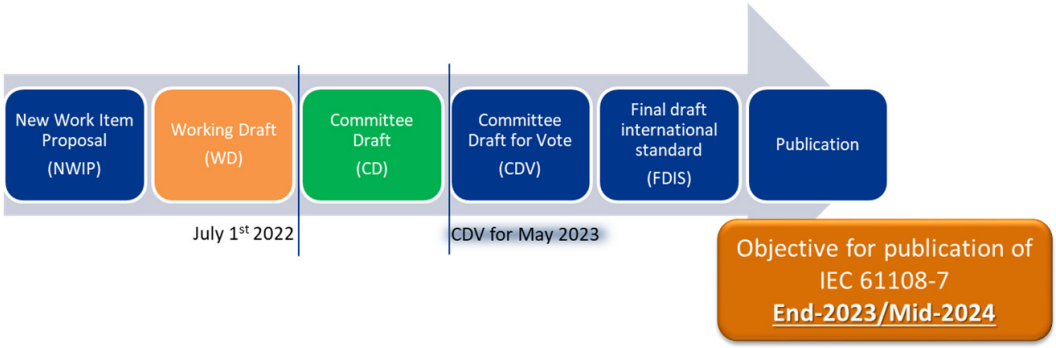


The UCP for maritime, fisheries and aquaculture took place on 3 October in Prague, as part of European Space Week, including two options for attending – on-site or remote.
Regarding the content, the sessions were grouped by application field, presenting dedicated case studies and summarising and gathering the user requirements for E-GNSS (EGNOS and Galileo) for Maritime Autonomous Surface Ships (MASS) and ship route optimisation; Pilotage Operations; Inland Waterways Navigation; Fisheries; Search and Rescue; Aquaculture (site selection, water quality parameters); Ocean Monitoring and offshore applications.

The Earth Observation requirements and related case studies were also present in the sessions, including a dedicated session on the Copernicus Marine Service.
Specifically for EGNOS, besides several potential application fields related to the positioning of individual marine devices, one of the main highlights was the provision of the update for the EGNOS maritime service, including the current roadmap for the release of EGNOS V3.
The conclusions of the UCP, including maritime and fisheries, were provided in a specific session on 4 October.

in maritime.

PRESENTATION AT CIRM ANNUAL CONFERENCE



Between 17 and 21 October 2022, the last CIRM annual conference took place in Malta. CIRM is the principal international association for companies engaged in maritime electronics, with a current membership of over 100 companies from 30 nations worldwide. CIRM exists to promote the application of electronic technology to SoL at sea and the efficient conduct of vessels, facilitating productive relationships between all stakeholders involved in electronic aids to marine navigation, communications and information systems.

For all these reasons, the participation of ESSP in the CIRM annual conference was considered important to present the status of the standard for SBAS L1 maritime receivers. This new standard, IEC 61108-7, is being developed in IEC TC80 with ESSP as lead through the working group PT61108-7, and it is expected to be published between the end of 2023 and mid-2024.

Some participants showed interest in the standard development. Also, in general, the new standard was well received among CIRM participants since IEC 61108-7 will ensure the safe use of SBAS L1 by all shipborne receivers worldwide compliant with the IMO Res A.1046(27) requirements for ocean and coastal waters and harbour entrances/approaches.

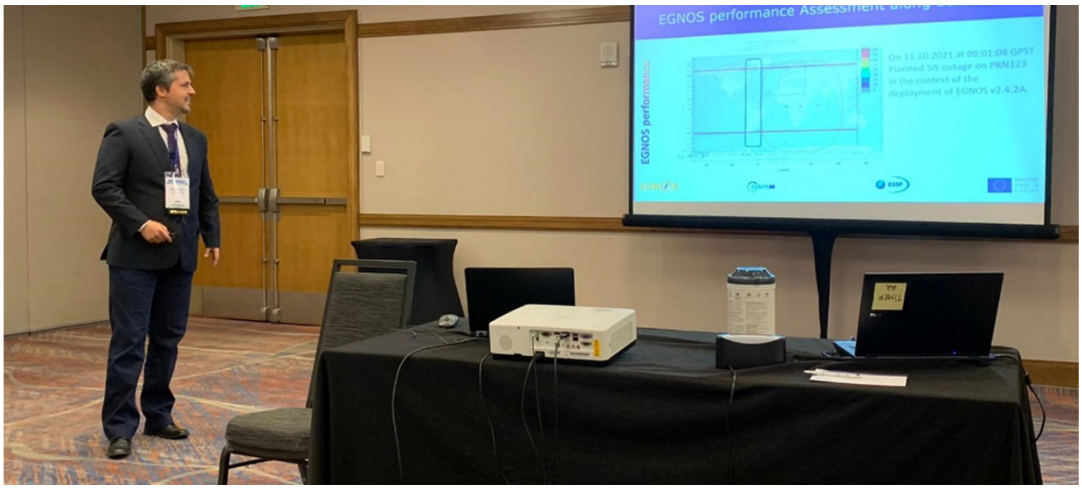
SMM HAMBURG

Last September, the 30th SMM 2022 took place in Hamburg (Germany). This leading international maritime trade fair, which occurred between 5 and 9 September, brought together 2,000 exhibitors from all technologies in the maritime industry and 30,000 visitors. Such a remarkable attendance should be considered a great success after a long period marked by pandemic restrictions.

The stands and the content of the conferences revolved around the highly relevant topic of "maritime transition."

During those five days, the exhibitors provided innovative and technological solutions to relevant aspects such as vessel emissions, digitalisation, safety communications, and the integration of vessel electronics where the positioning and navigation equipment, and therefore EGNOS, plays a key role. The conferences highlighted the relevant topics for the future of maritime navigation, such as alternative energy sources, maritime security, climate change's impact, etc. Lastly, the event itself facilitated the dialogue between the different stakeholders involved in those topics.

EGNOS PAPER PRESENTATION AT ION GNSS+ 2022



ION GNSS+ is the world's largest technical meeting and showcase of GNSS technology, products and services, and it took place between 20 and 23 September 2022 in Denver, Colorado.

This conference was split into several technical sessions during that week. ESSP participated as a presenter in the Commercial and Policy Sessions, particularly in the "Marine Applications and Search and Rescue" slot, with a paper titled EGNOS Performance Along the Baltic Sea with a

in maritime.

Maritime Receiver During 3 Months. This article analysed EGNOS performance in high latitudes along the Baltic Sea for three months in a real maritime environment with a commercial maritime SBAS-capable receiver. It aimed at demonstrating the benefits of EGNOS for maritime navigation, showing that the EGNOS L1 service can support ocean waters, coastal waters and harbour entrances/approaches in the Baltic Sea, being compliant with the operational requirements defined in the IMO Res. A.1046 (27).

The GNSS community received this technical presentation well, and several questions related to the execution of the data campaign and equipment used were asked. In addition, ESSP had the opportunity to discuss with key stakeholders in the GNSS market and maritime community to support the planned EGNOS L1 maritime service and the draft IEC 61108-7 standard for SBAS L1 shipborne receivers.

METSTRADE 2022

The METSTRADE show is the world's largest trade exhibition of equipment, materials and systems for the international marine leisure industry.

It took place from 15 to 17 November at the RAI Amsterdam. EGNOS was, once again, present at the event through a stand dedicated to the European GNSS.

This setup facilitated interaction with several visitors and other exhibitors involved in ship electronics and navigation equipment.

The event was structured to include three dedicated specialist areas (superyacht, marina and shipyard, and construction material) on top of the traditional core themes within the leisure industry.

As a result, the event was a great success in the number of attendees and the variety of fields covered.

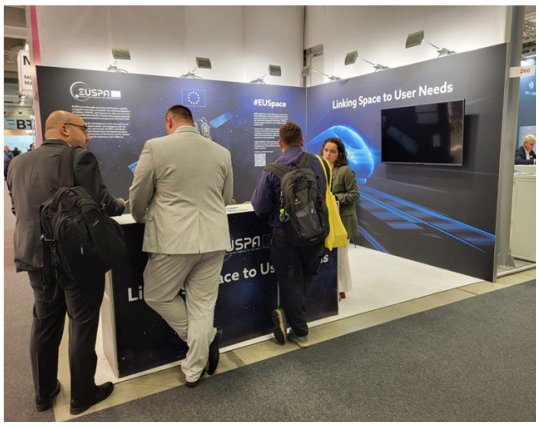
Did you know...?

The marine environment is becoming increasingly relevant in climate change discussions and the global economy, defined within the so-called Blue Economy markets. In this context, the European Space Programme (Copernicus, EGNOS, and Galileo) is a relevant actor that supports marine data at different levels.

Several webinars and informative communications on marine data and policies are periodically provided by the experts in the matter. More information can be found at: https://marine.copernicus.eu/events/marine-data-policies

in rail.

INNOTRANS



On 20-23 September, ESSP attended the Innotrans fair, an event that takes place every two years in Berlin, Germany. Innotrans was subdivided into five trade fair segments: Railway Technology, Railway Infrastructure, Public Transport, Interiors and Tunnel Construction.
EGNOS was present at stand number 260 in Hall A, City Cube. As the EGNOS Service Provider, ESSP provided information to the attendees that came to visit the stand and also visited several stands promoting and encouraging the use of EGNOS in the rail domain.
It was a great opportunity to contact people again. See you in two years!

in GNSS.

EGNOS IN EUROPEAN MOBILITY WEEK

In the framework of European Mobility Week, the EGNOS Service Provider published a mobility action to foster the use of EGNOS in smart mobility solutions.
The objective of European Mobility Week is to encourage behavioural changes in favour of active mobility, public transport and other clean, intelligent transport solutions.
EGNOS contributes to sustainable urban mobility, making positioning more accurate, available and reliable.

Credits: European Commission

in GNSS

EUROPEAN SPACE WEEK: EGNOS WORKSHOP

During European Space Week, which took place in Prague from 3 to 6 October, a session was held about EGNOS, organised by the EU Agency for the Space Programme (EUSPA) and the EGNOS Service Provider (ESSP). It was an opportunity to learn about the current status of the programme. This live-streamed event kicked off with a welcome speech and introduction. Next, insights on the programme status and market and service strategies were provided. The EGNOS implementation status was followed by some use cases to showcase EGNOS benefits in different market segments.

The workshop concluded with the EGNOS awards, which recognised those organisations committed to EGNOS. More details here.

Upcoming Events

RAIL LIVE!

29 Nov - 1 Dec

European GNSS will be present at Rail Live! the trade fair that takes place in Malaga from 29 November to 1 December. Rail Live brings together high-level industry leaders who drive innovation, investment and digital transformation in the global rail sector. Rail Live represents the entire rail industry, from Infrastructure Managers to High-Speed Projects, Metro systems to Freight Carriers.

RAILLIVE!

AEROSPACE TECHWEEK

20 - 30 March

Aerospace Tech Week is one of the world's leading events for aerospace companies and airlines to gather, discuss and develop the systems and solutions needed for the evolving requirements of the commercial aviation and defence industries. The show brings you the latest technology developments in aircraft connectivity (air-to-ground and nose-to-tail), IoT, big data, airline e-enablement, flight operations software, fuel efficiency, weather data, MRO software, digital transformation, AI, M2M, regulatory, policy, technical SES and next-generation challenges for avionics, plus the testing systems that are used in the design, construction and maintenance of all commercial and military aircraft. The event will revert to its traditional spring slot in Munich from 29 to 30 March 2023.

AEROSPACE TechWeek.com GLOBAL
29th-30th March 2023 | Munich, GERMANY

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

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