EGNOS BULLETIN

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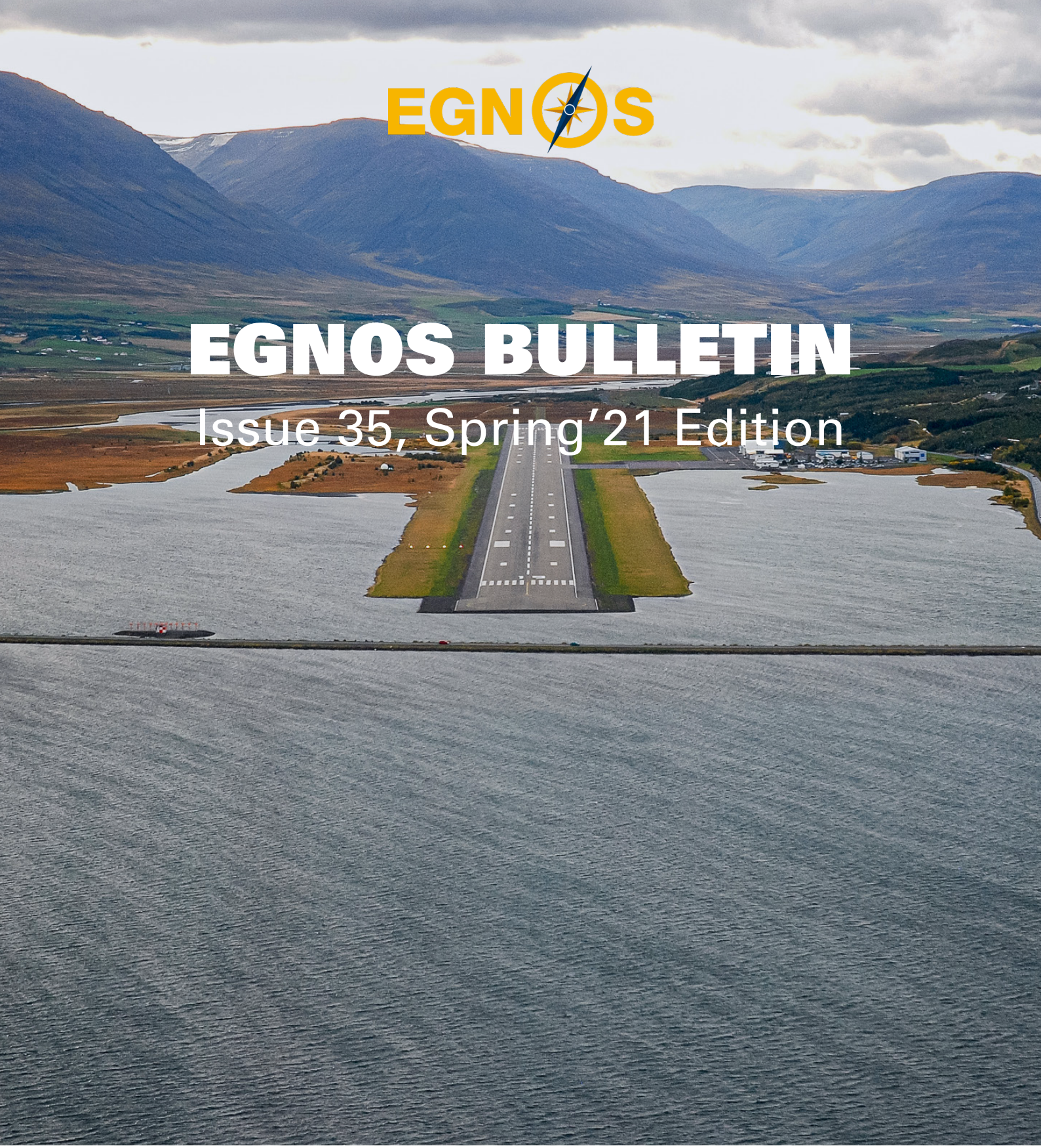

Credits: ISAVIA ANS / RWY19 at Akureyri airport

European
Global Navigation
Satellite Systems
Agency

NAVIGATION
MADE IN
EUROPE

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

ESSP

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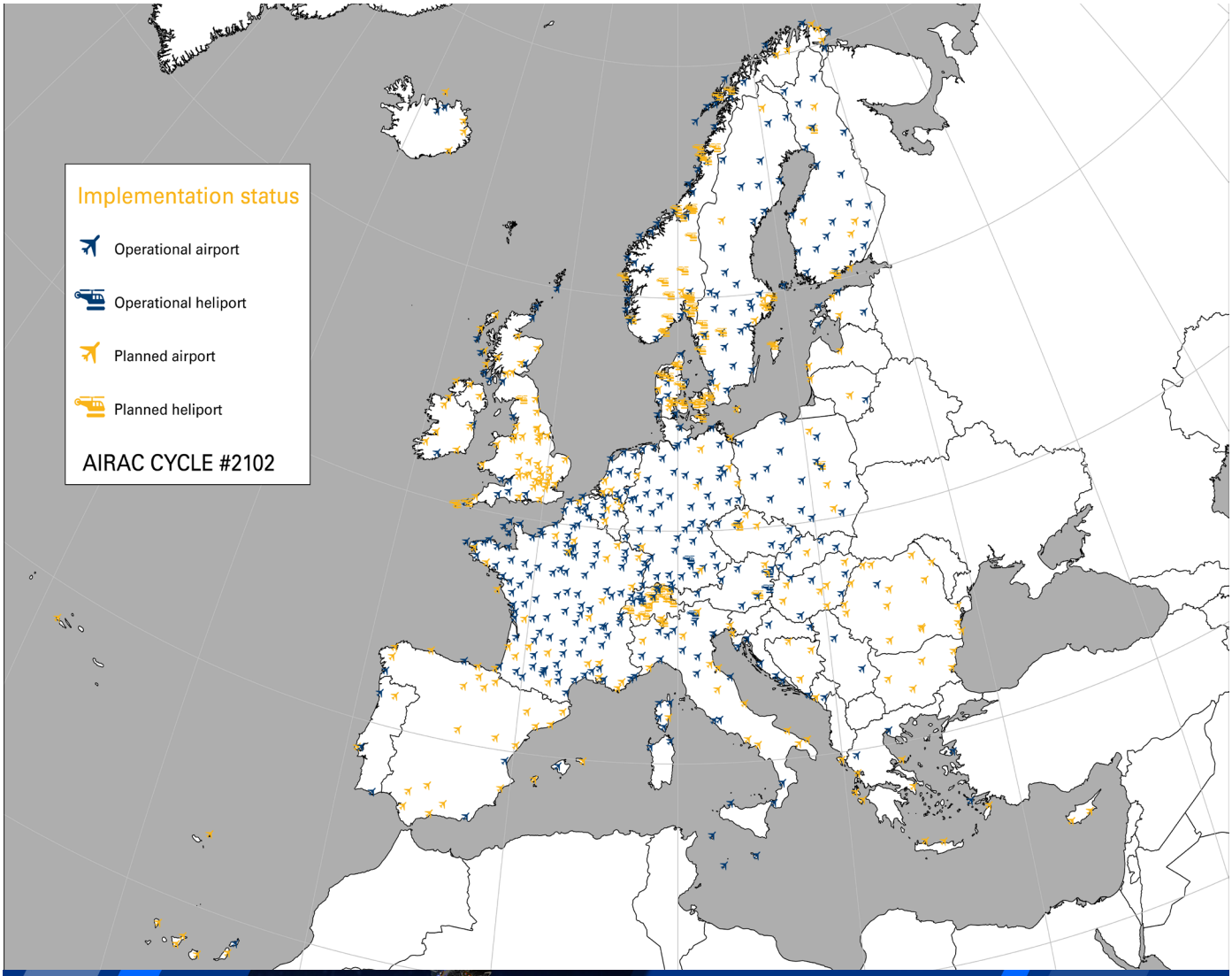
EGNOS implementation



EGNOS Success Stories

JETFLY

Jetfly Aviation S.A. is a business aviation company founded in 1999 and based in Luxembourg. The group consists of several subsidiaries (in Luxembourg, UK, Germany, Finland, Switzerland and Tunisia) covering all scopes of business aviation operations (fractional, management, charter, maintenance, training and operational support). The company operates the largest Pilatus fleet of PC-12 and PC-24 worldwide (50 aircraft) on behalf of 300 co-owners. The company employs a staff of 300 in Europe.

Credits: Jetfly / Mr. Fabien Rousset, Director of Flight Ops & Chief Pilot at Jetfly

Mr Fabien Rousset, Jetfly's Director of Flight Operations & Chief Pilot, shared some insights on Jetfly's operations and their experience with EGNOS and LPV. They have recently received their 8th PC-24, a new generation of business jets able to operate on unpaved runways and equipped with the latest avionics, including EGNOS and LPV capabilities, as standard from the manufacturing line. Jetfly fleet also includes 40 PC-12, one of the most popular single-engine turboprops on the market, capable of flying at high altitudes and land at large international airports, while at the same time servicing smaller airfields, a critical feature for business aviation (BA). The entire Jetfly fleet features EGNOS and LPV capabilities, the majority equipped by default from the manufacturing line, although they also upgraded five aircraft. Mr Rousset explained that "Business aviation needs to go where the client demands, being large airports or small airfields. LPV is a critical asset for BA because reaching the destination no matter the weather conditions is a must and, especially in winter, LPV helps to reach smaller airfields with precision and safety".

When setting fleet specifications, these aircrafts must meet complex criteria, including customer demands to land as close as possible to the intended destination, often at (very) small airports with short runways; the closer to the city centre, the better. A key element for BA is to save time, and this is where the new PC-24 jet perfectly complements their PC-12, "flying faster and further".

Jetfly indicated they reach 3,000 aerodromes in Europe, two times more than with a "conventional jet", even reaching Russia and Africa. Mr Rousset added that "We have noticed an increase in the number of airports and

> "LPV is a critical asset for BA because reaching the destination no matter the weather conditions is a must and, especially in winter, LPV helps to reach smaller airfields with precision and safety"

runways with LPV procedures, now widespread, as we have a large number of destinations with LPV and LPV CAT-I. The main advantage is being able to provide more availability of IFR approaches at smaller aerodromes, ensuring we can land even in tough visual conditions. LPV is a huge improvement over older non-precision approaches (NDB, VOR…)".

> "When you are about to take-off, with your aircraft right in the centre of the runway, and you look at your SVS (Synthetic Visual System) display in the cockpit, showing precisely that, you marvel at the awesome precision EGNOS offers you and your passengers"

The availability of EGNOS and LPV equipage options in BA is one of the greatest, if not the greatest, in all market segments. Mr Rousset stated that "In business aviation, you don't have a choice but to implement EGNOS and LPV capabilities. Clients know a great deal, and they demand the best of the best. When a client asks about the reason for not landing closer to their destination, if it is because you don't have LPV, you have a problem".

But, according to Mr Rousset, there are more benefits. "Aside from availability, reliability is paramount. We have rarely had a failure with LPV approaches, except for some instances, due to jamming or spoofing. When operating with ILS, systems sometimes need maintenance, including an out-of-service period of up to two months to be fully restored. LPV is always out there".

Airworthiness is decisive for implementing EGNOS & LPV in all operators, having been improved and eased significantly a number of years ago. "We did not have many issues with this, and now it is almost as standard as certificates. Flight manuals come from the manufacturer, but pilots' training is important: every 6 months, we train in the simulator, performing several LPV approaches,

Credits: Jetfly

Credits: Jetfly

and this is always part of the proficiency checks", said Mr Rousset.

EGNOS also simplifies flight planning by reducing the need to perform pre-flight RAIM checks over the intended route, streamlining the process involved in the typical 4 to 6 legs a day performed by Jetfly's pilots.

When asked about COVID's impact on aviation, Mr Rousset shared that "In April 2020, we had zero activity due to COVID, but this has changed. I think BA is less affected than other operations, although it changes continuously due to the decisions on lockdowns and flight restrictions made by the different states. In February 2021, we are at 50 to 60%, but every week we see changes. We have noticed very few leisure travels. But our business clients find fewer options with the main airlines, and they still need to fly to complete their activities, such as visiting a factory, meeting investors, etc. Business Aviation provides a solution. Our expectation for this summer of 2021 is better, depending on vaccination campaigns. We are working on having the pilots fully ready for the summer. Let's hope for the best".

Jetfly's Chief sees the EGNOS contribution to air navigation as quite important, especially LPV CAT-I, which is the future: "For sure, we sometimes forgot about the people that had been working on EGNOS' project for so long. Getting the service now is normal, but in our experience at Jetfly, we feel grateful for the work done. On the other hand, when airports see the economic benefit of choosing LPV over ILS, they will switch from conventional to GNSS-EGNOS based. Pilots immediately see the benefits, especially in business jets, which are always 10-15 years ahead of airliners in terms of technology. When you are about to take-off, with your aircraft right in the centre of the runway, and you look at your SVS (Synthetic Visual System) display in the cockpit, showing precisely that, you marvel at the awesome precision EGNOS offers you and your passengers. I take the opportunity to thanks the industry, the GSA, and the European Commission for providing EGNOS on a free basis".

KEMPEN AIRPORT

Kempen airport (ICAO code EHBD), also known as Budel after the nearby town, is a general aviation airport in the south-east of the Netherlands located near the border with Belgium. So close that, in fact, its own air traffic services –ATS- coordinates with the ATS services from Kleine-Brogel airport in Belgium in addition to the NLRAF military unit responsible for nearby airspace.

Credits: Kempen airport

The story of Kempen Airport began in 1970 with a grass runway. Over time, it transformed itself by adding an asphalt runway and becoming IFR certified. Kempen was an early adopter of satellite-based navigation, implementing one of the first GNSS approach in the Netherlands in 2011, together with GPS-based arrival and departure procedures.

Mr Noud Fransen, Kempen Airport's Financial Director, FISO (Flight Information Service Officers), and pilot instructor and examiner, was contacted to discuss its newest milestone: implementing a brand-new RNP approach down to LPV200 minima, taking full advantage of EGNOS. When asked about the singular aspects of Kempen and how it had managed to grow while being privately owned and surrounded by other airports in the region, Mr Fransen explained that decisions were made on a long-term basis, step by step, but always focusing on customers' needs. "Our philosophy was to develop international traffic and to open the region to business aviation. This type of aviation needs less opening-hour restrictions and must be affected by weather. Therefore, after investing in asphalt runways and taxiways, all features for IFR operations were accounted for. Runway RWY and approach lights were installed, and the implementation of IFR operations was requested to the Dutch aviation authorities. We were the first small airport in the Netherlands to make this request".

The results are remarkable: "With 90 home-based aircraft, around 60,000 movements a year and 170 per day, it is amongst the largest general aviation airports in the Netherlands, and a certified international airport that is used extensively by business aircraft (BA). Almost 80% of all aircraft movements are business, training and maintenance flights". Around 63% are training flights, and international business flights account for nearly 4,000 flights per year, in addition to private aviation, survey and government flights.

From the airport's management perspective, adding IFRs and ATS at Kempen, Mr. Fransen shared that "It took 12 years from the initial idea until the final permission to start. All procedures were designed, published, and 5 FISOs were trained. At this time, we made contact at Stans, Switzerland, with the first GNSS procedures in Europe. Our pilots trained others to allow the use of the GNSS approach at Kempen Airport. At that time, there were no others. We were the first!".

In Mr Fransen words, "the key to adopting GNSS at Kempen, and EGNOS afterwards is the simple and logical answer. The investment in ground aids, and their maintenance, is tremendous. The technical achievements of the last 20 years regarding aeronautical navigation equipment are enormous. The accuracy is beyond all expectations. My brother and I are both ATPL pilots trained the old-fashioned way, where you always had to make a mental 3D picture to fly IFR. Nowadays, one glance at your digital screens will reveal all you need (and even more)".

Credits: Kempen airport

Kempen was not alone in the process "With the help from several enthusiastic PANS-OPS developers, and the enormous support from Dutch authorities ILENT and LNVL, we were able to publish the change from GNSS to the LPV approach in the shortest possible time. The possibilities for our operations are eminent. Aircraft and helicopters have more accurate guidance and can use lower minimas. We improved from 540 feet to 210 feet".

But there were also some restrictions: "Although regulations in uncontrolled airspace are in place (EASA SERA) for IFR, and the safety assessment was supportive, currently, only IFR operations outside the daylight period are allowed at Kempen (early morning, late afternoon and night) due to some air traffic control limitations from the collateral unit".

Mr Fransen was asked about the type of traffic benefitting the most from the new EGNOS' LPV procedure and whether new users were expected at Kempen, thanks to EGNOS. Mr Franser replied that "Our core business at the airport is business aviation, training and aircraft maintenance. Aircraft come to our facility from all over Europe for specialised maintenance, Daher TBM series and PC12 series, and the avionics shop to rebuild cockpits. Most BA turboprops, jets, helicopters and even smaller GA aviation operating at Kempen are equipped to use EGNOS and, therefore, our new LPV procedure. So, currently, the predominant use of LPV is BA and training. Charter is growing, but the bottleneck is as long as the runway".

A particular area where the EGNOS LPV procedure at Kempen is relevant is flight training: "We can train pilots to the latest standards. Initial IFR training, in particular LPV, is done on Garmin equipped Cessna 172's, which are LPV capable. Home-based business aircraft are all LPV equipped. Even most home-based modern private planes are. The market with LPV equipped aircraft is growing".

Mr Fransen explained his view on the main benefits of EGNOS LPV "It is mainly the greater precision and the lower minima, which are better for the pilot and FISO's feeling of comfort. If you have good positioning, then it is also good for the guys on the ground. LPV procedures are the most modern approach type, excelling in terms of safety and allowing airports to continue developing them on a tight budget".

> "It is mainly the greater precision and the lower minima, which are better for the pilot"

Concerning the barriers preventing a wider EGNOS' adoption by general aviation aerodromes, Mr Fransen said that "Improvement and modernisation are inevitable. It is just a matter of time that the roll-out of additional use of EGNOS' possibilities and procedures occurs".

As a final closing, ESSP asked Mr Fransen to share his thoughts on EGNOS' contribution to air navigation: "We are grateful to use EGNOS for our business development. We are a small successful family business writing black numbers even in these dark and difficult COVID times. Therefore, we expect that international flights will revive quickly after uplifting international travel restrictions. With the technical possibilities of EGNOS and LPV and our enthusiastic team of employees, we look forward to the future. Even the daylight use of the LPV approach will succeed due to a proven 100% safety record and an endless effort of many believers that this technology is the future".

> "We are grateful to use EGNOS for our business development"

THE HYDROGRAPHIC SERVICE OF THE MARITIME ADMINISTRATION OF LATVIA

Credits: Hydrographic Service of the Maritime Administration of Latvia

The Latvian Hydrographic Service, established in 1994 as a non-profit organization, is part of the Maritime Administration of Latvia. This Maritime Administration, supervised by the Ministry of Transport, performs functions in accordance with the Maritime Administration and Maritime Safety Law and is also composed of the Latvian Ship Register, the Latvian Seamen's Registry, and the Maritime Safety Department.

> "EGNOS has been used since 2010 in chart production, surveys before and after dredging works, and for safe navigation purposes"

EGNOS has been used since 2010 in chart production, surveys before and after dredging works, and for safe navigation purposes. Aigars Gailis, Head of the Hydrographic Service, explains that they collect "multibeam data, single beam data, side scan data and sound velocity data" during the surveys performed throughout "the whole year, depending on weather conditions (ice, low temperatures, strong winds, waves)". The equipment used is TRIMBLE, Hemisphere Vector™ V102 GPS compass, which is EGNOS-enabled.

Surveys can be performed from very shallow waters (around 0.8m) near the shoreline to up to 50 NM from the nearest coast, particularly in the Baltic sea and the Gulf of Riga (port and fairway surveys). Mr Gailis refers to the use his organization has given EGNOS, clarifying that "Outside the RTK availability zone, our survey system automatically turns to SBAS, which is EGNOS, to continue working with less provided accuracy. But still, that fits the IHO S-44 standards, as well as our company's internal survey methodology". Out of the RTK range (typically 30-50 Km from the ground base/reference station), they can benefit from the accuracy provided by EGNOS because it satisfies their requirements in offshore areas at no cost at all.

They consider the EGNOS User Support website useful to check what is new and review the performances provided by EGNOS.

EGNOS ENABLED PPUS IN THE PORT OF SEVILLE

Credits: Prácticos de Sevilla

Located on the lower reaches of the Guadalquivir River, in Seville, this commercial river port is the only one in Spain with these characteristics. With an access channel of over 80 kilometres and a modern lock, the port allows the entrance of big merchant vessels and cruises. So far, 200-metre-long passenger ships and 190-metre-long bulk carriers have been the largest vessels permitted. The river's maximum draught is 7.20 meters and, in terms of accuracy, the most demanding manoeuvres are those carried out to cross the so-called Puente de las Delicias, 42 meters wide, and the lock, 40 meters wide. The limited width and the authorised draught of the access channel, together with bigger vessels requiring entrance to the port, makes the work of pilots even more necessary. Pilots in the Port of Seville are very aware of the benefits new technologies can bring to their pilotage operations. That is the reason they started using Portable Pilot Units (PPUs) three years ago when big vessels required access to this inland port. Nowadays, they use PPUs in other situations as well. For instance, when facing bad weather conditions or to support anchoring manoeuvres at night.

PPUs must be understood as tools carried onboard vessels by pilots to support the decision-making process when navigating in confined waters. PPUs can be considered a more advanced version of vessels' ECDIS, which provide pilots updated and high-density navigation charts, traffic management and ship-handling tools.

In the Port of Seville, pilots use a unit from AD Navigation that can be configured in different functional modes and can use various corrections sources over GPS. Carlos de Bricio, the pilot responsible for new technologies at this port, is in favour of using EGNOS corrections, considered of great benefit in specific situations, such as the entrance and navigation through the lock or in docking and turning manoeuvres. When configured to apply EGNOS corrections, their PPU achieves an accuracy of 50 centimetres, which is very useful since ships are getting larger, increasing the difficulty of manoeuvring and highlighting the need for accurate position information.

The use of EGNOS is in line with the IMPA Guidelines recommendations on the design and use of Portable Pilot Units. These guidelines recommend differential corrected positioning devices, either by GBAS or SBAS, as a minimum to provide enhanced accuracy in the positioning.

Credits: Prácticos de Sevilla

EUROPE´S PROTECTED AREAS BENEFITTING FROM EGNOS

Credits: Alt Pirineu Natural Park

According to Europarc, the representative body of Europe's Protected Areas, EGNOS can support these sites by providing more accurate positioning data in typical GPS field operations related to the conservation of their ecosystems and the management of their infrastructures.

> "Having the highest peaks of the Pyrenees in Catalonia was not an obstacle for the introduction of the EGNOS technology in their activities. This service provides them with the accuracy they need at no additional cost"

One of these examples is the Alt Pirineu Natural Park that is now benefitting from EGNOS. This park was created in 2003 by the Government of Catalonia. It is the largest natural park in Catalonia, Spain, covering an eighty thousand hectares area, located between the Pallars Sobirà and l'Alt Urgell regions. The park has a twofold objective: in the first place, to protect the extraordinary natural and monumental heritage of the area and preserve the values of an ancestral modus vivendi; in the second place, to contribute to the creation of a management regime aimed at achieving sustainable development in the entire natural area.

National Heritage technicians Olga Nicolas and Elisenda Montserrat use EGNOS for fauna and flora studies and other forestry works. They have been using EGNOS for several months to increase positioning precision during their field works. As confirmed by Ms. Nicolas, EGNOS' service activation was very easy for them: "Our Garmin GPS automatically configures EGNOS, and its use is very simple".

Having the highest peaks of the Pyrenees in Catalonia was not an obstacle for the introduction of the EGNOS technology in their activities. This service provides them with the accuracy they need at no additional cost "in the location of points, fields and transects. Ms Montserrat, who is aware of the EGNOS User Support Website and the guidance material provided to EGNOS' users, clarifies it is an efficient tool".

In the future, they plan to continue working with EGNOS and will investigate the work with other complementary technologies, such as Lidar, in field surveys.

CENTRAL PIVOT IRRIGATION SUPPORTED BY EGNOS

Credits: Trigger systems

Trigger Systems is a Portuguese start-up founded in 2017. They design the software and manufacture the hardware to automate weather-based precision predictive irrigation. One of its uniqueness is the virtual sensor probe, relieving costs with infrastructure while improving accuracy and feedback to its intelligent controller. The technology can save farmers and managers of green spaces a minimum of 20% of water, plus related operating costs, such as energy and labour. For several years, Trigger Systems have been analysing EGNOS' benefits in their applications, and finally, last summer, they started commercialising a solution using EGNOS. In particular, they manufacture a switchboard that automates central irrigation pivots equipped with EGNOS. As explained by João Doroana, Software Developer at Trigger Systems: "Our first GPS solution had RTK precision, having excellent precision. However, it was very expensive and, because of that, we tried different approaches. The best option we found was GPS and SBAS/EGNOS enabled". They are satisfied with the accuracy provided by EGNOS because "It typically provides submetric accuracy, making a lower cost GPS solution available to our clients".

One of the advantages mentioned by Mr Doroana is that "It is easy to configure our equipment. EGNOS is configured in the pivot GPS device, and EGNOS is simply a checkbox. After that checkbox, we can change some more complex configurations, but, for now, the basic configuration is good enough".

Therefore, they sell their circular pivots with EGNOS already configured so the user can benefit from an increased precision in their agricultural fields at no cost. The performances provided by EGNOS satisfy Trigger Systems and their users, as confirmed by the fact that this product has had good reception among its clients, who immediately detected the added value without an additional cost. As explained by a manager of several agricultural farms: "Now that I have upgraded to the EGNOS enabled version, the pivot never misses a spot!"

> "The performances provided by EGNOS satisfy Trigger Systems and their users, as confirmed by the fact that this product has had good reception among its clients, who immediately detected the added value without an additional cost"

In the future, Trigger Systems will continue investigating new products to benefit from EGNOS.

Talking About EGNOS with... Isavia ANS

Credits: Isavia ANS

"Isavia ANS Is the Air Navigation Services Provider (ANSP) for Iceland and the surrounding oceanic areas (BIRD). The company has about 235 professionals and experts in air traffic control services, AIS, MET, flight procedure design, flight inspection and validation, communications, surveillance and navigation. The airspace served reaches from the south of Iceland (61°N), includes Iceland's domestic area, and provides services over Greenland and around the Faroe Islands. The service volume is around 5.4 million square kilometres in size and reaches the North Pole. Isavia ANS is very active in international cooperation and follows closely new technologies and methods being developed for aviation, from both sides of the North Atlantic, with the benefits to our customers in mind."

The implementation of LPV procedures is very recent in Iceland, having published the first LPV procedure in 2019 at Husavik Airport.

Tell us about ISAVIA's decision and process to implement EGNOS procedures in Iceland.

"Iceland is on the boundary of EGNOS' service volume and, therefore, additional steps were needed for the validation of EGNOS for approach navigation in Iceland. For several months, Isavia ANS collected data to be used for the validation, in locations close to target airports from the first implementation. This data was then handled and processed cooperatively by Isavia ANS and ESSP being the results presented in a report to the Icelandic Transport Authority (ICETRA). Isavia ANS additionally went through the steps of safety analysis with local airlines and ICETRA. The result was the authorisation to design and publish EGNOS approaches east of 19°W, essentially splitting the island in the middle, covering the eastern part of Iceland.

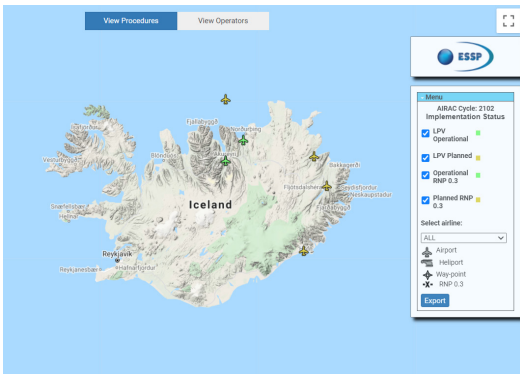


Figure 1. LPV Implementation Status at Iceland: Source: EGNOS User Support Website

Husavik Airport was chosen as the pilot project because of its closeness and sensitivity to the boundary of EGNOS APV-1 service volume and its location on the north coast, resulting in an interesting research case on EGNOS satellite's footprints".

Our readers would like to know more about the singular aspects affecting Iceland's airspace configuration, such as meteorology, terrain and/or types of traffic. What are the main challenges you faced when implementing LPV procedures?

"Iceland is a country of elevated terrain, where airports are often located in valleys between mountains and the North Atlantic weather can often be quite unpredictable, resulting in quick change in visibility and wind. These elements present a unique navigation challenge, especially for domestic traffic in the country. Isavia ANS looked into adding EGNOS-based LPV to the stable of navigation means early on and, in cooperation with the EGNOS Program, deployed EGNOS ground stations. LPV availability makes navigation with vertical guidance possible, improving safety where the ground infrastructure is not available for such precise navigation. And in other cases, LPV can reduce minimas where conventional navaids have difficulties due to terrain features".

Akureyri Airport (ICAO code BIAR) was second in receiving LPV procedures. What particularities make Akureyri special, and how did you implement LPV procedures?

"Akureyri Airport (BIAR) is an airport located in a tight valley in the northern part of Iceland, which has the second-highest traffic volume of all domestic airports in Iceland, only behind Reykjavik Airport (BIRK). The traffic there can range from private propeller aircraft to class D wide-bodies such as B767, which results in a unique navigation challenge. A variety of navigation solutions have been used in the past, such as the high approach angle ILS or the LOC approach supplemented by ASR final. More recently, the GNSS RNP approach, which allows designing procedures with an as-low-as-possible decision height that increases landing capability in reduced visibility conditions.

> "It can save operators up to 40 NM flying not having to make the approach to runway 01"

EGNOS LPV is an appropriate addition to these methods; it avoids costly investment in ground infrastructure and allows procedure designs with narrower design surfaces while being an equally safe, or safer, navigation than before. Aside from finding the best fit for the design criteria, we also had to consider possible TAWS/GPWS warnings when flying so close to the ground and checking if the geostationary EGNOS satellites were visible during the LPV part of the procedure. Furthermore, in terms of surveillance, Isavia ANS increased the ADS-B coverage in the fjords to cover the approach area".

What are the main benefits of LPV procedures with RF legs: Environmental, fuel consumption, airspace flexibility…? Was LPV the only type of approach that suited your requirements?

"The main benefits at Akureyri are shorter routings when arriving from Reykjavik, constant width design criteria during the turn, and less required airspace than a normal fly-by turn. When flying in

Credits: Isavia ANS

Figure 2. Flying view approaching the final segment of the LPV procedure to RWY19 at Akureyri.

a narrow fjord/valley, all aircraft follow the same path, making TAWS warnings more predictable. RF turns are used for LNAV and LNAV/VNAV as well, but LPV offers much smaller design criteria, especially in the missed approach".

> "Operators are very happy with the new approaches, especially the LPV option"

Why develop two different LPV solutions -with and without RF legs-? Is it to suit various operators' needs or even avionics?

"We can say yes to both. As said earlier, during the first turn in the missed approach, RF turns offer us shorter approach legs and smaller criteria. Most of the domestic fleet is RF capable, but this is not so for other traffic. RF capability offers slightly lower minima".

Credits: Isavia ANS

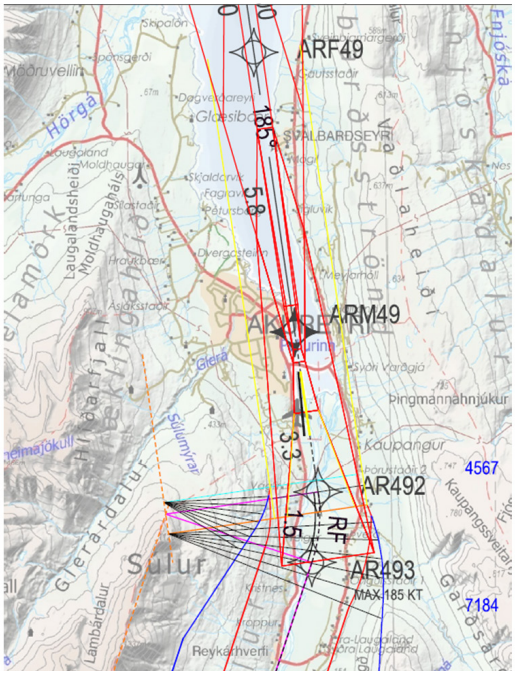


Figure 3. LPV design surfaces.

Which traffic types or airlines are operating at Akureyri? Do you have any feedback from them after flying the LPV procedure?

"The major domestic airline using Akureyri Airport is Air Iceland Connect, operating DHC8 400/200, the regional airline, Norlandair, operating DHC6 and BE20 and Myflug, the ambulance operator, utilising BE20´s. Operators are very happy with the new approaches, especially the LPV option. We also have occasional international flights flying larger aircraft landing at Akureyri Airport, where LPV may help. However, we have received less feedback from these operators than from the domestic flight operators, indicating that domestic airlines may benefit the most".

We have noticed that the LPV minima for runway 19 at Akureyri –both for X and Y LPV procedures is between 140ft – 450 ft lower than the ILS CAT I depending on the aircraft type and the missed approach climb gradient. What are the main reasons at Akureyri that allow lower minima for LPV than for ILS CAT I?

"The main difference is that, in the first missed approach leg, LPV offers track guidance with narrow criteria up until the first turn. Although a similar criterion is available for the ILS, the track guidance is missing, so for safety reasons, we decided not to publish the lower minima for the ILS against that calculated for ILS with the RNP 1 missed approach".

Even if it is just a small difference, does

this lower minimum avoid any disruptions throughout the year? Are there other benefits?
"The LPV minima is very beneficial, especially during the winter when it is snowing or in low ceiling mornings. It can save operators up to 40 NM flying not having to make the approach to runway 01 and help to avoid a re-route to an alternative airport with the complexity of delivering their passengers to their destination by other logistical means".

Share your thoughts with our readers about EGNOS' contribution to air navigation in Iceland and your future plans with EGNOS.
"EGNOS provides opportunities thanks to the increased accuracy and integrity for en-route navigation and, especially in domestic approach navigation (LPV). Isavia ANS wants to utilize this new technology to best serve our customers. Isavia ANS looks for the best opportunities to apply EGNOS LPV in domestic airfields, starting with designs that maximise benefits regarding landing minimas, terrain or difficulty in applying procedures based on ground infrastructure. Due to EGNOS' actual service volume distribution, Isavia ANS only has the option of doing this eastwards from 19°W. In the future, Isavia ANS would like to see EGNOS' service volume expand westwards to open up further opportunities towards an increasing country-wide EGNOS LPV approach in Iceland. The biggest and busiest international (BIKF) and domestic (BIRK) airports in Iceland are located on the west coast, and there are also opportunities at smaller airfields in the west. Isavia ANS would like to work towards the widespread use of EGNOS LPV in Iceland with EGNOS' stakeholders, considering the navigation performance and safety benefits this includes. Isavia ANS hopes to see a general support towards this goal within the EGNOS Consortium in the future.
In addition, RNP approaches with LPV are planned for 5 aerodromes this year: BIGR and BIVO in late April, and BITN, BIEG and BIHN later this year".

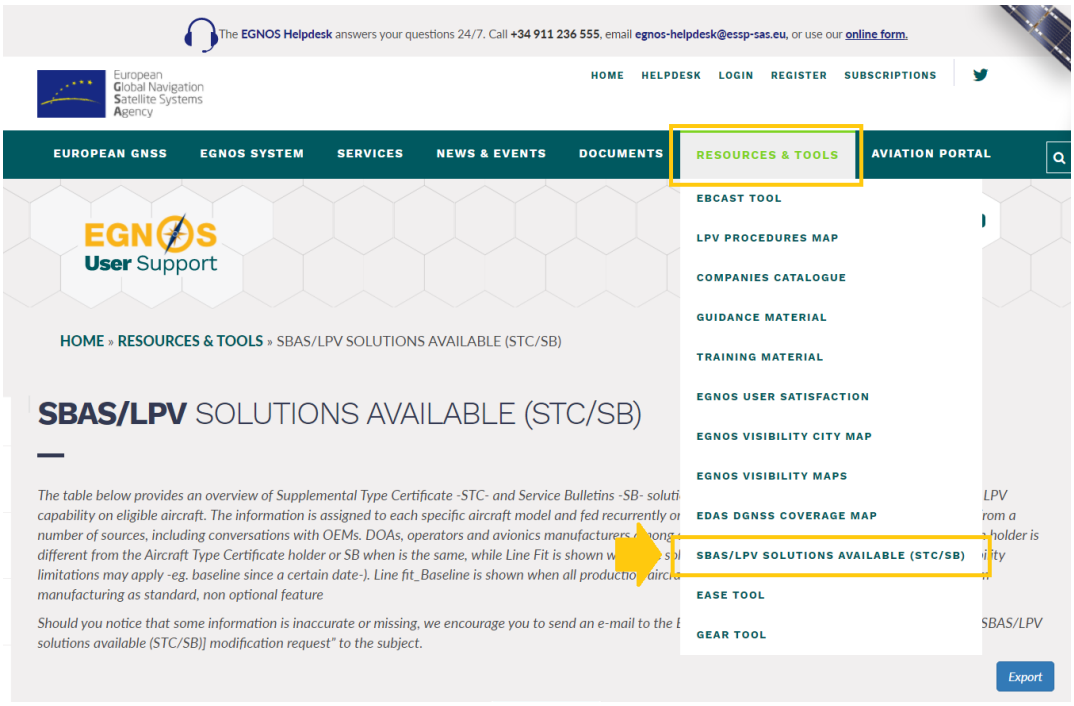
> "The LPV minima is very beneficial, especially during the winter when it is snowing or in low ceiling mornings"

Credits: Isavia ANS

Snaebjorn Gudbjornsson (left) is a chief flight procedure designer at Isavia ANS and has ten years of experience in the field. Snaebjorn has ATPL licenses and is a flight validation pilot at Isavia ANS, flying the company's BE20. In addition, Snaebjorn has a background in air traffic control.

Arnór Bergur Kristinsson (right) holds a MSc. in Electrical Engineering, with a focus on GNSS, from the University of Iceland. He has been working with Isavia ANS as a project leader in various satellite navigation fields for twenty years and acts as a consultant for the government and authorities on the subject. For most of this time, Arnor has been involved with EGNOS leading EGNOS' ground segment deployment and operations in Iceland and the domestic SBAS services implementation.

SBAS Avionics: What is Available in the Market?



Intending to satisfy the continuously growing interest in implementing SBAS and LPV on the European fleet, ESSP, in coordination with several avionic manufacturers, has recently published an "SBAS avionics tool" on the EGNOS User Support Website to provide easy access to all possibilities available in the market today.

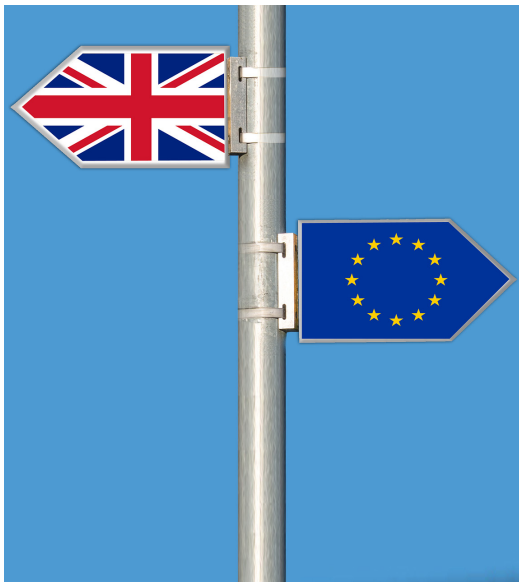
This webpage has been created to ease the search process for LPV and/or SBAS solutions for specific aircraft, manufacturers, solution holders or even capabilities – such as SBAS-based ADS-B out or LPV, or both–. This online interface provides an overview of Supplemental Type Certificates (STC) and Service Bulletins (SB) solutions, available (together with EASA STC/SB code) in the market to implement SBAS and LPV capability on eligible aircraft. It is also accessible to any interested user here.

The information shown in the tool comes from gathering inputs from several sources, including conversations with OEMs, DOAs, operators and avionics manufacturers, among others.

All users are welcome to leave their feedback and to actively participate in filling and complementing the information by contacting egnos-helpdesk@essp-sas.eu.

EGNOS services highlights

BREXIT



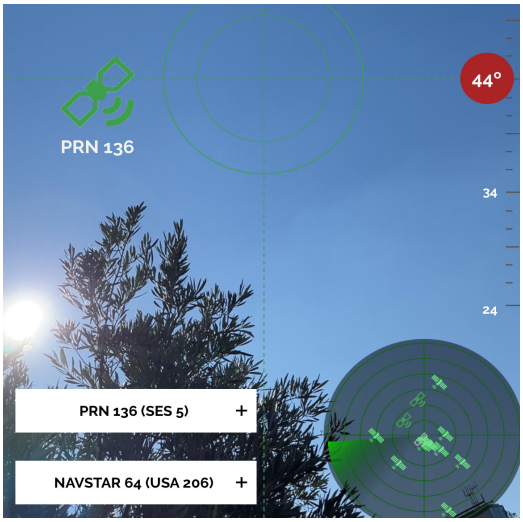
Due to Brexit conditions, following instructions from the EC and in coordination with the GSA, 22 UK ANSPs have been notified six months in advance about the termination for convenience of their respective EGNOS Working Agreements (EWA), all set before the end of 2020. In this regard, on December 24th, 2020, letters were sent to the EWA points of contact, both by e-mail and certified postal mail. In accordance with the provisions of the agreement, the letters stated the ESSP is authorized to maintain the existing EWAs with the UK ANSPs until June 25th 2021, meaning that EWA-related services will be provided normally until then. Both EASA, ESSP's oversight authority, and the UK's CAA have been duly informed of this way forward to ensure coordination among all stakeholders.

In the same way, due to Brexit conditions and following instructions from the EC and the GSA, the ESSP has notified all EDAS users from the UK that their subscriptions will terminate on June 25th, 2021. In this regard, on December 24th, 2020, e-mails were sent to EDAS users from the UK stating that the ESSP is authorized to nominally continue providing them with EDAS services following the provisions of the applicable EDAS Conditions of Access and EDAS Service Definition Document (SDD) until June 25th, 2021.

EGNOS APP

Have you already downloaded the latest release of the EGNOS application? This 2.2.0 version comes with multiple updates such as the LPV200 historical availability evolution and the brand-new feature "Satellite Finder". Just use your camera to get the different information on all the EGNOS and GPS satellites above you. You can also check all the satellites at a glance on the radar.

Do not forget to update it to this new version. It is available on Android and iOS!



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

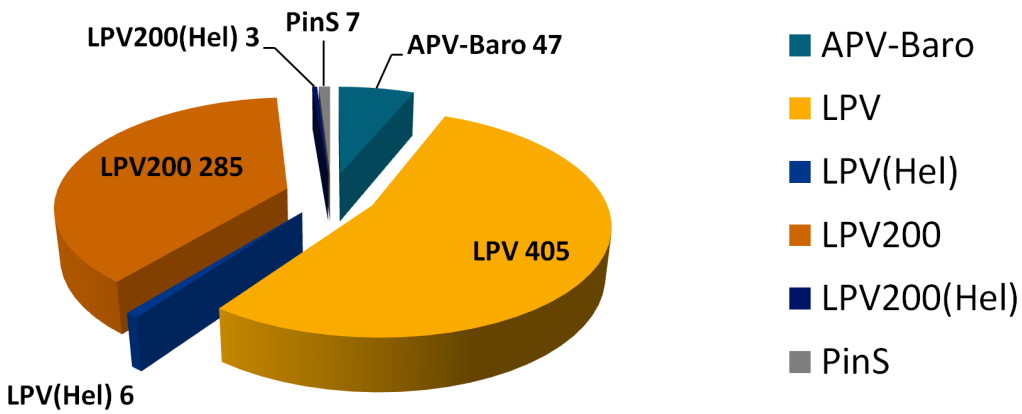
EGNOS WORKING AGREEMENTS SIGNED (EWA)

The following EWAs have been signed in the last quarter:

	Odense AFIS	**Denmark**
	Pajala Airport	**Sweden**
	CIANS	**Cyprus**

LPV, LPV-200, PinS & APV Baro procedures published (including AIRAC cycle 2021 #02– 25/02/2021)

Next graph shows, the number of procedures
LPV, LPV-200, PinS, APV-Baro, LPV-Hel and LPV200-Hel. The total number is **753**

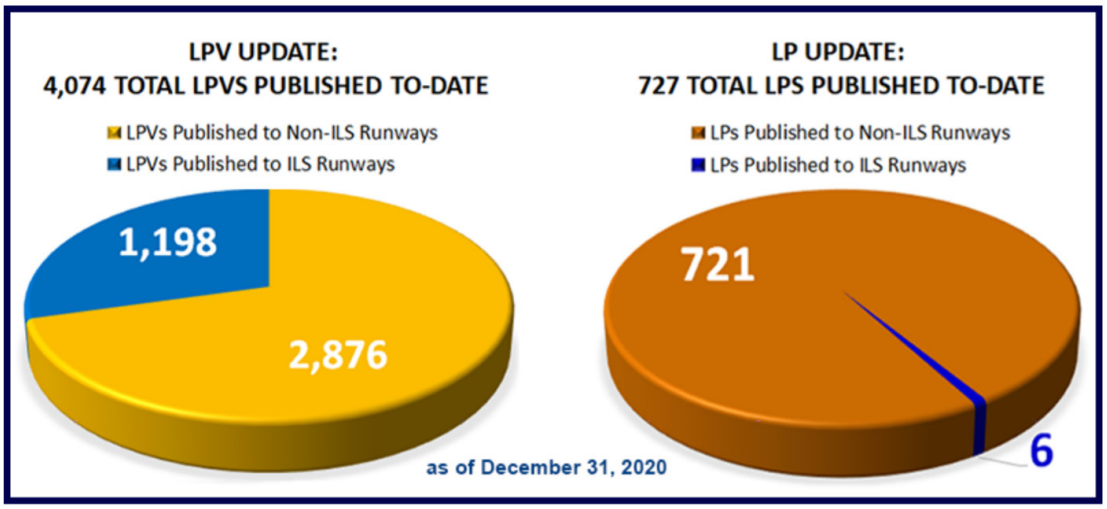


SBAS in the world

FAA PROCEDURE TABLE

Chart below shows the WAAS list of satellite based approach procedures. You can find further information on SatNavNews.

Courtesy of the FAA WAAS Team.



"SBAS FOR AFRICA AND INDIAN OCEAN" FLIGHT DEMONSTRATIONS, A NEW CRUCIAL STEP TOWARDS SBAS SERVICES PROVISION IN AFRICA

Credits: ASECNA / ASECNA ATR42-300 aircraft

After important achievements last year, the "SBAS for Africa and Indian Ocean" initiative, led by the Agency for Air Navigation Safety in Africa and Madagascar (ASECNA), started 2021 with a new crucial step for its development, through the successful performance on last January of flight demonstrations at the international Gnassingbé Eyadéma airport of Lomé (Togo).

This programme, which pursues the autonomous provision over the African and Indian Ocean continent of Satellite Based Augmentation System (SBAS) services to enhance flight safety and efficiency, marked indeed important milestones in the second half of 2020 with the completion of the preliminary design of the system (based on the EGNOS technology and thanks to the technical support of the French Space Agency and European GNSS Agency) and the validation of the services areas, followed by the deployment of a test-bed and the broadcast since October 2020 of an ICAO SARPs compliant pre-operational signal in Western and Central Africa, the first ever SBAS service in this part of the world.

> "SBAS can revolutionise navigation for the approach phase"
>
> **Capt. Patrice Mouevi (ASKY)**

> "SBAS means flight safety through approaches with minima equivalent to ILS CAT-I everywhere at all times"
>
> **Capt. Zouel Bayli from Air Côte d'Ivoire**

Exploiting the pre-operational APV-1 service, a series of 5 flight demonstrations was carried out on 27th January 2021 by means of the ASECNA ATR42-300 aircraft, equipped for the occasion by specific receiver and flight display, which flew the approach and landing LPV procedures designed for the two runway thresholds of the Lomé airport.

These demonstrations showed in real configuration the technical performances of the signal, especially in a geographic area known for perturbations due to the adverse ionospheric conditions, and validated from an end-to-end perspective the test-bed, which is essentially composed of a network of GNSS reference stations developed with the French Space Agency, a demonstrator developed in conjunction with Thales Alenia Space, and the NigComSat-1R GEO satellite, operating the PRN code n°147 recently assigned to ASECNA.

The demonstrations also showcased on the field the benefits of SBAS operations, in terms of safety improvement, operational costs reduction and environmental protection. VIPs and pilots, embarked for the occasion, provided very positive feedbacks in this regard.

These outcomes were debriefed during the Outreach event on SBAS in aviation in Africa, organised in the wake of the demos on 28-29 January 2021 in conjunction with the EGNOS-Africa Joint Programme Office (JPO). This event, held virtually, gathered more than 450 participants from all over the world, representing more than 30 airlines, key aircraft/avionics manufacturers (Airbus, Boeing, Embraer, ATR, Collins Aerospace, CMC Electronics), civil aviation authorities, SBAS providers (FAA, European Commission, …) and other aviation stakeholders, with the objective to develop a multilateral dialogue to accelerate user adoption and penetration of SBAS services, even beyond Africa.

What's going on...

in aviation.

USER CONSULTATION PLATFORM (UCP)

The Aviation and Drones Market Segment panel of the third User Consultation Platform (UCP) took place on December 2nd, 2020, as an online event. The panel gathered over 100 participants and was conducted by Carmen Aguilera and Katerina Strelcova. After the overall vision of the EGNOS and Galileo services (current and upcoming evolutions) by the GSA and a short presentation on Copernicus services for aviation by the EC, the first main block concentrated on discussing user requirements in space to enable greener aviation. ERA and CANSO presented their views, starting a conversation on the topic and enriched by panellists from DSNA, EBAA, SDM and SJU. There was consensus on EGNOS' support towards building a more modern ATM to reduce emissions by fuel-saving/reduction, making it feasible to approach regional airports in (almost) all weather conditions. Furthermore, it would support noise reduction thanks to the steeper glidepath allowed by LPV procedures.

The second block focused on PBN implementation and future evolution for navigation, with presentations from EASA, DSNA and ASL-F, and enriched with the participation from Eurocontrol, EHA, CANSO, EBAA, Fokker, Deimos Space, SDM, Collins Aerospace, Thales and Europe Air Sports. Everyone agreed that EGNOS enhances access to airports and that, even though PBN regulation mandates the publication of LPV in Europe, there is still work to do to increase the number of users of EGNOS-based procedures. The last block focused on user requirements for GNSS in drone operations and urban mobility. It included the presentations of EASA's, DELOREAN's and REALITY's projects, with the subsequent debate and participation from Eurocontrol, Drone Consultants Ireland, Boeing, Everis, GMV, CATEC and Telespazio IB.

The results of the UCP will be used to compile and update the Aviation Reports on User Needs and Requirements. The minutes of the session are available here.

ATM AWARDS

Last February, both ESSP and NLA have been awarded in the "Service Provision" category of the ATM prices 2020 organised by ATM Magazine with a case named "EGNOS service provision scheme for rotorcraft operators in class G Airspace", recognising contributions to safe, cost-effective and efficient airspace management.

in geomatics.

USER CONSULTATION PLATFORM (UCP)

The Geomatics and Urban Planning panel in the Third User Consultation Platform (UCP) took place on December 1st. A virtual event that gathered more than 80 participants to discuss the use of EGNSS in geomatics and urban planning. The session started with an introduction to the GSA GNSS Market Report to explain the market's evolution regarding geomatics in GNSS. User Needs and Requirements Documents were also discussed, including interactive questions to users to collect their feedback. Afterwards, several use cases were presented to show the applications and benefits of EGNSS in geomatics and urban planning. The event was concluded with a Copernicus Programme presentation, focusing on the Land Monitoring Service and its impact on the sector. The discussions raised during the event will serve to feed the new reports on user needs and requirements and will include the results of the meeting. The minutes of the session are available here.

INTERGEO

Intergeo, the leading European conference and trade fair for geodesy, geoinformation and land management took place from the 13th to the 15th of October. This year the event was virtual, with a stand for the European GNSS Agency to report the European Commission's space programmes. The booth received several visitors who clarified their doubts through digital meeting rooms.

The European GNSS Agency presented the Geomatics on the Move prize during a conference promoting the competition of innovative geomatics applications and solutions using Galileo and EGNOS.

Did you know...?

The Climate Change Service and Atmosphere Monitoring Service (CAMS) of Copernicus Programme provide weather forecast information, that can be used for optimizing flight planning and decision making for airlines, policymakers and users. Based on indicators obtained from satellite data, such as air pollution, airlines and manufacturers can optimize their maintenance, repair, and overhaul plans thanks to the precise monitoring of aircraft exposure to harmful particles, also contributing to sustainable development.

in agriculture.

USER CONSULTATION PLATFORM (UCP)

The third UCP Agriculture Market segment panel took place on December 1st, 2020, as an online event. The panel gathered over 100 participants from organisations and institutions using Galileo, EGNOS, Copernicus and complementary solutions in different agriculture and forestry applications. The session consisted of several parts: the first one focused on reviewing the definition of agricultural GNSS requirements, its current status and a summary of the activities launched in 2020; the second part centred on the use of EGNSS in R&D projects; lastly, the third part focused on Copernicus and synergies with EGNSS. Joaquin Reyes (GSA) explained the EGNSS roadmap. It was noted that key policy initiatives (e.g. Farm to Fork Strategy and post-2020 CAP) are promoting the adoption of EGNSS and Copernicus, thus shaping future user requirements.

The main outcomes discussed were:

- EGNSS and Copernicus play a significant role in a wide range of applications and can bring high value when it comes to implementing the Farm to Fork Strategy of the EU's Green Deal.
- The use of EGNOS is increasing as shown by success stories that confirm EGNOS benefits agriculture and forestry applications.
- Synergies between Copernicus and EGNSS contribute to achieving ambitious Farm to Fork strategy goals.

Cristina Ananasso (European Commission) explained how Copernicus contributes to agriculture and forestry. In particular, she commented on how Land (CLMS) and Climate Change Services (C3S) support different projects. Participants agreed on the importance of these events to share progress and gather requirements on the adoption of European Space Programmes. The UCP results will be used to compile and update the Agriculture Reports on User Needs and Requirements. The minutes of the session are available here.

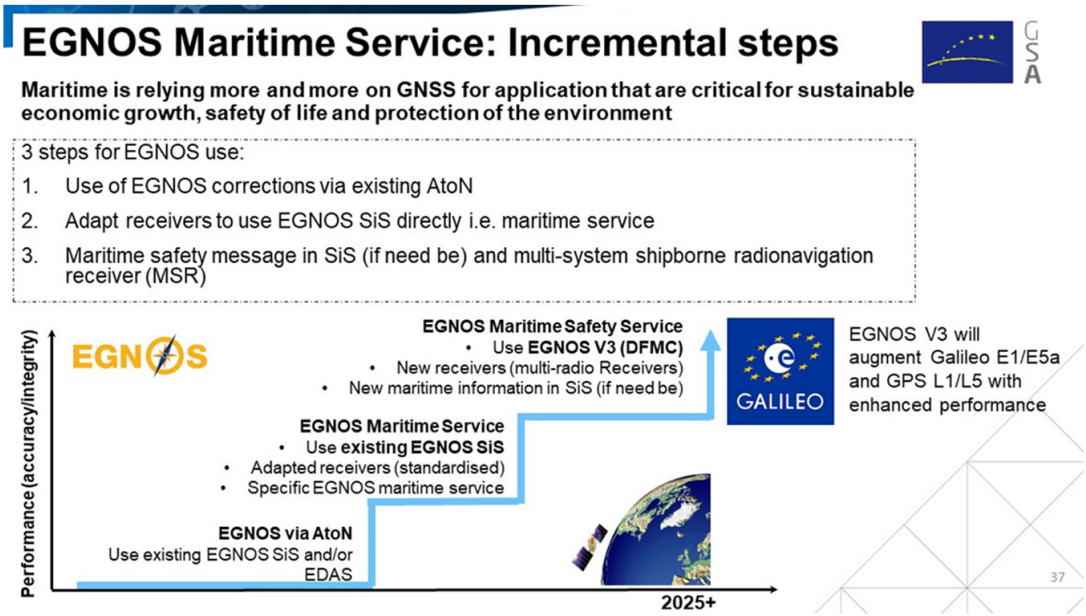
DATAGRI

Datagri, the forum promoting digital transformation in the agri-food sector, took place from the 16th to the 20th of November in different online formats to bring together experts worldwide to discuss the main trends in digital transformation technologies and innovation.

Joaquín Reyes, from the European GNSS Agency (GSA), presented the GSA and the European space programmes activities in the conference "Tools to Support Farmers' Decisions", representing an opportunity to show how EGNOS can support farmers in increasing efficiency at a low cost.

in maritime.

USER CONSULTATION PLATFORM (UCP)



Credits: GSA

The Maritime Market segment panel of the third User Consultation Platform (UCP) took place on December 1st, 2020. For the first time, it was not a face-to-face event. However, many participants (more than 125) joined to share views on GNSS' maritime requirements. The session consisted of multiple sections, presented by different panellists and the GSA as the organiser.

The session opened with an introduction and update on Maritime and Inland Waterways' user needs and requirements for E-GNSS, followed by an overview of the potential application of Copernicus Services for Maritime, Inland and Ocean Monitoring segments. Furthermore, the GSA informed of an update of some of the resilience requirements for PNT solutions, coming from new guidance from both IMO and IALA.

The second part of the session focused on the GNSS services for the Maritime Market segment. The GSA presented the EGNOS Maritime Service and its deployment strategy in multiple steps, from an EGNOS L1 Service to an EGNOS V3 L1/L5 Maritime Service that includes Galileo augmentation.

Furthermore, the Galileo HAS service and service levels were introduced and presented to the audience. The HAS service plans to deploy in a three-phase approach and targets emerging applications such as autonomous vehicles, drones, or robotics, applications where 20 cm positional accuracy is sufficient.

The final part of the session included the presentation of very interesting projects that are providing valuable results to update the requirements gathered in the UCP report. The panellists showed the audience how different EGNSS and Copernicus services could be successfully deployed into the Maritime Market segment. The minutes of the session are available here.

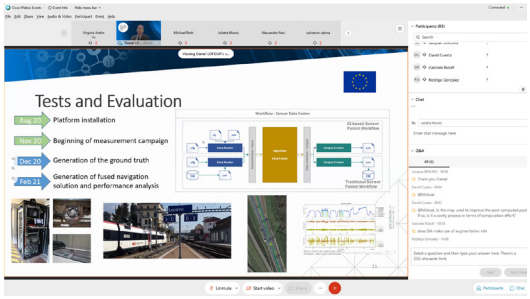
in rail.

USER CONSULTATION PLATFORM (UCP)

The Rail Market Segment panel of the third User Consultation Platform (UCP) took place on December 2nd, 2020, as an online event. The panel gathered up to 77 participants and included comprehensive coverage of the rail-user community. The session consisted of several parts: the first one concerned the current status of rail R&D projects and this year's main achievements in the rail sector; the second part involved reviewing the definition of GNSS' requirements for rail; the last part focused on new services and R&D strategy.

As an introduction, relevant non-safety applications were said to represent a considerable part of EGNSS users, whilst R&D mainly deals with safety-relevant ones. In this sense, significant progress has been made since the 2019 Space for Innovation in Rail event in Vienna. In particular, the Change Request proposal to the CCS TSI and ongoing or recently selected projects.

The report's current issue on users' needs prompted interesting discussions underlined as remaining challenges: the use of EGNOS to reach both accuracy and integrity requirements, the need for blanket specifications for a digital map for localization purposes, the need for a receiver



Credits: GSA

capable of facing local effects in the complex railway environment and, finally, the need for standards in terms of performance evaluation and certification.

Such consultation highlighted that the requirements' definition could be difficult since it is highly dependent on the selected architecture or solution. Despite the variety of applications and, the community hopes for a single solution capable of responding to multiple applications. The mutualisation work will help with reaching this solution. Participants concluded agreeing on the importance of this kind of events to share progress and requirement expressions. The minutes of the session are available here.

European Space Week: EGNOS Session.

EUROPEAN SPACE WEEK: EGNOS SESSION

The EGNOS ANNUAL SERVICE WORKSHOP was celebrated on-line during the European Space Week on December 9th, 2020. The on-line venue significantly increased the number of registered users, which came up to 1300.

During the hour and a half-long session, the GSA and the ESSP provided information on the programme's status & roadmap, as well as on the market strategy, together with the latest status on EGNOS' service and its adoption in Aviation (Operators view on EGNOS, ANSP view, Implementation evolution and a simulation flying Rost LPV procedure), Maritime, Helicopter Emergency Medical Services (HEMS) and Agriculture.

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.

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