



EGNOS, it's there. Use it.

First European LPV200

EGNOS BULLETIN

Issue 19, Q2 2016

PHOTO: DASSAULT AVIATION



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Agency

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EGNOS

Success Stories

ATI ACHIEVED LPV OPERATIONAL APPROVAL FOR THE BELUGAS

After suffering from several years of delay, first on the EASA certification of the LPV modification (achieved on March 2015), and then on the operational approval application, Airbus Transport International (ATI), the transport division of Airbus in charge of shipping aircraft pieces from the different Airbus factories for assembly at Toulouse, received last April the Operational Approval to fly LPVs from the French DGAC.



Credits: Patrick Ludolph from Hamburg, Deutschland

For ATI, getting and delivering the pieces at the right time in their network of sites is critical for meeting the delivery deadlines of the Airbus aircraft, thus increasing accessibility at these airports in bad weather was a long-searched target.

Laurent Vialard, Senior Avionics Engineer from ATI, qualifies this milestone as 'really good news'. At Airbus, they are now looking forward to completing the suite of LPV charts at their common destinations. Nowadays, there are LPV charts published at Saint Nazaire, Hamburg, Bremen (LNAV/VNAV), Toulouse and Perpignan, and there are plans ongoing in Chester, Getafe and Seville.

AVIDYNE RECEIVES EUROPEAN CERTIFICATION OF IFD540 & IFD440 GPS FMS SYSTEMS

Avidyne Corporation announced on June 8 that they have received European Aviation Safety Agency (EASA) approval of their IFD540 and



Credits: Avidyne Corporation

IFD440 GPS-based Flight Management Systems. "The IFD440 and IFD540 have been incredibly popular in the U.S. and in many of the N-registered aircraft based in Europe, and this EASA approval now opens the flood gate for the huge number of pilots flying European-registered aircraft, giving them access to the latest and the best GPS navigator in all of general aviation," said Dan Schwinn, Avidyne's President & CEO. "European aircraft owners upgrading to an Avidyne IFD will get a modern hybrid touch-screen GPS, a display for terrain, traffic and other safety systems, as well as a platform for wireless connectivity, and much more."

[Avidyne](#), [DAC International](#), and authorized European Avidyne dealers are now accepting orders, and initial deliveries of the EASA-approved IFDs are planned to begin this month.

Talking about EGNOS benefits with...

Dassault Aviation

Dassault's Falcon 2000LXS became the first business jet to fly an LPV-200 approach in Europe on the 3rd of May 2016 at Paris' Charles de Gaulle Airport. As Dassault representative at this flight event, Alain Boucher wanted to share his experience with our EGNOS Bulletin readers.

First of all, thank you Alain for your dedication and for making this first LPV-200 flight a reality. How did you find the whole LPV-200 experience?

We were waiting for this to happen in Europe for a long time. With WAAS – the North American equivalent to EGNOS – such operations have been a reality for several years. The fact that Europe is catching up and offers now the same level of operational capability is a great step forward, especially for Business Aviation. The French DGAC did really a great job in organizing those first LPV-200 flights in Roissy CDG, and Dassault Aviation was pleased to be invited to fly a Falcon 2000LXS down to the 200ft LPV minima. This is really a big step for European satellite navigation, with much more to come with Galileo!

You seem quite enthusiastic and committed with EGNOS and Galileo, which we appreciate, but why were you so interested in becoming the first business aircraft manufacturer to ever fly an LPV-200 in Europe?

Dassault Aviation has always been an ardent supporter of satellite navigation, LPV being today

the most advanced application thanks to GPS augmentation systems such as EGNOS. On top of that, the French DGAC has been pushing hard for the publication of a high number of instrument approach procedures with a LPV line of minima. So Dassault Aviation, as a European Business Jets manufacturer, had really to be the first in that user segment to fly a European LPV-200. The LPV benefits are particularly important for general aviation and Business Aviation.

Speaking of that, what are, in your opinion, the main benefits of EGNOS for business aviation?

LPV approaches make it possible to land at facilities which are not equipped with expensive instrument landing systems, including many small regional and local airports. Lowering the decision height from 250 ft to 200 ft provides a substantial operational benefit in poor weather and low visibility conditions. LPV offers a very accurate and stable guidance to the runway, and this is now available at no cost for the smallest airports used by business jets. Thanks to EGNOS, LPV will progressively replace ILS Cat1 in Europe, as we know it is already happening in France, for instance.



LPV approach with Enhanced Vision System from Dassault Aviation

We can even guess that LPV-200 is just one step more and in the near future satellite navigation technology will enable to go lower than 200ft on approach.

Before we jump into future technologies, tell us, how did you get to know EGNOS for the first time?

In fact it all started with WAAS in the US: Dassault Aviation was able to certify their airborne systems for LPV-200 operations with the EASY2 cockpit upgrade back in 2011. After WAAS, EGNOS was the next, and European, piece of a worldwide effort to develop Navigation performance augmentation systems for the GPS – and tomorrow Galileo.

So it has been a few years now that you were able to offer EGNOS (SBAS) solutions but do you currently do it on all your new aircraft models?

Yes, all in-production Falcon Jets are equipped with Dassault's second generation EASY 2 avionics suite, which is designed to support SBAS, LPV200 and other new navigation features. For the older aircraft, some retrofit solutions also exist. Around 80% of our customers are asking for the LPV capability.

Could you give us an estimate on how many of these SBAS capable Dassault's units are currently flying in Europe?

It is hard to answer precisely this question, as many of our aircraft are flying all over the world. Since the rollout of the first Falcon 20 in 1963, over 2,400 Falcon jets have been delivered and around 600 of them are equipped with the EASY2 cockpit and therefore LPV-200 capable today.

How about US operators? Do you get a higher demand there due to the availability of procedures?

A lot of LPV approach procedures have been published in the US after WAAS entry into service. Current number is now higher than for

ILS Cat1. LPV is very popular in the US because it is accessible to small operators of general aviation and business aviation. The demand for LPV is very high. We can imagine that the same thing will happen in Europe with EGNOS, as the number of published LPV is already quickly increasing!

You commented earlier on future navigation technologies. Is Dassault working on something specific which could improve the current LPV200 performances?

Indeed, we are working, amongst other things, on the Enhanced Flight Vision System (EFVS) which does not exactly allow to reduce the decision height (DH) of the Instrument Approach Procedure (IAP) being flown but it allows the crew to actually "see" the required visual references for landing with augmented vision, in a head-up display, in weather conditions which would make it impossible for natural vision. Basically, EFVS allows to fly a procedure and to proceed to landing with reported visibility lower than the one required on the IAP published chart.

So LPV and EFVS are very complementary, allowing Business Aviation operators – most of which are not ILS Cat2 approved - to even land in worse than Cat1 weather conditions.

“Thanks to EGNOS, LPV will progressively replace ILS Cat1 in Europe

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Meet the users



Alain Boucher, Navigation and Flight Guidance Systems Specialist at Dassault Aviation. He has been working in that field for more than 25 years, on all Dassault Aviation types of aircraft. He is also a member of several Eurocae & RTCA standardisation working groups.

5 Years

Flight Validation and Flight Inspection of LPV Procedures

Soon after the availability of EGNOS SoL service in March 2011, FCS carried out the Flight Validation of the LPV procedure at their home airport in Braunschweig (EDVE), Northern Germany.

Standardizing Flight Validation and Flight Inspection

The process of developing, validating and publishing new instrument flight procedures is subject to complex and stringent quality control processes as part of their formal approval.

Performance Based Navigation (PBN) procedures, including EGNOS-based LPVs, are not an exception and also need to be qualified with the highest levels of integrity. In order to standardize the necessary Flight Inspection and Flight Validation tasks, ICAO published Document 9906 Volumes 5 and 6 in 2012. These Standards and Recommended Practices describe the steps necessary to ensure that new procedures are thoroughly evaluated before publication, with the validation flight using a pre-production database acting as the final end-to-end test. The ICAO documentation also details requirements on pilot qualification and these documents are being adopted by many Flight Inspection service providers as the basis for their Flight Validation activities.

“LPVs need to be qualified with the highest levels of integrity”

Implementation of EGNOS LPV Procedures

Since that first validation of the LPV procedure in Braunschweig, over 30 LPV procedures have been published in Germany, at both regional airports and international airports that constitute important transport hubs within Europe. Outside Germany, FCS has supported EGNOS deployment by completing the Flight Validation of procedures designed by skyguide in Sweden during 2015. In 2016 FCS is planning Flight Validation missions in the Slovak Republic and in Austria as part of the GSA-funded IMPROWE project (with the first LPV200 approach for FCS), and again in Sweden where one of the approaches will be a RNP AR, also a first.

IFR Procedures for Helicopters

A particularly strong demand for Flight Validation of LPV and PinS helicopter procedures emerged in Switzerland, with the strategic decision of the Swiss EMS operator Rega to transition their complete operations to IFR. To support this



FCS King Air 350 (Fozair.net)



AW-109 SP over the Alps (Samedan) – PROuD Project

activity one of Rega's AW-109 SP helicopters was equipped with an FCS/Aerodata Flight Inspection System, named "HeliFIS", at the end of 2014. FCS has since supported Rega in the Flight Validation of several LPV approaches and PinS segments implemented as part of the Swiss "Low Flight Network" (LFN), used both by Rega and Swiss Air Force helicopters. In the future, RNP AR procedures will be implemented and connected to the LFN. In 2015 FCS also played an active role in the GSA-funded PROuD flight trials of a PinS/LPV approach to a hospital in Chur and a PinS/LPV approach into Samedan airport in Switzerland.

Validating the NAV database

Validating the NAV database is critical to LPV Flight Validation. In order to complete this activity FCS obtains a test (pre-production) database with the newly designed procedures. This special database is produced for the FMS 3000 in the FCS King Air through the standard certified processing chain involving Jeppesen and Rockwell Collins, using the same source data as that for the final procedure. To validate the database on the ground, FCS employs its purpose-designed "FIDIT" (Flight Inspection Database Integrity) tool, an extension of the "DbIT@" validation tool used by Lufthansa and Swiss Airlines to validate the NAV databases of their global fleets. FIDIT compares ARINC424 and FMS coding, both for waypoints and the LPV FAS data block, documenting the results and highlighting any discrepancies in a custom report format.

Advantages of Standardization

Given FCS's background and experience in the Flight Validation field, processes are stable and economies of scale allow for fixed cost items,

such as test database subscriptions, to have little influence on individual task costs. This combination makes Flight Validation by FCS cost-effective, with Flight Validation and Flight inspection of one runway end with two approaches, including the missed approach and transitions usually requiring no more than one flight hour. Combining several LPV approaches at nearby airports into one mission is also an easy way to reduce the cost of Flight Validation. A further advantage of standardized processes and a stable organization is the ability to manage issues and delays that may arise during the design and publication processes, and to respond to any questions arising after the flight with qualified answers based on experience.

“Standard reporting provided by FCS includes the pilot's Flight Validation Report, a Flight Inspection Report and a Database Validation Report

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About FCS

FCS Flight Calibration Services GmbH, primarily serves its ANSP shareholders in Germany, Switzerland and Austria with Flight Inspection and Flight Validation services. For this purpose, FCS operates two King Air 350 aircraft equipped with a Rockwell Collins Proline 21 cockpit and an Aerodata Flight Inspection System. FCS, as an EASA Part-SPO high risk specialized operator is IS-BAO SMS stage 3 audited/ registered and ISO9001 certified.

Standard reporting provided by FCS includes the pilot's Flight Validation Report, a Flight Inspection Report – containing data from the Aerodata Flight Inspection System relating to FMS and GNSS performance – and a Database Validation Report.

What's new?

Since last bulletin...

EGNOS WORKING AGREEMENTS (EWA) SIGNED

The following EWAs have been signed in the last quarter:



BAE System
Marine Ltd
United Kingdom



Coventry
Airport Ltd
United Kingdom



CODA
Operations Ltd
United Kingdom

LPV & APV BARO PROCEDURES PUBLISHED PER COUNTRY (including last AIRAC cycle 2016 #7 – 23/06/2016)

Next table shows, for each country:

- the number of airports with LPV procedures, as well as the total number of LPV procedures;
- the number of airports with APV Baro procedures authorised to be flown with EGNOS vertical guidance as well as the total number of APV Baro procedures.

Country	Airports – LPV procedures	# LPV Procedures	Airports – APV baro Procedures	# APV baro Procedures
Austria	2	2	0	0
Belgium	2	3	0	0
Croatia	1	1	0	0
Czech Republic	4	8	1	4
Denmark	3	6	0	0
Finland	1	2	0	0
France	86	144	4	5
Germany	22	36	24	63
Guernsey	1	2	0	0
Italy	7	17	0	0
Netherlands	2	3	0	0
Norway	11	23	7	16
Poland	2	4	0	0
Portugal	1	2	0	0
Slovak Republic	2	4	0	0
Spain	1	2	0	0
Sweden	2	3	0	0
Switzerland	8	10	0	0
United Kingdom	2	4	0	0
Total	160	271	36	88

EGNOS Adoption Docs + Tools

LPV MAP
Where to fly an EGNOS-based Instrument Approach Procedure?

EBCAST
An EGNOS Business Case Assessment Tool for airports and airlines

BULLETINS
Access to all EGNOS Bulletins

Brochures
EGNOS benefits and success stories

GUIDANCE MATERIAL
Find out how to use EGNOS

TRAINING MATERIAL
Information package to be used by Approved Training Organisations

USER SATISFACTION
User satisfaction surveys

SBAS in the world WAAS APPROACH PROCEDURES GAGAN, INDIA'S SBAS

Table below shows the WAAS list of satellite-based approach procedures. You can find further information on [SatNav news](#).

Courtesy of the FAA WAAS Team

Satellite-based Approach Procedures			
	Procedures (Part 139 Airports)	Procedures (Non-Part 139 Airports)	Total Number of Procedures
RNAV (GPS) Approach LNAV Line of Minima	1,778	4,295	6,073
RNAV (GPS) Approach LNAV/VNAV Line of Minima	1,402	2,151	3,553
RNAV (GPS) Approach LPV Line of Minima	1,404	2,274	3,678
Non-ILS runway	50	1,689	1,739
ILS runway	1,354	585	1,939
RNAV (GPS) Approach LPVs w/200' HAT			940
RNAV (GPS) Approach LP Line of Minima	86	523	609
GPS Approach GPS Stand-Alone Procedures	8	83	91
GLS Approach	11	0	11

(Data as of May 26, 2016)

The Airports Authority of India (AAI), which received the certification of GAGAN for APV-I services on the 21st of April 2015, is now actively working on the implementation of the first RNP APCH procedures to LPV minima at 6 different airports in the country. In order to validate the procedures, which publication is expected by the end of the year, one of the two AAI flight inspection units is currently being retrofitted with SBAS avionics in Germany.

EGNOS

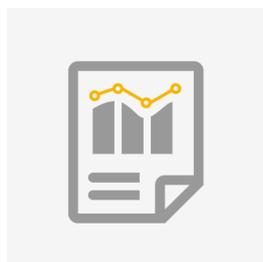
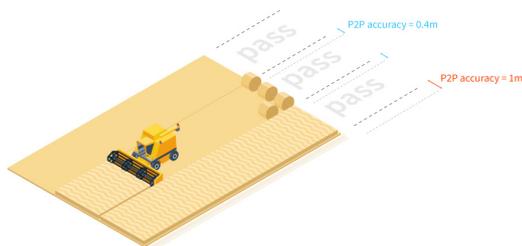
Services Highlights

Measuring accuracy as farmers do:

Pass to Pass Accuracy

Since beginning May, the EGNOS User Support Website provides information on the accuracy provided by EGNOS measured as farmers do; using the pass to pass concept.

Please visit [here](#) to find this information on line.



Yearly Performance Report available

The yearly performance report covering from April 2015 until 31 March 2016 is already published.

[Click here](#), to download it.

New Performance Reporting

In the last months a number of improvements have been done in the [monthly performance reports](#).

Namely, those are:

- New graphs showing the daily compliance trend for APV1 & LPV200 availability.
- Table with LPV200 performances in airports with such procedures published.

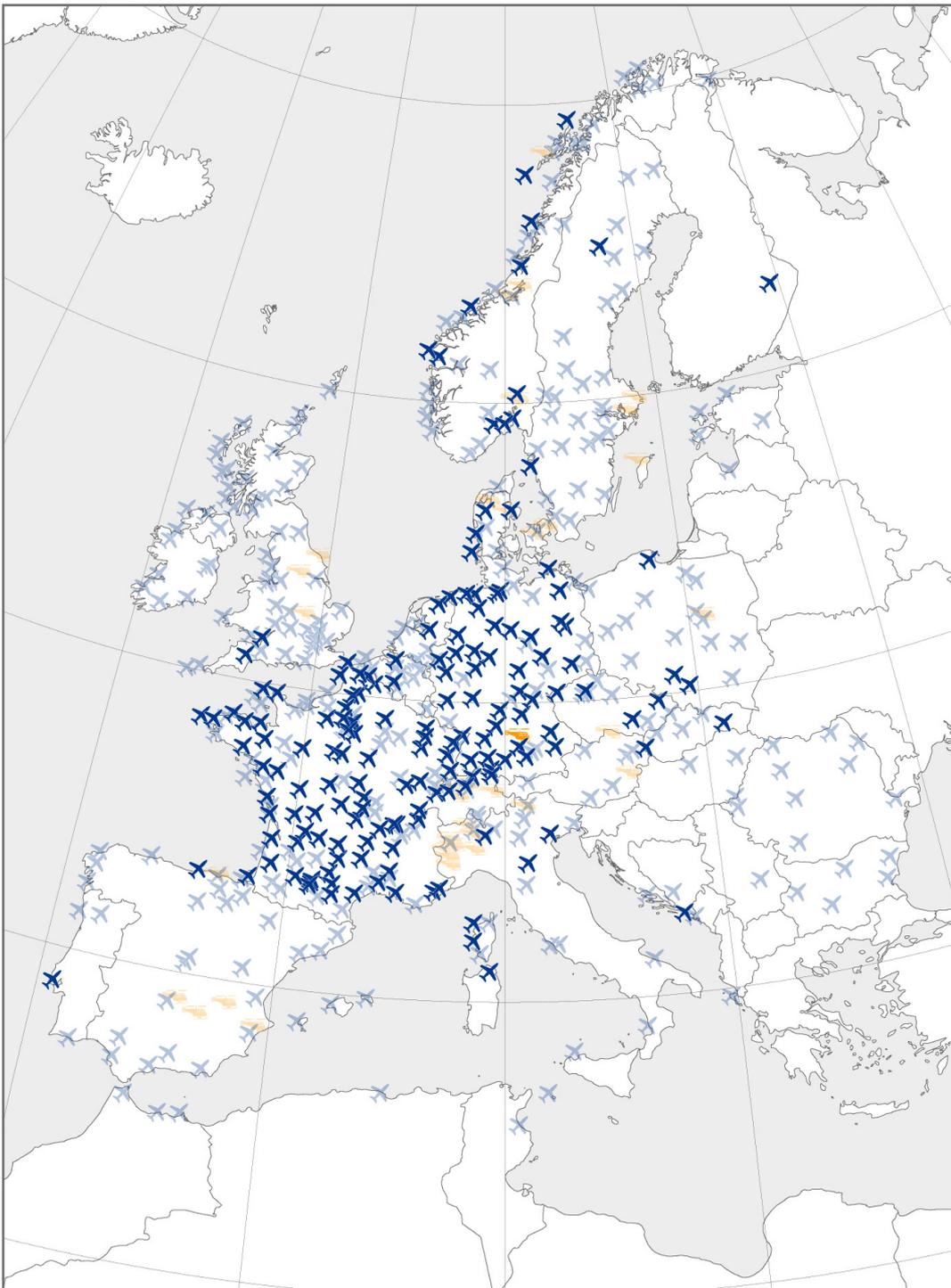


EGNOS Service Definition Documents

New version of EGNOS Service Definition Documents (SDDs) for OS and SoL with new committed service areas and other updates based on the EGNOS System Release (ESR) 2.4.1M is planned to be published in Q3 2016.

More information about the SDDs in force [here](#).

EGNOS implementation



What's going on...



in aviation.

EBACE2016:

INCREASING AWARENESS IN BUSINESS AVIATION

The annual European Business Aviation Convention and Exhibition took place last 24-26 of May in Geneva, demonstrating its standing as Europe's foremost sectorial event. In the vast EBACE exhibition floor, our booth was open to show the benefits of the EGNOS services to these demanding users.

There were two remarkable events on EGNOS in the Convention Agenda: the roundtable "Capacity and Connectivity: Satellite-Based Technologies to the Rescue" discussed the benefits of EGNOS for Business Aviation, with a keynote made by

Mr. Gian-Gerhardo Calini, from the GSA Market Development Department. There was also a meeting sponsored by EBAA and the GSA to discuss ongoing projects and new priorities for operators on the implementation of EGNOS-enabled operations.

Some interesting contacts were made at the event, and, as compared to past editions, an increased level of knowledge on the system was noticed among the attendees. Surely, EGNOS is succeeding in showing its benefits to these key aviation stakeholders.

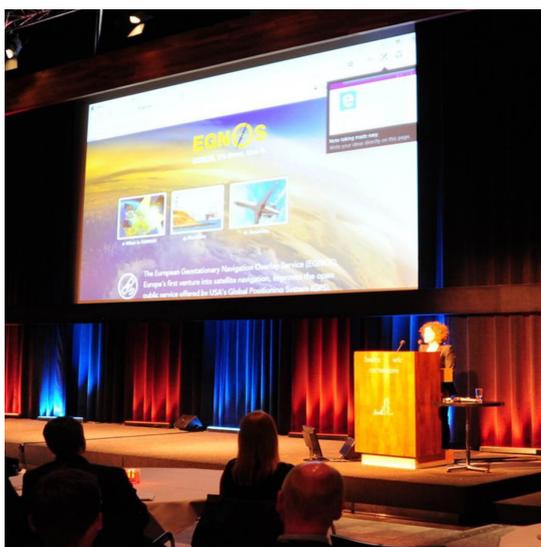


Did you know...?



...that this year edition of the European Navigation Conference was held in Helsinki from the 30th of May to the 2nd of June. The focus was on innovations in positioning, navigation and timing technologies and applications at land, sea and air. In the maritime field, it is worth highlighting ESSP participation with the presentation "EDAS Based Virtual Reference Stations for maritime users". More information [here](#).

in surveying.



ESRI GIS TRANSPORTATION SUMMIT

On the 19th May, EGNOS was presented in the [ESRI GIS Transportation Summit](#).

GIS experts from road, rail, aviation, public transport, maritime and logistics transportation organizations in Europe met in Rotterdam to exchange on the latest achievements.

In the plenary session, EGNOS was presented to the audience using the ArcGIS on-line platform. Proceeding of this conference can be found here.

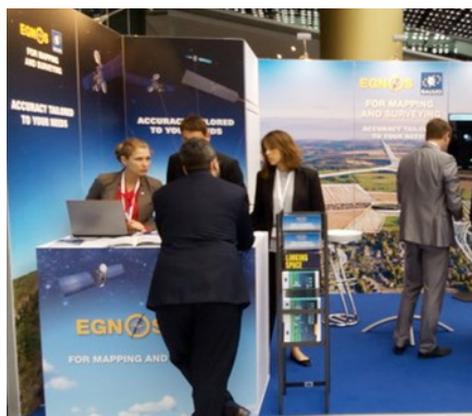
Have a look on it!, visit egnos.maps.arcgis.com

EGNOS AT GEOSPATIAL WORLD FORUM

EGNOS was present in Geospatial World Forum. A specific workshop on GNSS was provided on the 24th May afternoon.

It was presented to the audience how-to guides on the configuration of a number of receivers so:

- to have them ready to use free EGNOS signal.
- to have them ready to connect to EDAS NTRIP service.



Did you know...?

...that Google has recently announced that the new Android N operating system will make raw GNSS measurements available to apps? This means pseudoranges, Dopplers and carrier phase will be accessible from a phone or tablet computer, which opens a wide range of possibilities to the use of EGNOS! A hands-on demonstration of this new Google development will be offered in September at ION GNSS+. Read more in [GPSWorld](#) article.



in European GNSS initiatives.



EUROPEAN SPACE SOLUTIONS: BRINGING SPACE TO EARTH

The fourth edition of the European Space Solutions conference took place in The Hague from the 30th of May to the 3rd of June. Bringing together leaders from business, government and society, the event was focused on how space makes a difference to people's lives.

On one hand, Galileo and EGNOS (satellite navigation) were shown as main examples of European projects providing global precision and helping in the increasing of Europe's competitive edge. On the other hand, the opportunities that Copernicus (Earth observation) can deliver open the door to innovative solutions to real-life challenges.

Besides the plenary sessions, where leaders from the public sector and industry discussed on how space serves as a powerful tool in tackling today's economic, social, and environmental challenges, focus sessions targeted the latest trends in leveraging space solutions for Agriculture & Food, River Deltas of the World, Smart Mobility, Climate Change & Environment, Health & Safety and Energy needs.

EGNOS User Support was present at the Business Support area of the exhibition. In this booth, visitors were informed on EGNOS based services and were invited to contact the [EGNOS Helpdesk](#) where questions related to the EGNOS system, services and applications will be answered.

Further information on this event could be found [here](#).



Did you know...?

...that the Europe's largest event in Intelligent Transport Systems and Services took place from 6 to 9 June in Glasgow. This is the [ITS European Congress](#) driven in this edition by the main topic "Delivering Future Cities Now". Exhibition, live demonstrations and technical sessions were part of the event, where the latest trends in intelligent mobility were addressed, without forgetting sustainability and environmental issues, and highlighting the benefits space can bring to ITS applications.

Upcoming Events

INNOTRANS 2016

EGNOS will be present in the leading international trade fair for transport technology which takes place every two years in Berlin. Yes, we are talking about InnoTrans.

Organized by Messe Berlin, the 11th edition of InnoTrans will take place from 20 to 23 September 2016. Its more than 3000 exhibitors occupy all 40 halls available at Berlin Exhibition Grounds covering five segments: Railway Technology, Railway Infrastructure, Public Transport, Interiors and Tunnel Construction.

Do not miss the opportunity to visit EGNOS.



**20-23
Sept**

ERA General Assembly

ERA's premier event, the ERA General Assembly, will this year take place in Madrid between the 11th and 13th of October. The event provides a vital forum for regional aviation businesses where EGNOS, as one ERA member, will participate in the conferences and as exhibitor.

EGNOS will be there at stand B31.



**11-13
Oct**

Helitech 2016

The most prominent exhibition and conference related to Helicopters in Europe is scheduled this year again in Amsterdam, from the 11th to the 13th of October 2016.

EGNOS will be represented in the event with a stand and the GSA will participate in the experts Conference. Are you going to miss it?



**11-13
Oct**

Intergeo 2016

Geospatial community meets at INTERGEO: the entire value creation is present in this fair: from data capture, technologies and processes right through to finished products, visual representations and solutions.

EGNOS will be present at Intergeo 2016



**11-13
Oct**

ION GNSS+ 2016

ION GNSS+ is the world's largest technical meeting of GNSS technology, products and services. This year's conference will take place in September 12-16, at the Oregon Convention Center in Portland. As every year, this event will bring together international leaders and researchers in GNSS and related positioning, navigation and timing fields to present their new studies, technologies and products, providing the suitable environment for the exchange of ideas.

ESSP will be present in the Marine Applications session with the topic "EDAS for a DGPS Maritime Service: EGNOS Based VRS Performance with Pre-Broadcast Integrity Monitoring". Abstract available here.



**12-16
Sept**



EGNOS, it's there. Use it.

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

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.

<http://egnos-portal.gsa.europa.eu>

EGNOS applications. Developers platform. Business support.

For questions & information

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Disclaimer: EGNOS is a complex technical system and the users have certain obligations to exercise due care in using the EGNOS services. Before any use of the EGNOS services, all users should review the EGNOS Sol. Service Definition Document ("SDD") and/or EGNOS Open Service SDD (both available on the ESSP SAS website <http://www.essp-sas.eu/>) in order to understand if and how they can use these EGNOS services, as well as to familiarise themselves with their respective performance level and other aspects the services may offer. Use of an EGNOS service implies acceptance of its corresponding SDD specific terms and conditions of use, including liability. In case of doubt the users and other parties should contact the ESSP SAS helpdesk at egnos-helpdesk@essp-sas.eu. Aviation Users may also contact their National Supervisory Authority. Data and information (the "Data") provided in this document are for information purpose only. ESSP SAS disclaims all warranties of any kind (whether express or implied) to any party and/or for any use of the Data including, but not limited to, their accuracy, integrity, reliability and fitness for a particular purpose or user requirements. Text and pictures that are part of the Data may be protected by property rights. Any use shall require the prior written agreement of ESSP SAS.



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

