European
Global Navigation
Satellite Systems
Agency

LINKING SPACE TO USER NEEDS

Summary of GSA Achievements in 2016

A significant year for European GNSS and the GSA

FOREWORD

A number of important milestones were reached in 2016 for both the European GNSS Agency (GSA) and for the European GNSS programme as a whole. The headline, of course, was the Declaration of Galileo Initial Services in December, but the year was full of many key achievements highlighted here in this overview.

With the Declaration of Initial Services, Galileo officially moved from tests to the provision of live services. As a result, users around the world are now being guided using the positioning, navigation and timing information provided by Galileo. The start of Galileo services also marks an important milestone for the GSA. As Europe's link between space and user needs, the GSA was delegated the responsibility for the Galileo service provision by the European Commission. This transition started in January 2017 and is expected to be completed by June 2017.

Both in preparation for and support of Galileo Initial Services, a wide range of other important achievements were accomplished in 2016, to pave the way for the GSA to take up its new responsibilities in 2016, including:

- The signing of several major contracts and agreements, including the €1.5 billion Galileo Service Operator (GSOp) procurement contract, the €1.4 billion GSA-ESA Galileo Working Arrangement and the €2.4 billion amended European Commission (EC)-GSA Galileo Exploitation Delegation agreement.
- The first smartphone to incorporate Galileo came to market.
- The world's leading chipset manufacturer announced that its chips will be Galileo-enabled.

2016 was also another successful year for EGNOS, which posted its best-ever service provision. Not only did the programme continue to increase its market share in the key civil aviation sector, it saw substantial growth in such emerging markets as rail, maritime and road transportation. The Agency also made significant headway in moving towards EGNOS Version 3 this year, most notably by preparing the invitation to tender with the European Space Agency (ESA).

It is important to highlight the scale and success of the 'behind the scenes' work that is essential to achieving these results. First and foremost is the Agency's commitment to ensuring that Galileo and EGNOS, and the signals and services they deliver, remain secure. In 2016, a number of essential security activities were accomplished. For example, 2016 saw the Galileo Security Monitoring Centre (GSMC) start permanent 24/7 operations.

In 2016, the Agency published and extensively promoted the very first GNSS User Technology Report, which serves as a sister publication to our well received GNSS Market Report. The GSA also promoted European GNSS at a broad range of conferences and exhibitions and greatly improved its presence on the internet and social media. And to support the Agency's success in 2016, the GSA committed €1.1 billion, signed 360 legal commitments and processed 652 job applications.

2016 was a year spent preparing the Agency, the infrastructure and the market for the next phase of Galileo and EGNOS in order to meet the many challenges ahead. With the experienced and dedicated team we have in place, I am confident that the GSA's future – and the future of European GNSS – is bright.

Carlo des Dorides
Executive Director

2016: A Year in Review

By developing the next generation of Global Navigation Satellite Systems, Europe is opening new doors for industrial development, job creation and economic growth. In support of both Galileo and EGNOS, during 2016 the Agency was responsible for a broad range of core and delegated activities, including:

Strengthening the GNSS Service Portfolio

In 2016, the market position of Europe's GNSS programmes was strengthened by GSA actions in many ways, including:

- **Aviation:** prepared EGNOS adoption in such emerging markets as drones and surveillance, and focused on new opportunities offered by SAR.
- **Agriculture:** 3rd edition of the Farming by Satellite Prize.
- **Surveying:** 78% of reference networks have plans to upgrade to Galileo in 2017.
- **Road:** promoted the benefits of EGNSS to the Autonomous Driving concept, including engaging in constant dialogue with major car/sub-system manufacturers.
- **Rail:** achieved final recognition of GNSS as one of the pillars of future ERTMS by major stakeholders.
- **Location-Based Services (LBS):** 14 product tests were completed in cooperation with top mass-market manufacturers.
- **Timing and Synchronisation:** took the first concrete steps towards developing a time distribution concept based on Galileo Service Time for critical infrastructure.
- **Maritime:** developed International Association of Lighthouse Authorities (IALA) guidelines for the use of SBAS in maritime.

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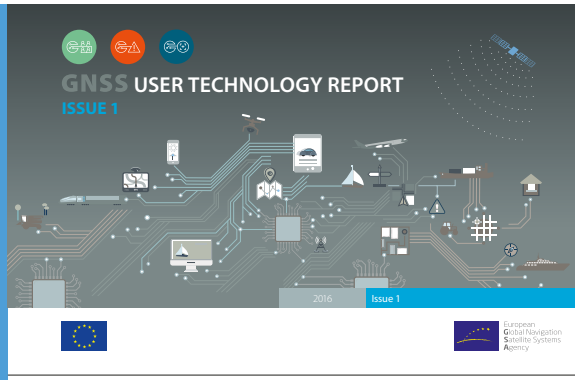
Preparing the market and ensuring the uptake of **EGNOS** and **Galileo**

The Declaration of Galileo Initial Services meant that the Galileo Open Service (OS), Search and Rescue (SAR) Service and Public Regulated Service (PRS) are officially operational. But before users could take full advantage of these services, they first



Taking the pulse of the GNSS user technology industry

In 2016, the GSA published the inaugural edition of its GNSS User Technology Report. As a sister publication to the *GNSS Market Report, the GNSS User Technology Report* zeros in on the state-of-the-art GNSS receiver technology, along with analysing the trends that are sure to shape the entire GNSS landscape. Over 5,000 copies of the report were downloaded for free in 2016.

According to the report:

- Nearly 65% of all chipsets and modules currently on the market support multiple constellations.
- It is expected that within the coming years, 100% of all new devices will be multi-constellation capable.
- The leaders in multi-constellation capability are mass-market receivers and high accuracy professional receivers, with nearly 30% already capable of using the four available global constellations.

had to have Galileo-ready devices. Thanks to the GSA's comprehensive market development efforts focussed on stimulating demand for Galileo in the user communities, many major chipset and receiver manufacturers had Galileo-ready devices available even before the launch of Initial Services. The Agency worked closely with the entire value chain (e.g. chipset and receiver manufacturers, service providers, etc.) and the main user communities (e.g. mobile operators for consumers, automotive industry for road, etc.), to support them in adopting Galileo.

A major focus in 2016 was the promotion of European GNSS within such emerging market segments as maritime and rail. Key achievements here included the recognition of Galileo by the International Maritime Organisation (IMO) and the inclusion of EGNOS and Galileo in the roadmap for the future European Rail Traffic Management System (ERTMS). As to PRS, the Agency supported Member States' Competent PRS Authorities in preparing their authorised users for the adoption of the Galileo PRS.

DID YOU KNOW

In 2016, 17 major brands had already included Galileo capability in their mass-market and professional devices, representing more than 90% of the market.

Promoting the Benefits of European GNSS

In the lead up to the Declaration of Galileo Initial Services, the GSA raised awareness on how the first services offered by the programme, together with EGNOS, will spark substantial economic growth in Europe. Here the GSA promoted – through a wide array of timely on- and offline campaigns, events and tools – how both programmes are fuelling new innovative and effective applications and services by offering more precise and reliable positioning, navigation and timing information.

By encouraging participation in the Horizon 2020 (H2020) framework programme for research and innovation, and promoting their results, the GSA continued to raise awareness on how EU-funding helps support the growth of European GNSS-powered businesses.

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In Focus: Civil Aviation

It was another year of growth for EGNOS and civil aviation. The GSA worked with 10 regional and business aviation operators to equip aircraft with EGNOS-compatible avionics. Another 71 new SBAS approach procedures were designed – including 18 LPV procedures – at 230 airports/helipads located in 20 countries.

Furthermore, 14 new projects were funded through various calls for proposals geared at fostering EGNOS adoption in civil aviation. Many of these projects are well on the way to developing 75 new EGNOS procedures and retrofitting 68 aircraft/rotorcraft with EGNOS capability.

In addition, EASA and the European Commission have mandated SBAS-LPV implementation across Europe by 2020.

Success story – The First Galileo Hackathon

In 2016, the GSA organised the first ever 'Galileo Hackathon'. This unique event brought together teams of passionate coders and geo-enthusiasts from around the world to compete for prizes. The challenge: to develop innovative applications that make full use of Galileo's unique capabilities, in less than 24 hours.

The Hackathon was an excellent opportunity for participants to connect with the Geo-IoT app development community and gain competitive insight on what Galileo brings to smartphones. It also provided a unique communications angle for the programme.

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Ensuring a Secure System

The GSA is also charged with ensuring that the system is secure. Thus, in the lead up to the Declaration of Galileo Initial Services, the issue of security was of critical importance.

The Security Accreditation Board (SAB), an independent body hosted by the GSA, is responsible for evaluating and assessing the security features of Galileo and EGNOS and the services they offer. In 2016, SAB oversaw a number of important security-related accreditations. Flight Key Cell operations were carried out and three Security Accreditation Statements were issued relating to the 7th and 8th Galileo launches – including the 1st launch of four Galileo satellites on Ariane 5 – as well as the historic Declaration of Galileo Initial Services.

Another key GSA Security milestone was the launch of permanent 24/7 operations at the Galileo Security Monitoring Centre (GSMC). The GSMC, which the GSA oversees, manages system security and serves as the operational interface between the Galileo Control Centres and relevant stakeholders.

In support of the Galileo Public Regulated Service (PRS), three workshops with the EU Member State Competent PRS Authorities (CPAs) were organised in the context of Initial Services preparation. In addition, the PRS Pilot Project call for grants regarding joint test activities was launched, with proposals currently under evaluation. The PRS user segment technological roadmap was monitored and the process to plan future activities has been developed in cooperation with the EC. The Agency also began developing a PRS service implementation roadmap for 2018-2020.

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2016 Communication Highlights

- Completely revamped content and design of the GSA website and reorganised the GSC website.
- Launched new **useGalileo.eu** tool for finding Galileo-enabled devices, in 24 languages, which saw nearly 40,000 unique visitors in the first month of going live.
- Published six *GSA Today* eNewsletters to over 8,000 subscribers, sent out 15 press releases to the media and placed a range of articles written by GSA experts in relevant trade publications.
- Coordinated the GSA's participation in over 36 events, including the organisation of the 4th successful *European Space Solutions* in The Hague with over 1,500 attendees, the 8th GSA Prize within the *European Satellite Navigation Competition*, the 2nd *GSA Open Days* in Prague and a strong contribution to the Galileo Initial Services launch event in Brussels.
- Increased the Agency's digital engagement (Facebook: +85%, Twitter: +137%, LinkedIn: +41%, YouTube: +75%) and launched numerous targeted promotional materials and videos.
- Continued to support the successful European Space Expo project, which welcomed its one millionth visitor.

Some 2016 GSA Security Achievements:

- The GSA's Central Security Office (CSO) finalised and maintained the physical security of GSA headquarters in Prague.
- PRS pilot projects were fully supported and a call for grants regarding joint test activities was launched and submitted proposals evaluated.

Developing the programme: Tasks delegated to the GSA from the European Commission

On top of these core tasks, 2016 was also a productive year for the Agency in relation to its various delegated tasks. Many of these tasks involved preparing the exploitation phases of Galileo and EGNOS and managing GNSS research under the EU's H2020 funding initiatives.

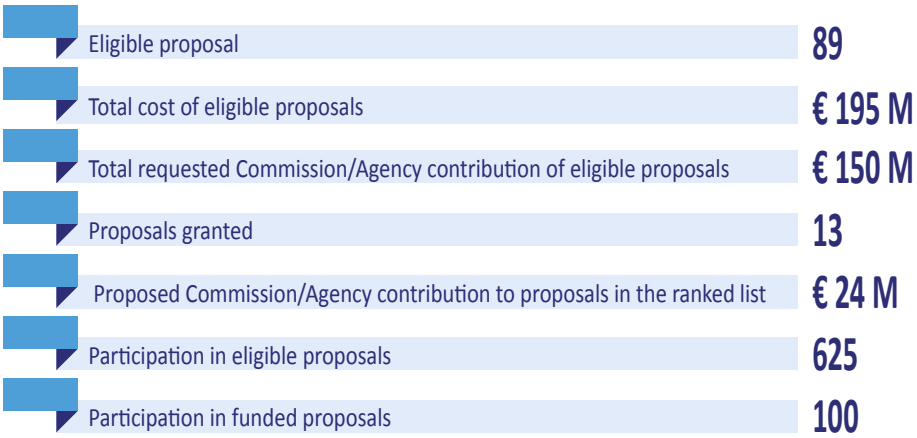
Managing **GNSS Research**

The GSA was delegated the responsibility of managing all of the EU's H2020-funded programmes relating to GNSS applications. In 2016, this role included seeing that the 27 projects from the first H2020 call all progressed according to plan and started producing concrete results. The GSA also oversaw the launch of 13 additional projects, funded under the second call. These projects cover all major GNSS market segments. The GSA opened a third call in November.

In addition, the Agency managed R&D activities relating to the Galileo PRS user segment. These activities focused on developing low-end operational PRS receivers (including security modules) and server-based PRS technologies capable of supporting future applications.

H2020 2nd Call

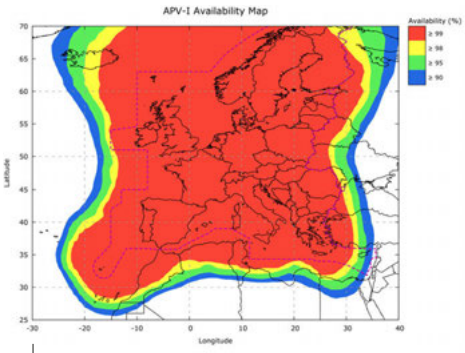
The topics included: EGNSS applications, Small and Medium Enterprise (SME), based EGNSS applications and Releasing the potential of EGNSS applications through international cooperation.



R&D by the numbers

By the end of 2016, H2020 projects have resulted in:

Exploitation of **Galileo** and **EGNOS**

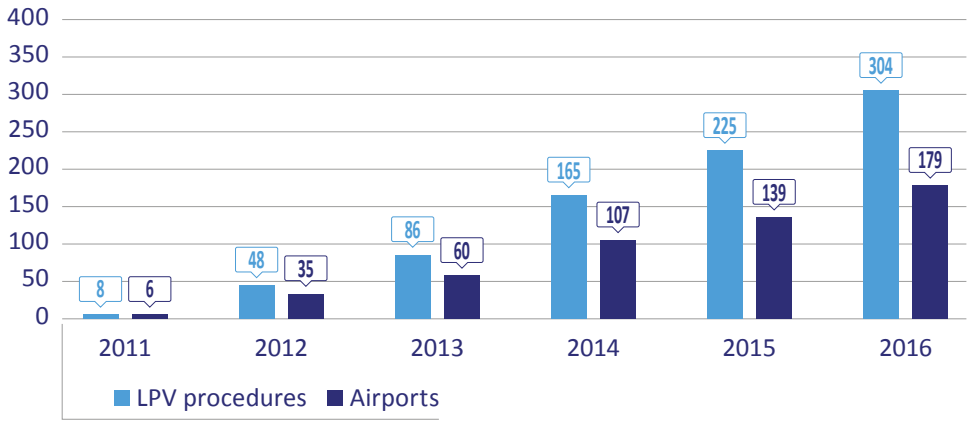


EGNOS Safety of Life service coverage

It was a very positive year in terms of the two delegation agreements pertaining to the exploitation phases of the Galileo and EGNOS programmes, both of which were amended in 2016. In December 2017, to coincide with the official declaration of Galileo Initial Services by the European Commission, the GSA awarded the Galileo Service Operator (GSOp) contract and prepared for the handover of activities previously performed by the ESA. At the end the year, the GSA formally signed a working agreement with ESA in regards to the Galileo programme. The agreement consolidates the partnership between the two agencies and focuses on the development of the Galileo ground segment.

Regarding EGNOS, in 2016 the programme continued to provide excellent service performance over the entire service area. The Agency also took significant steps to ensure the programme's future success by issuing a long-term roadmap for its activities and preparing the invitation to tender for EGNOS Version 3 with ESA. In addition, the Agency oversaw various procurement activities relating to the implementation of a new GEO transponder service. In the civil aviation segment, the GSA evaluated the 2015 call for proposals to foster EGNOS adoption. Twenty-seven aviation projects received funding, delivering more than 100 EGNOS procedures and 100 EGNOS-equipped aircraft.

Growth of EGNOS use in European Aviation



More and more receiver and chipset manufacturers are using Galileo

"With our Mate 9 and P10 families all being Galileo-enabled, we ensure our customers have the most connected device no matter where they are."

Huawei Europe Head of Handset Portfolio and Planning, Arne Herkelmann

"NovAtel's high-precision GNSS receivers, antennas and certified ground-reference station receivers have supported Galileo signals in anticipation of the complete constellation."

NovAtel President and CEO, Michael Ritter

"Qualcomm Technologies is helping to improve consumers' experiences with location-based services by adding Galileo support to our IZat location platform and deploying it broadly across our modem and application processor portfolios."

Qualcomm Technologies, Inc. Senior Vice President Product Management, Alex Katouzian

"It is a great privilege for BQ to be one of the first in the world to offer Galileo in our devices."

BQ Assistant General Manager, Rodrigo del Prado

Growing the **GSA Team** and Ensuring its **Success**

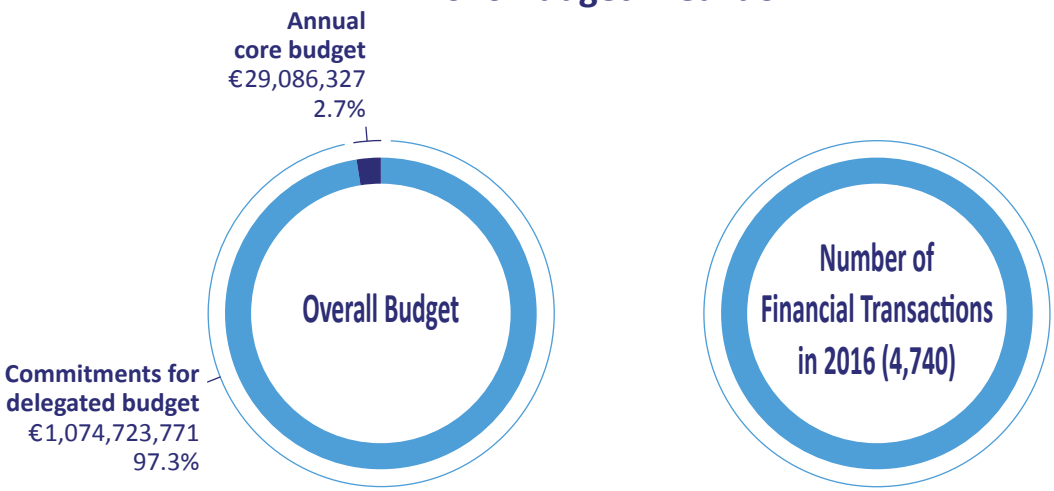
As Europe's GNSS programmes continue to mature and the GSA's role continues to expand, so must the team, funding and infrastructure that supports them.

Ensuring that the Agency is staffed with the specialised talent required remains a top priority, and in 2016 the GSA increased its staff size by 13% compared with 2015. Furthermore, as many procurements and contracts were initiated during the year, the GSA's Legal and Procurement capabilities played an important role in providing a foundation to ensure that the GSA can deliver.

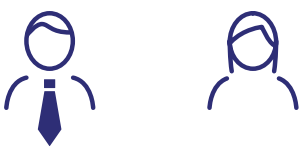
GSA Project Control activities ensured the effective management of the Agency's Administrative Board and such key programming documents as the Annual Work Programme and Annual Activity Report. In addition, more than 4,500 financial transactions were processed, with an average payment turnaround of just 14 days – well below the 30 days prescribed by the Financial Regulation. As to Risk Management and Quality Control, the Agency continued to improve its Integrated Management System in line with its ISO 9001 certification. It also took the first steps in preparing for the new Quality ISO 9001 Certification, which is expected in 2017.

The GSA's own executed budget for the year was €29,086,327. In addition, in 2016, the Agency managed a delegated budget of €1,074,723,771 in terms of new commitments for contracts and grant agreements, and €111,612,684 in payments. By the end of the year, the GSA's entire core budget was committed.

2016 Budget Breakdown

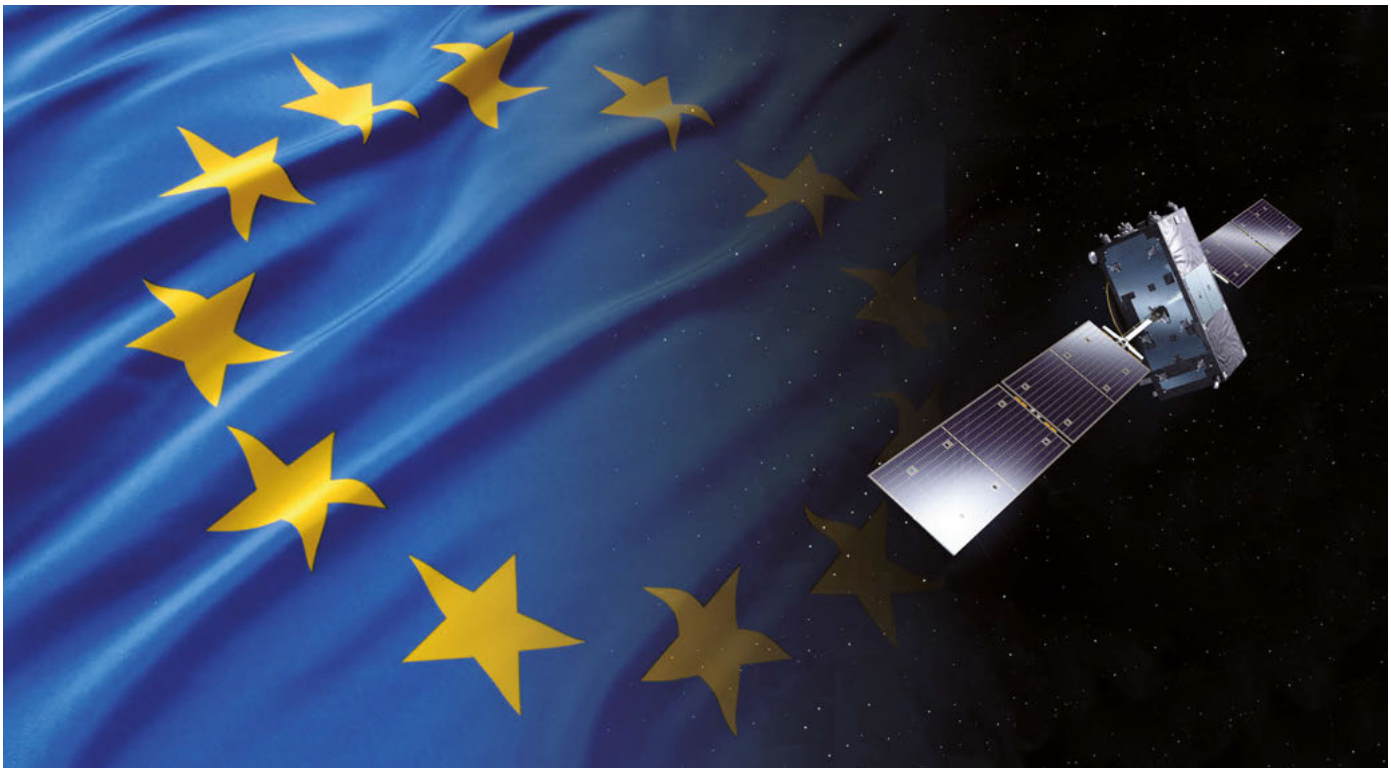


Gender Composition



Male: **54%** Female: **46%**

The GSA – making European GNSS work for Europe



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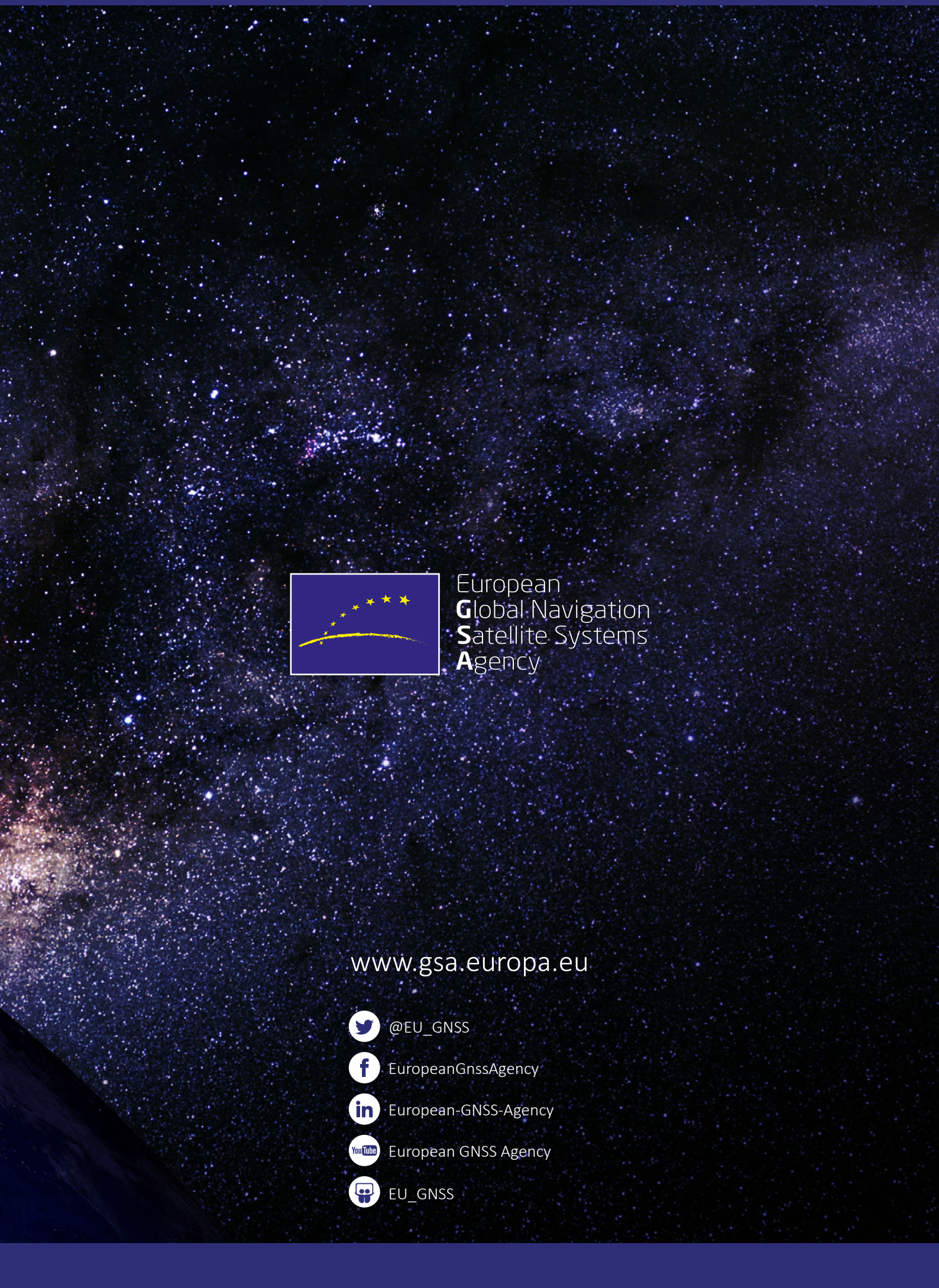
In summary, it was a positive year for the GSA, for Europe's space programmes and for Europeans everywhere. Although much of the discussion about Galileo Initial Services focused on user benefits, it is not only users who are reaping the rewards. Europe as a whole is set to enjoy substantial economic growth as a direct result of Galileo. The additional accuracy, integrity and resiliency provided by Galileo will enable a range of new applications and services that will benefit from increased positioning reliability, thus further driving economic growth in Europe and beyond.

In parallel with the development of Galileo, EGNOS also continues to develop and deliver. In the aviation sector, for example, more and more airports are implementing EGNOS-based approaches. In agriculture, EGNOS-based precision farming now benefits over two-thirds of Europe's tractors, and today EGNOS is the standard for mapping and surveying in Europe. EGNOS is also seeing increased interest from such areas as maritime and rail – a positive trend for the EGNOS service provision.

Turning our attention to 2017, the GSA is continuing its cooperation with the ESA on the acquisition of the multi-frequency/multi-constellation EGNOS V3 which, when operational, will improve the accuracy and reliability of the positioning platform. The GSA is also preparing the market for the EU's eCall initiative, which will be implemented in all new car models in Europe as of April 2018. As for Galileo, the GSA continues its work to maximise adoption across user market segments, fostering EU economic and industrial benefits. By the time the system reaches full operational capability in 2020, the Agency fully expects that Galileo will be positioned as the second GNSS constellation of choice in multi-GNSS receivers.

Clearly, it was a successful year for European GNSS and the GSA, one that further strengthens the solid foundation on which an exciting future will be built.



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