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**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND
THE COUNCIL**

**on the implementation of the Galileo and EGNOS programmes and on the performance
of the European GNSS Agency**

{SWD(2017) 346 final}

1. INTRODUCTION

On the occasion of the 60th Anniversary of the Treaty of Rome, EU leaders, the European Parliament and the European Commission committed to the Rome Agenda, and pledged to work towards a safe and secure Europe, a prosperous and sustainable Europe, a social Europe and a stronger Europe on the global scene. The European satellite navigation programmes EGNOS and Galileo contribute to this Agenda.

In line with the Union's Space Strategy¹ and the objectives of the GNSS² Regulation³, Galileo and EGNOS focus on:

- maximizing the integration of space into the European society and economy, by increasing the use of satellite navigation technologies and applications to support public policies;
- fostering a globally competitive European space sector, by supporting research, innovation, entrepreneurship for growth and jobs across all Member States;
- strengthening synergies between civilian and security activities in the field of navigation, and ensuring European autonomy;
- promoting the role of the Union in the world and opening up new business opportunities for the European satellite navigation industry.

This report presents the interim evaluation of the European satellite navigation programmes, Galileo and EGNOS, and the evaluation of the European GNSS Agency (GSA) as required by Article 34 of Regulation (EU) No 1285/2013 on the implementation and exploitation of the European satellite navigation systems ("the GNSS Regulation")⁴ and Article 26 of Regulation (EU) No 912/2010 setting up the European GNSS Agency ("the GSA Regulation")⁵. The report is accompanied by a Staff Working Document detailing the evidence based assessment.

¹ COM(2016) 705 final of 26.10.2016.

² GNSS stands for Global Navigation Satellite System.

³ Regulation (EU) No 1285/2013 of the European Parliament and of the Council of 11 December 2013 on the implementation and exploitation of European satellite navigation systems and repealing Council Regulation (EC) No 876/2002 and Regulation (EC) No 683/2008 of the European Parliament and of the Council (OJ L 347 of 20.12.2013, p. 1).

⁴ Regulation (EU) No 1285/2013 of the European Parliament and of the Council of 11 December 2013 on the implementation and exploitation of European satellite navigation systems and repealing Council Regulation (EC) No 876/2002 and Regulation (EC) No 683/2008 of the European Parliament and of the Council (OJ L 347, 20.12.2013, p. 1).

⁵ Regulation (EU) No 912/2010 of the European Parliament and of the Council of 22 September 2010 setting up the European GNSS Agency, repealing Council Regulation (EC) No 1321/2004 on the establishment of structures for the management of the European satellite radio navigation programmes and amending Regulation (EC) No 683/2008 of the European Parliament and of the Council (OJ L 276, 20.10.2010, p. 11).

The interim evaluation focuses on the period from 1 January 2014 to 31 December 2016. It covers the progress made in the European GNSS programmes Galileo and EGNOS against the evaluation criteria set up in the Better Regulation Guidelines⁶: effectiveness, efficiency, relevance, coherence and EU added value, specific requirements enshrined in the GNSS Regulation, and the overall political objectives of the Union. As the GNSS Regulation entrusts the GSA with a key role in the implementation of the European satellite navigation programmes, the Commission considered it is appropriate to evaluate the GSA jointly with the evaluation of the programmes.

2. MAIN FINDINGS CONCERNING THE IMPLEMENTATION OF THE EUROPEAN GNSS PROGRAMMES

2.1. RELEVANCE OF THE GALILEO AND EGNOS PROGRAMMES

The European satellite navigation systems, Galileo and EGNOS, owned by the European Union, are fundamental for both the European economy and security. Positioning and timing signals provided by satellite navigation systems are used in many critical areas of the European economy, such as mobile phone networks, in-car navigation, traffic management, power grid synchronisation or electronic trading. It is estimated that almost 11% of the EU economy is impacted by satellite navigation services⁷. Therefore, the EU clearly needs to maintain and operate independent satellite navigation programmes to secure the availability of those applications and services ensuring global coverage, including the circumpolar area. In addition, space capacities are strategically important to civil, commercial, security and defence-related policy objectives. For this reason, Europe needs to ensure an autonomous, safe and cost-effective access to space.

2.2. ACHIEVING KEY OBJECTIVES

2.2.1. Market uptake

Over the evaluation period, the market uptake of Galileo and EGNOS has progressed well. The European GNSS industry has grown and accounted for 25% of the global GNSS market in 2015⁸. European manufacturers represented the majority of manufacturers for the road and maritime market segments. European system integrators represented the majority of integrators for the maritime, agriculture and surveying market segments.

Driven by a few large companies and a plethora of innovative SMEs and start-ups, Europe performs strongly in the development of added-value applications⁹.

⁶ Better Regulation. Guidelines on Evaluation and Fitness Checks.
http://ec.europa.eu/smart-regulation/guidelines/ug_chap6_en.htm (access: 2017-04-12).

⁷ Analysis of GNSS impact on the EU Economy, November 2016. Study conducted by VVA, GMV, Kontor Qwentes and LS.

⁸ European GNSS Agency: GNSS Market Report, Issue 5 (May 2017), p.13.

⁹ European GNSS Agency: GNSS Market Report, Issue 5 (May 2017), p.13.

The development of Galileo has already generated major benefits in Europe, like the development of services. Thus, following the declaration of Galileo Initial Services, chipset and receiver manufacturers have had the possibility to start leveraging on more performant GNSS signals, especially for smartphones and in-vehicle navigation systems. The vast majority of new navigation chipsets include the processing of Galileo signals and are gradually integrated in user receivers in various market segments. All new products of the two largest smartphone manufacturers do include Galileo-compatible chipsets, which is a true measure of its success. The regulatory measures taken by the EU in the automotive sector (eCall and Digital Tachograph) are pushing for the adoption of solutions integrating GNSS based technologies, whilst at the same time ensuring compatibility with Galileo and EGNOS. It is worth pointing out that Galileo competes with other GNSS that are supported by regulatory measures to impose or stimulate the use of these systems.

As for EGNOS, major socio-economic benefits have already been produced especially in three industrial domains with the largest market penetration: aviation, agriculture and surveying. In other sectors, such as maritime and rail, the GSA has been implementing market penetration roadmaps. However, due to the slower adoption of new technologies and existence of alternative ground based technologies the market uptake in these sectors is slower.

2.2.2. System deployment and services

The Galileo programme has achieved its key objective set out for the evaluation period - the system was declared operational and is providing Initial Services since December 2016, namely an initial open service (OS), search and rescue support service (SAR) and public regulated service (PRS).

The space segment of Galileo was enhanced with 14 additional satellites launched in the evaluation period, one of the enablers for declaring the Galileo Initial Services operational. In November 2016, for the first time ever, four Galileo satellites were launched together on an Ariane-5 rocket. The implementation of complex technology intensive programmes however entails risks. Galileo is no exception. Such risks materialised in 2014 with a Soyuz launch incident, which resulted in two satellites being injected into an incorrect orbit. It materialised also with an anomaly affecting some atomic clocks on board of Galileo satellites. In both cases, the root cause has been identified and the necessary mitigation actions have been implemented. The delay in the deployment schedule induced by the launch anomaly was recovered with an accelerated ramp-up of the Galileo space segment and the two satellites are already being used for the SAR service. As regards the clocks, a refurbishment programme for the next satellites to be launched has been implemented and operational procedures for the satellites in orbit established. The quality of the services provided by the system has not been affected by the difficulties encountered and the performance of the system is above expectations.

The EGNOS services were continuously provided and improved during the period 2014-2016. Thus, EGNOS now provides the highest quality guided approach services available today to airline and aerodrome operators, with an increase in flight and landing safety, and benefits related to the optimisation of fuel consumption. In addition, EGNOS is used by a larger number of users: more than 230 airports in 20 countries are using EGNOS landing approach procedures at the end of 2016¹⁰.

However, the priority for EGNOS remains to cover the entire EU-28 territory with the EGNOS service and to extend the EGNOS service coverage to the remaining 1.02% of the EU-28 territory (eastern part of Cyprus, the Azores, and the northern parts of Norway and Finland).

2.2.3. International cooperation

In the field of international cooperation, several actions were undertaken to strengthen Europe's role as an international player in the field of GNSS. In particular, negotiations were concluded in 2016 with the Agency for Aerial Navigation Safety in Africa and Madagascar (ASECNA), laying down the terms and conditions for the provision of space based augmentation systems in Africa based on EGNOS. In addition, the GNSS agreement with Korea was concluded in June 2016 for increased cooperation.

2.3. EFFICIENT DELIVERY - MANAGEMENT

2.3.1. Budget

For the period 2014-2020, the European Union allocated a total budget of EUR 7 071,73 million for the Galileo and EGNOS programmes. This envelope covers programme management activities, Galileo deployment and exploitation activities, EGNOS exploitation activities and risks associated with these activities. As of end 2016, the Galileo and EGNOS programmes are on track to respect the budget boundaries set by the GNSS Regulation for the period 2014-2020. The Commission monitors the budget closely to ensure it stays within the limit.

2.3.2. Delivery mechanisms

Over the period 2014-2016, the governance scheme that was decided in 2013 has been progressively implemented: Delegation Agreements were concluded between the Commission and the European Space Agency (ESA) on the Galileo deployment phase, as well as between the Commission and the European GNSS Agency (GSA) on the Galileo and EGNOS exploitation phases. Working Arrangements between the GSA and ESA for both Galileo and EGNOS programmes were equally concluded. The role of the GSA in the operational management of the programmes has gradually increased.

¹⁰ European GNSS Agency: Summary of Achievements in 2016, p. 6.
https://www.gsa.europa.eu/sites/default/files/2016_gsa_summary_report.pdf

The new governance scheme has brought more robust management processes. These have contributed to maintain the programmes within budget boundaries and to mitigate risks and the impact of unforeseen events on the programmes.

The new governance set-up required the key actors (European Commission, ESA and GSA) to adapt to their new role, a role which is not necessarily fully in line with their corporate culture, competencies and/or structure. That adaptation however led to some inefficiency. For example, the organisation of responsibilities and control processes has often required lengthy discussions among the governance actors, thus affecting the reactivity of the decision-making process. Furthermore, the fact that the deployment phase and the exploitation phase run in parallel with different governance set-up required both agencies to perform additional activities to ensure consensus with the Commission on the way tasks have to be executed.

A learning curve of the involved entities and of the programmes themselves is expected to further improve the situation in the next few years. An efficient decision-making process is particularly important for operational programmes driven by services and users' needs as Galileo and EGNOS. In that context, the interaction between the entity in charge of deployment (ESA) and the entity in charge of operations (GSA) will have to be looked at closely.

In terms of security, the declaration of Galileo Initial Services and the overlap of the deployment and exploitation phases have led to some challenges. In particular, the independence in operation of different entities responsible for the implementation and verification of security requirements (European Commission, GSA, ESA) should be maintained.

However, it is still worthwhile to further optimise the current governance scheme for the Galileo and EGNOS programmes, in order to reflect the entry into operational phase of such service-driven programmes. This may involve reducing the administrative burden for the key actors, as well as the complexity and length of the decision making process. Finally, it should evolve to take into account new security challenges such as cybersecurity and to clearly define the roles and responsibilities of the actors in charge of the implementation and verification of security requirements.

2.4. EU ADDED VALUE

With the Declaration of Initial Services, Galileo officially moved from a testing phase to the provision of live services. Users around the world are now guided using the positioning, navigation and timing information provided by Galileo¹¹.

A few months after the Declaration of Initial Services, a number of Galileo-ready devices already hit the mass market. All main chipsets (sold by 17 major suppliers worldwide,

¹¹ European GNSS Agency: GNSS Market Report, Issue 5 (May 2017), p.15.

representing 95% of the market) that are used in smartphones, tablets, cars, professional survey equipment, etc. use Galileo.

These chipsets are embedded in consumer and professional products that we can buy today. Based on the main products on sale, the GSA estimates that more than 100 million user devices enabled for EGNOS and/or Galileo services are today in the hands of European citizens. From 2018, all new car models sold in the European Union will rely on EGNOS and Galileo to calculate the position of emergency calls in case of accidents.

In addition, the potential number of users is expected to become bigger: shipments of GNSS devices in the European Union are expected to grow from 210 million units in 2015 to almost 290 million in 2020¹², representing a much larger base of users for EGNOS and Galileo.

Thus, the implementation at EU level of the Galileo and EGNOS programmes has brought a high added value compared to what could have been achieved by the Member States at national, regional or local level. The size and complexity of the programmes require implementation at EU level, as no viable alternative exists to ensure an appropriate return on investment. As a result of this, all stakeholders agree that the continuation of the programmes' implementation at EU level is a condition for the achievement of the Galileo and EGNOS objectives.

The Galileo and EGNOS programmes contribute to a safe and secure Europe by ensuring European autonomy in accessing and using space in a safe and secure environment, and in particular consolidate and protect its infrastructures, including against cyber threats, as well as by strengthening synergies between civilian and security activities in the fields of navigation, communication and observation, including through monitoring borders, land and maritime security conditions.

The Galileo and EGNOS programmes also promote a stronger Europe on the global scene. Given the increasing competition with other GNSS and SBAS systems, it is crucial that Europe develops its own systems, to take part in the race to the technology, to remain a world-class actor in space and a partner of choice on the international scene.

3. MAIN FINDINGS CONCERNING THE GSA

3.1. IMPACT AND EFFECTIVENESS OF THE GSA

Over the period 2014-2016, the GSA has successfully achieved important objectives for the progress of Galileo and EGNOS programmes and for the development of European downstream markets. This has been accomplished through an effective implementation of both core tasks entrusted to the GSA directly on the basis of the GSA Regulation, and tasks delegated to it by the Commission through Delegation Agreements.

¹² European GNSS Agency: GNSS Market Report, Issue 5 (May 2017), p.13.

Key achievements of the Agency include the implementation in particular of testing activities that were a prerequisite for the declaration of Galileo Initial Services; the transition towards the Galileo exploitation phase, in particular the award of the contract to the Galileo Service operator (GSOp); the smooth implementation of FP7, Horizon 2020 and Fundamental Elements R&D projects; as well as downstream market development through monitoring, communication and promotion activities. These results have been delivered within budget.

3.2. EFFICIENCY IN TERMS OF SMOOTH RUNNING, WORKING METHODS AND USE OF RESOURCES

Over the period 2014-2016, the Agency has been efficient overall in terms of smooth running, working methods and use of resources.

As regards the smooth running of the Agency, the processes implemented by the GSA are primarily defined in the legal framework governing the Agency, which the Agency has complied with. This has contributed to the effective implementation of the programmes.

Regarding working methods, the GSA has been proactive in improving the effectiveness and efficiency of its delivery process, to be able to handle properly the increasing responsibilities with which it is entrusted. Thus, the Agency has been awarded in the period the ISO-9001 certification, showing a quality management system.

Concerning the use of resources, the GSA has faced a challenge in terms of attracting the relevant resources and skills. Between 2014 and 2016 with the increasing responsibilities entrusted to the GSA, the total budget managed by the Agency has grown by 85,9%, and the GSA staff has increased by 22,1%.

3.3. ROLE OF THE SECURITY ACCREDITATION BOARD (SAB) AND SECURITY GOVERNANCE

The GSA Regulation established the SAB, which is responsible for security accreditation related tasks for the European GNSS systems. It works independently with no reporting to the GSA Executive Director. The SAB has performed well, and constant monitoring is required to ensure its complete independence.

The evaluation has demonstrated that all relevant bodies (e.g. security organisation in EC, ESA and GSA; SAB) and processes (e.g. security requirement identification, security accreditation, security risk identification and management, security of the operations, system security monitoring) are today up and running. This has allowed the relevant actors to fulfil their tasks ensuring the accreditation of all the deployed elements of the European GNSS systems, the accreditation of the Ariane 5 as a launcher for the Galileo satellites, and the declaration of the Galileo Initial Services in December 2016.

The efforts to optimise security will have to continue, in particular, with regard to the appropriate management of cyber threats and the need to improve the independence of security accreditation activities from other programme activities. The GSA will have to monitor its ability to maintain the security processes through the exploitation phase.

4. WAY FORWARD

4.1. MARKET UPTAKE OF GALILEO AND EGNOS

Continuing to reinforce the market uptake of Galileo and EGNOS services is essential to ensure the return on the Union's investment in the programmes and to maximise the socio-economic benefits that these services can generate. There is a need to continue working on ensuring an appropriate regulatory framework for the uptake of GNSS services. This will also require reinforcing available legal mechanisms.

At EU level, EU policies have to take into account the benefits of Galileo and EGNOS positioning, navigation and timing services through concrete measures, including regulatory measures, development of standards and future sectoral strategies. The emphasis needs to be on key sectors with the highest added value such as mobile phones, Internet of Things, autonomous and connected cars, aviation and unmanned aerial vehicles (drones) and critical infrastructure using timing synchronisation. The Commission will release a European radio navigation plan to facilitate the introduction of global navigation satellite system applications in sectoral policies. At national level, these efforts should also be supported by encouraging the use of Galileo and EGNOS services in national policies and government applications.

Devices and applications using Galileo and EGNOS are developed by SMEs and start-ups. European companies are facing fierce competition from US and Chinese companies and they are dependent on non-European critical components and technologies. There is a need to step up the support for increasing the competitiveness of European downstream industry aimed at improving their global market share, and creating jobs. Support for research and development activities, SMEs and start-ups in the area of satellite navigation through EU funding programmes are to be monitored.

Galileo and EGNOS services must continue to develop based on the needs of users to deliver state-of-the-art satellite navigation services with higher robustness and new innovative features. This is especially important in an ever more competitive international environment where other constellation providers have ambitious modernisation plans. The Commission is already working on the next generation of Galileo and EGNOS infrastructure that will allow for modernised services. To ensure that developments are driven by user needs, including security-related requirements, the Commission will strengthen the user consultation process and set up dedicated user platforms.

4.2. GALILEO AND EGNOS SERVICES

After the Initial Services phase, the Commission will ensure that Galileo services are gradually improved with the aim of reaching full operational capability by the end of 2020. To reach this objective, the space and ground infrastructure of Galileo will continue to be deployed. The Commission will procure necessary launch services to ensure the launch of all procured satellites.

The Galileo Commercial Service will also be introduced before 2020 consisting of innovative high accuracy and authentication features, both expected to be differentiators for the adoption

of Galileo by users. In addition, the Commission has launched the work on the evolution of the system, in full consultation with Member States and end users' communities to ensure that future services continue to be fully in line with their needs.

Emphasis should also be put on cyber security to ensure that protection mechanisms are in place, and are commensurate with the evolving cyber threats.

The EGNOS services are provided to end users in Europe with a high degree of stability and performance. The key user community of EGNOS is the aviation sector. To guarantee the continuity of the EGNOS services, recurrent activities will continue to be implemented and system updates prepared. The Commission will ensure that full coverage of the targeted area is achieved in line with the EGNOS Service Evolution plan.

In parallel, the development of the next generation of EGNOS is well under way. This new version will augment both GPS and Galileo signals on dual frequencies, which will bring major improvements to the EGNOS services and increase user uptake.

Finally, to safeguard the resilience of the services, the Commission will assess measures to secure the provision of critical components for both satellite navigation systems, in particular through diversification of the supply chain.

4.3. INTERNATIONAL COOPERATION

The promotion and use of Galileo and EGNOS services worldwide is important to increase the use of European technologies worldwide and to open up new market opportunities for European companies. The adoption of EGNOS technology and services in the Western Balkans, in the European Neighbourhood Policy (ENP) countries and on the African continent is expected. As regards Galileo, promising markets which would greatly benefit from its services and applications will be targeted, such as for example Asia and South America.

Galileo and EGNOS programmes are also means for reinforcing the role of the EU as a global actor. The representation of the programmes' interests in international organisations and fora needs to be reinforced, in particular on subjects related to compatibility and interoperability with other global satellite navigation systems and proper use of frequency bands.

4.4. GOVERNANCE OF THE PROGRAMMES

The public governance of the programmes put into place for the period 2014-2020 ensured a smooth transition from the deployment to the exploitation phase of the Galileo programme. The GSA is progressively settling into its new role in the operational management of Galileo.

The experience with the operational management of EGNOS shows that an approach where design, construction, operations and service provision are most efficiently delivered in fully integrated management.

In the governance of security related issues, adequate mechanisms are in place to ensure smooth management of requirements during the overlapping deployment and exploitation phases up to 2020. The independence of operation of the organisations (the Commission,

GSA and ESA) responsible for security requirement implementation and verification should be maintained and the independence of the security accreditation activities from other programme activities could be further improved.

The Commission will monitor and, if necessary, adjust the interactions with the GSA, ESA and other stakeholders of the Galileo programme in particular in order to ensure that the needs of the exploitation phase of Galileo are met.

Ahead of the proposals for the next multi-annual financial framework, the Commission will initiate a review of the overall governance to address the shortcomings identified during this evaluation process.

5. CONCLUSIONS

The evidence presented in the interim evaluation demonstrated that overall the implementation of the GNSS Regulation and of the GSA Regulation has shown good results in the light of the general evaluation criteria and specific requirements for the European GNSS programmes. The Galileo and EGNOS programmes have achieved all the milestones that were set for the period concerned and progress is being made towards delivering on all the programme implementation objectives set for 2020.

Looking to the future, the Commission aims to provide a long-term vision for the programmes, allowing businesses and users to reap the benefits of the European satellite navigation systems. In this context, the Commission will strive for greater synergies between space and defence programmes, in line with the recently adopted Space Strategy for Europe and Defence Action Plan.

The growing demand for precise location information, in combination with the ongoing evolution of satellite navigation technology, means that the European market for users of Galileo and EGNOS will expand. Also, the traditional GNSS market will be complemented with the field of Internet of Things, smart cities and Big Data.

Therefore, the next years will be crucial for consolidating the achievements and preparing the evolution of the programmes.