GOVSATCOM
makes the EU stronger on security and defence

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Abstract

In the era of cyber threats and incidents related to the issue, secure communication for applications in critical circumstances responds to the growing need in Europe, where the use of commercial services is becoming insufficient. One solution that fulfils security needs is to provide accessible and reliable services based on space segment resources that are government controlled. The aim of the paper is to investigate Governmental Satellite Communication (Govsatcom), which is the first such large initiative to strengthen and increase the security and defence of the community of European countries. Furthermore, the paper discusses some implications related to the demand for this type of satellite communication and describes the engagement of the main involved institutions i.e. the European Space Agency, European Defence Agency, and European Commission, especially elaborating the PACIS projects running under ESA umbrella, which are one of the main preparatory actions for the IV EU Space Programme. Considerations about future relations between related parties and Poland's possible engagement and the kind of benefits it would deliver are also considered. The paper leads to a conclusion that the future EU space programme creates a proper environment for cooperation between community members and delivers an opportunity to use safe and secure satellite communication for members who cannot afford to have their own capabilities.

Keywords:

European Union, satellite communication, national security

Introduction

Telecommunication is the foundation of the functioning of every developed society. In the era of cyber threats and incidents related to the issue, secure communication for applications in critical circumstances responds to the growing need in Europe, where the use of commercial services is becoming insufficient. One solution that fulfils security needs is to provide accessible and reliable services based on space segment resources that are government controlled. It enables an appropriate response to threats, and also creates the opportunity for international cooperation (Ranvoisy & Gault, 1981, pp. 1343–1351). It should be borne in mind that sending sensitive information related to security requires guaranteed access to means of communication and protection against interference, interception, violation and risk related to cyber threats (Bielawski 2019) as well as directing the integration of scientific and industrial potential in the area of defence towards European Union countries (Papadimitriou *et al.*, 2019, pp. 183–191).

EU Member States are facing up to Europe's defined needs in the area of providing satellite communications. This is confirmed by the actions taken to create the Governmental Satellite Communications (GOVSATCOM), which is the first such large initiative to strengthen and increase the security and defence of the community of European countries (European Defence Agency – EDA 2019). The priority objective of this programme is to ensure long-term access to satellite services, ensuring access to reliable, secure and cost-effective telecommunications for the European Union and the Member States in the future funding period for 2021–2027. These services are to be secure, reliable and cost-effective for EU and national public authorities, managing mission and critical security operations (EDA 2019). The increase in European autonomy as well as overcoming the fragmentation of demand by using expensive and innovative solutions in synergy with industrial entities, deserves attention in the programme. The European Union, the EDA and the European Space Agency (ESA) are involved in the programme, whose activities are closely connected and coordinated with each other. They perform in parallel preparatory actions in the form of projects and demonstration activities, the result of which is that information is collected on the needs and organisation of the system and establishing relationships between entities interested in its use at the national and Community level. Bearing in mind the aspects above, Poland responds actively in its national space strategy (PSK – Polish Space Strategy) through participation in the GOVSATCOM program as a priority, becoming in the same breath a tool for achieving goal number 1 of PSK, which is supposed to increase the competitiveness of the Polish space sector and its share in the turnover of the European space sector. The PSK is part of the Strategy for Responsible Development which responds to a new model for Poland's economic development. The purpose of PSK is to build a stable and efficient collaboration between science and industry, development of new techniques and technologies as well as supporting foreign cooperation, in order to stimulate economic growth, based on innovations in the space sector (Ministry of Development 2017). The implementation document, which is the project of the National Space Programme (NSP), set up for 2019–2021, assumes in its content the development of capabilities applicable in the security and defence area to improve safety as a whole, using the potential of the space sector. Development of safe and secure satellite communication would be one of the priorities set by the NSP in a short timeframe, contributing collaterally to the initiative which is to kick-start soon in the European arena.

The purpose of this p is to identify the meaning of Governmental Satellite Communication GOVSATCOM. It updates the information related to the subject matter presenting the involvement of the EU and the ESA in preparatory actions already run for the EU Space Programme.

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Genesis

In December 2014, the European Commission expressed the need to create a new generation of satellites for government satellite communications. For this purpose, it was necessary to establish close cooperation between the ESA, the EDA and the Member States of these organisations. The need to create a common satellite communication system has been highlighted in many documents developed together by the subject institutions. In November 2014, the European Defence Agency approved the initial satellite communications needs for European military entities involved in conducting national operations and operations of the Common Security and Defence Policy (CSDP). Thanks to the support of the EDA feasibility study, technical and missionary requirements for 2016 were developed in 2015 and various solutions regarding these needs were also assessed. In 2016, in the Global Strategy, the European Union recognised the importance of external and internal threats. Controlling and monitoring the sovereignty of borders required the undertaking of investments in the field of satellite communication and autonomous access to space as well as constant observation of both the Earth and the area outside the Karman line. To increase EU autonomy, security has become a priority of the global strategy. In the European Defence Action Plan, the European Commission has highlighted, among other things, the need to strengthen Member States' defence capabilities through the joint procurement of armaments and military equipment, developing and maintaining a full spectrum of operational capabilities on land, sea, air and space, highlighting the need here to take steps to ensure the protection and critical resilience of European space infrastructure in both military and civil areas. In connection with the EU capabilities, it was considered necessary to strengthen the defence industry due to the competitiveness in the European technological and industrial base in order to enable the use of the resources by EU Member States and international partners and organisations, i.e. NATO. The currently evolving threat environment needs particular care. Therefore, the implementation of appropriate solutions to reduce the risk for the EU and its Member State operations has become an important aspect for the European Union to face.

EDA – Govsatcom Demo

At the level the EDA's work, after the needs of Govsatcom were collected and developed by the Steering Board in March 2017, a demonstration project began to be developed, the so-called Govsatcom Demo to provide government satellite telecommunications capabilities to EDA member states and European CSDP entities based on existing, as well as developed, combined SATCOM resources. The "Pooling & Sharing" demonstration project of EDA Governmental Satellite Communication has now entered the implementation phase with the first meeting of the Project Management Group taking place in Madrid (EDA 2019). The project is ready to provide telecommunications services in order to meet the relevant requirements of Member States and European CSDP entities. This is possible thanks to the use of resources provided by Member States. The combination of these capabilities is designed to provide SATCOM satellite communications that cannot be obtained on the commercial market. The Govsatcom demo version responds to the need for secure and guaranteed access to satellite communications and is fully compatible with the EU's defence capabilities priorities. It is very likely that it will replace the current initiative to acquire satellite services from EDA, the so - called SatCom Market, in the future.

ESA – Govsatcom Precursor

In 2016, a meeting of the Ministerial Council of the ESA took place, at which Member States declared their participation in the programme. The first step of ESA in the implementation of the project consisted primarily of preparatory research, by supporting

requirements consolidation, identification of innovative technologies, subsystem projects as well as preparation of technical implementation scenarios of the programme. In addition, the project is to ensure custom system solutions (including elements of the orbital system) and innovative services that support the validation of technical specifications and initial operational concepts. These activities are carried out to explore the possibility of using them in the future system. A very important aspect at this level of activity is also supporting European industry in developing new technologies to increase security and IT solutions. The third step involves managing the GovSatcom programme itself, which is planned to be under the leadership of the European Union. GovSatcom consists of several projects, called Pacis, which are run by satellite operators or service providers supported by an industrial team from ESA Member States. They aim primarily to develop and demonstrate an innovative system of solutions and technologies for connecting and providing existing or future secure satellite systems and services. The next goal of the projects is to support, create and certify secure operational facilities including the deployment and initial use of the planning phase of future missions. An important aspect of the projects is also to offer potential institutional users the possibility of their own involvement by demonstrating services using available space.

Six implementation projects have begun:

Pacis –1 (current participants are Luxembourg, Belgium, Great Britain and Portugal), it is implemented in cooperation with a satellite operator and a consortium. The project aims to demonstrate the benefits of using a secure hub using commercial and government communication satellites for rapid deployment for emergency communications, civil defence and humanitarian aid. Its implementation is expected to last until 2020/2021.

Pacis –2, in which Spain is involved, aims to develop an intelligent satellite communication flow management system. The program's assumption is to maintain the full capacity of the satellite, use the adaptability of satellite antennas and also satellite processes to ensure communication between the ground station and the satellite depending on various policies and priorities of users. The project is to show that the developed system will have a positive outcome thanks to using satellites, in telemedicine and management during crisis incidents among other things.

Pacis – 3, in which Spain, Norway and Italy participate, has the task of developing innovative elements of payload and the associated, properly secured ground segment, which is supported by state services. The development of the possibilities of new elements of the payload of the communication satellite and the associated properly secured ground segment is to be focused on the supervision of the southern borders of the EU. Crisis management, infrastructure monitoring and efficient use of the system are important aspects.

Pacis – 4, to which Italy is associated, is developing an innovative user terminal RPAS (Remotely Piloted Aircraft System), which supports commercial data transmission services. The result is to demonstrate the benefits of using government RPAS to run operations for national security services through a modernised government user terminal and government satellite communications.

Pacis – 5, in which France and the United Kingdom participate, will be implemented by Airbus Defence and Space in cooperation with private partners (commercial satellite operators) and satellite manufacturers from two ESA Member States. Its task is to create satellite communication capacity at the government level for the Project, in cooperation with one of the ESA member states.

Pacis – 6, in which the United Kingdom is involved, creates System structures for the future Govsatcom service platform as well as the platform itself, is enabling institutional users to choose from among the many global, regional and national satellite communications networks (both commercial and governmental) that meet their operational requirements. The Satellite Communication Management Secure at the Govsatcom level (Govsatcom Precursor Managed Service Framework – GMSF) will constitute the initial, uniform base of catalogued services and products that will be used by users.

The Govsatcom Precursor programme for government satellites responds to the growing demand for lower grade security communications than military communications (European Space Agency, 2019), but ensuring a trusted exchange of information for the benefit of European citizens. Its use is important for crisis management and maritime security. This is the first step to demonstrate how the European space industry can support an EU initiative. Pacis projects will create secure mission control systems and operational centres and show the benefits of connecting and sharing data with users. Some of them have been defined as a segment of the future federation of demonstration projects, whose task will be to represent the majority of European satellite operators and service providers, and a wide range of use cases. The ESA Govsatcom Precursor is continued within optional programme ESA ARTES 4.0, decided during the ESA Ministry Council '19 for the next 4 years. The programme will be implemented in synergy with the EDA demonstrator. One of the main tasks of the ESA, along with the satellite industry is the preparation and implementation of information gathered by satellites, which simplifies European and global reach, resistance, mobility and security of service.

The European Commission

The European Commission cooperates with the EDA and the ESA, assesses the demand and feasibility of the new initiative that is GOVSATCOM. The EC is currently developing an impact assessment of the system, analysing and assessing various options for the future European capacity of the programme in accordance with the needs and objectives of users. The ESA supports work with a precursor which will develop appropriate system requirements, candidate projects and technology. The GOVSATCOM initiative signals a new partnership not only between military and civilian institutional entities, but also with industry to make a greater contribution to Europe's competitiveness.

Examples of using satellite techniques

Satellites in orbit around the Earth offer data and signals that facilitate the functioning of modern human beings in everyday conditions. The use of commercial satellite techniques in public administration and for government purposes is of great importance. Satellite pictures enable an integrated image of land and infrastructure. Earth observation provides information on temperature and air quality, which certainly helps local authorities identify air status. Satellite navigation is also a valuable tool for improving city management, in particular for monitoring and optimising public and private transport. In fact, satellite navigation provides key information that facilitates the implementation of transport systems in cities and their facilities. The development of satellite communications enables residents to access public service information as well as provide feedback to local authorities. The use of telecommunications in the area of environmental protection can be seen in the example of the Archelon organisation, which deals with the protection and research of sea turtles and their habitats in Greece. The Archelon (Zbinden, Aebischer, Margaritoulis & Arlettaz, 2007, pp. 157–162) uses the Argos global navigation satellite system to locate and track turtles equipped with transmitters. Thanks to this solution, it becomes much easier to monitor the population of turtles or manage the beaches on which they nest

(Eurisy, 2019a). The next social group that uses satellite systems is the SCAEL, an association based in France. The organizsation consists of 1700 farmers, and their task is mainly to produce wheat, rape and barley as well as laboratory tests and comparative analysis of new technologies. SCAEL began using precision agriculture advisory services developed by Astrium (satellite data provider) and Arvails (research institute in the field of applied agriculture). These services combine both satellite information and information collected by SCAEL technicians to advise farmers on the amount of fertilizer used in line with actual crop requirements (Eurisy, 2019b).

The university hospital in Coventry, Warwickshire (Winzor & Rogers, 2011) in the UK is one of the largest academic hospitals supporting more than a million people. The UHCW breast screening service is part of the national screening programme that provides a free screening service for women aged 47 to 73 to detect breast cancer at an early stage. The use of satellite systems in this case involves equipping cars with a satellite dish that allows screening tests to be sent directly to the hospital. The satellite connection provides secure online access to the hospital network, while supporting the transmission of patient screening data back to remote units (Eurisy, 2019c). The use of satellite techniques to prevent e.g. floods is applicable in Romania. Since 2010, under the leadership of the Romanian Ministry of Environment, 24 public and research institutions from eight Danube countries, have cooperated in the implementation of the project consisting in the creation of appropriate mapping of flood risks throughout the Danube River Basin. To achieve this goal, satellite images were used, which were then combined with other sources. The flood risk map shows extreme event scenarios. It shows not only flood coverage but also potential damage to various types of land users and the number of inhabitants affected (Eurisy, 2019d).

Future development of technology brings new opportunities within satellite usage and one of them is development of the upcoming internet – internet of things (IoT), in which numerous heterogeneous networks containing different user data will be integrated seamlessly through appropriate protocol stacks. It enables anything with a transceiver to access the Internet anywhere, anytime. It means connection between monitoring devices, sensors, household appliances, actuators, vehicles etc. In many cases, IoT devices are in remote areas (e.g., deserts, oceans, forests), in some extreme topography, where they are unable to connect to a direct terrestrial network and can only be accessible by satellite, and LEO satellite constellation is the remedy for that situation as it has low propagation delay, small propagation loss and global coverage (Qu *et al.*, 2017).

The above are just a few examples where satellite broadcast in particular satellite communications offers many opportunities for its users. Ensuring that in matters as important as security and secure services based on space segment resources, it becomes a challenge not only at the technological level. It is worth emphasising that the demand for services based on secure, reliable but available satellite communications is constantly growing (Clark, 2019, pp. 325–331). This situation makes us aware that both the ability to cooperate with international public administration and active involvement in shaping systems that are part of space infrastructure are required at this stage.

Conclusions

The shape of the programme, its evolution and proposed activities in the field of research and development are still being determined, among other things due to the dynamic development of communications technology and new areas and domains (mega-constellation in low Earth orbit – LEO, the need for high bandwidth, matching to possible changes in infrastructure at Member State level).

Global coverage including the Arctic region is expected and the use of breakthrough technologies in the system as well as meeting new challenges such as the Internet of things etc. Ensuring proper security of transmitted data as well as audited operators controlled governmentally are key issues, and then the programme will constitute the right instrument for Members States executing tasks within the CSDP.

There is still room for submitting new projects within the space area as in the H2020 programme and more than 200 million euros remain to be used for the last opening, and the EC envisages possible changes to the existing framework defined in the field of submitted applications, which provides the opportunity to submit new proposals for the implementation of tasks for GOVSATCOM until its closing on March 5, 2020.

The next support will be reflected in the future as part of Horizon Europe (Walshe *et al.*, 2013, pp. 668–669). As part of the development of the space segment, close cooperation between the ESA (which has competence in the development of SATCOM capabilities – large satellites) and Member States is expected to develop as soon as possible technological areas/directions are developed for the needs of the programme.

Development of breakthrough technologies that offer a higher level of service requires an average of 5–7 years of commitment. The next element is the testing and implementation phase, which is why preparatory activities to achieve the assumed goal, e.g. in 2030, require launching now.

Satellite communication dominates in the space commercial sector and is also a driving force in the development of the European space industry, and new commercial entities appearing on the market that are playing an increasingly important role in Europe. It can already be said that this sector is undergoing transformation, i.e. a reduction in the demand for services offered from the GEO orbit is evident, new technologies are introduced as a result of the demand for access to SATCOM everywhere, for everyone and with high bandwidth, diversification of satellites [20 kg – 7 tons placed in all the Earth's orbits LEO/MEO/GEO] (Nakashima *et al.*, 1994).

The ESA addresses these trends by highlighting its flexibility and capabilities in the design of its optional ARTES 4.0 programme. The programme, as defined, is to be adapted to new technological challenges and enable the development of innovation at every stage of its implementation, the so called A la carte, and the ministers of Member States decided on its final shape at the ESA Council meeting at the end of November 2019.

Precise budgeting for GOVSATCOM implementation in the next financing period 2021 – 27 (multiannual financial framework) is still expected and decisions in this area are waiting for approval. It should be pointed out at this stage that the main characteristics of the programme will be its usability, ability to prioritise services, coverage, and cyber security. In addition, a clear coordination in the programme and indication of responsibility for the various stages of its preparation and implementation vis-à-vis Member States are required as soon as possible.

The results of the preparatory actions should be properly used, especially Govsatcom Precursor ESA, and how much data, what parameters and how they can be used in the future EU programme should be determined.

The Polish side has done a lot at national and community level to strengthen its possible position in the future EU space programme, GOVSATCOM. It delegates its representatives to the GOVSATCOM EU expert group and as a part of meetings established

at the end of the last year for the technical task force and security team of GOVSAT-COM EU. Together with EU partners (Member States and European Community agencies, Polish Space Agency (PAK) it submitted a proposal under H2020 in the first quarter of the 2019.

The submitted proposal covers: developing an atmosphere of trust and exchange of knowledge between consortium members, which will enable further cooperation that ensures efficient communication and exchange of knowledge, gathering information on the needs of end-users of secure satellite communications at European Union level, identifying current and planned capabilities of member countries in the field of Govsat communication, identifying the needs for standardisation, creating a map of research and an innovation project related to secure satellite communications and developing recommendations for the EC regarding necessary investments and technologies.

Active Polish participation and finding a proper place in the GOVSATCOM programme may contribute not only to reducing the end users financial burden for commercial SAT-COM services which, in turn, do not offer a secure level that is well aligned with the demands, but also grant Poland a higher position among countries with space ambitions (Adriaensen *et al.*, 2015, pp. 356–367).

The Brexit Era may also bring some depletion of EU funds for the Space Programme and the active participation of Poland and other countries in this initiative is more expected than ever and would be a remedy for the lack of resources.

There is still a chance to be included in 4th European Space Programme, as a partner not as a client.

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