航空宇宙政策・法學會誌 第34卷 第1號
2019년 6월 30일 발행, pp. 79~123
http://dx.doi.org/10.31691/KASL34.1.3.

논문접수일 2019. 06. 15
논문심사일 2019. 06. 23
게재확정일 2019. 06. 28

Legislation on Space Security: *South Korean and Poland Challenges**

Małgorzata Polkowska**

Contents

* Publication financed under the project implemented in the RESEARCH GRANT Program of the Ministry of National Defense Republic of Poland.

** Professor at the War Studies University (Warsaw, Poland) (E-Mail : mpolkowska@wp.pl).

Ⅰ. South Korea in Space

As opposed to the U.S. and Russia's space programs which began in the late 1950's, South Korea's interest in space technology started thirty years later. As their economy grew throughout the 1980's, so did their motivations for developing a knowledge based economy based upon investments in science, technology, and innovation. These initial investments in 1989 were in building sounding rockets and satellites. The launch of the nation's first satellite, a university built satellite called KISAT-1, was only in 1992. The launch of the nation's first sounding rocket, KSR-I, followed a year later in 1993. Within the span of two decades, the country has managed to develop their space capability with limited resources, embedding space applications into everyday services. From 2005-2008, the Korean aerospace workforce has increased an average of 11.2%. This is due to a growing number of aerospace specialists in private industry, research institutions, and universities.1 The South Korean space program budget has increased from $58 million USD in 1997 to $317 million in 2008, exemplifying their commitment to space technology development.[1] The start of South Korea's space initiatives was in 1989, when the government recognized the potential benefits of space technology to the nation and took the first steps towards investing in space development by creating the Korea Aerospace Research Institute (KARI). Established as one of several Korea Institute of Machinery and Materials (KIMM) affiliates, KARI was one of the research institutions to help transform the nation from a light industry goods producer to a world leader in high-technology industries. KARI has proceeded over the past two decades in developing sounding rockets and satellites, with goals to achieve indigenous satellite technology and launch capabilities.

---

1) S. Wan, report presented for the Secure World Foundation September 2010 U.S. – South Korean Space Cooperation A background on South Korea's space program, America's geopolitical influences, and future areas for strategic collaboration.

KARI is based in Daejeon, South Korea, in the technology cluster the late President Park Jung-hee created in 1974 to centralize science and innovation. To encourage government-invested institutions – industry – academic collaboration, science and technology companies along with universities were encouraged to become established in the city. Companies congregated in the northern part of Daejeon, forming the research and development hub of Daedeok Valley. To spur advanced science and engineering education in the Daedeok technology cluster, the Korea Advanced Institute of Science and Technology (KAIST) was founded in 1971. Created under a special law that subsidizes the university with government funds and dubbed the Massachusetts Institute of Technology (MIT) of Korea, KAIST is conveniently located next to KARI, other research institutes, and science and technology companies.[2] Therefore much of Korea's space activities history has been intertwined between government, university and research institutions.[3]

Ⅱ. Korean Space Legislation

South Korea has been developing their space program over the past two decades based upon a development plan created in the mid1990s. In November 1996, KARI became an independent government funded institute from KIMM as the nation became serious about their space technology development. The National Space Development Plan was released soon after, with minor revisions in 1998, 2000, and 2005. The 2005 Space Development Promotion Act states,

---

2) Ch. Han-Lim, Current status of Activity on Academia presentation on Space Situational Awareness Workshop: Perspectives on the Future. Directions for Korea, January 24-25 2019, Soeul

3) Ch. Daewon, Overview of KARI activities on SSA, presentation on Space Situational Awareness Workshop: Perspectives on the Future. Directions for Korea, January 24-25 2019, Soeul

"The Government shall formulate a basic program on space development promotion containing the following items for the promotion of space development and the use and administration of space objects." Thus, the act required a legalized basic space plan to be formulated every five years and provide the nation the decree to implement its space activities. This is how the 1996 National Space Development Plan, now called the Basic Space Development Promotion Plan, became enacted to have legal status.[4)]

South Korea issued its space law in 2005 (Space Development Promotion Act). The Act was partially amended in 2011, 2013, 2014 and last changes come from 2015[5)]. The preamble mentions that the purpose of the Act is to facilitate the peaceful development and exploitation of outer space and to contribute to national security. Receipt of a firing license (the act does not apply to other activities, e.g. remote-sensing) concerns the conduct of activities on Korean territory and Korean devices located there (possibly on the territory of another country) or elsewhere and is closely related to the aspect of national security. The Minister of Science and Technology is involved in the licensing and has a casting vote. National security control measures are designated by the government in the Basic Plan on Space Development Promotion. The plans are updated annually, after consultation with the General Director of Intelligence Services. The National Chemical Committee controlled by the President is also involved in the plan. And although the Minister of National Defense is not mentioned anywhere, the Committee and the special Space Development Agency guarantee that no licensed activities contrary to national security will be undertaken. Once a license has been obtained, the relevant authorities control and monitor the entities for national security concerns. Licenses may also be suspended and revoked. The Minister of National Defense may demand the suspension of space activities by a private

4) S. Choi, Activities at NSSAO, SSA activities in Korea- presentation at Space Situational Awareness Workshop: Perspectives on the Future Directions for Korea, January 24-25 2019, Soeul

5) [Enforcement Date 21. Jul, 2015.] [Act No.13009, 20. Jan, 2015., Partial Amendment] 02-2110-2428

entity due to military operations or any other state of emergency in the state. Then the Minister of Science and Technology suspends the licensing activity of the entity.[6] According to the 2005 Space Development Promotion Act, the law states the government should have a national plan; therefore the updated 2007 version of the National Space Development Plan became enacted into a legal status. "Introduction to Space Activities of Korea." KARI. December 11, 2008. In addition to establishing the Basic Space Development Promotion Plan as a legal document for implementation, the Act seeks to promote space development in a systematic way and ensuring the efficient use and administration of space objects. Therefore the 2005 Space Development Promotion Act also includes Korea's basic space law for national space activities. Korea's basic space law essentially reiterates the nation's adherence to the international space treaties. The Act also establishes a National Space Committee to deliberate on space matters regarding the space program, policies, licensing, and investments. It is also worthy to note that under the Space Development Promotion Act, the "Minister of Science and Technology may designate and support a special agency to pursue space development projects in a systematic and efficient way."5 Such tasks have been pursued by KARI; however, since the institution has not been designated as the special agency they only act as a government agency without having the same legal entity as their U.S. counterpart NASA.

The 2007 Basic Space Development Promotion Plan extended the space development goals until 2016. The twenty year plan laid out the foundational steps needed to achieve independent space capability in hopes to exemplify the nation as one of the space powers and means to benefit the national economy. Ideally, the current basic development would lead to a long term harmonious collaboration between research institutions, universities, and commercial companies. Through this plan, Korea has focused mainly on two areas: satellite development and indigenous launch capability. The revisions over the years have

6) F. von der Dunk, The Issue…, dz. cyt., s. 225-257; R. Jakhu, National Regulations…, op. cit., p. 121.

been minor; mainly to reflect mission delays, cancelations, and further details to missions and the long term strategic vision since most technological development plans are still under implementation. The plan, while simplified to those two main priorities, has allowed the nation to focus on basic space development with the intention of expanding their strengths and niches upon mastering fundamental space technologies.

In Space Law from 2005 amended in 2015 some definitions of the term have been introduced. The term "space development" means any of the following activities such as research on the design, manufacturing, launch, operation, etc. of artificial space objects and development of technology therefor; or use and exploration of outer space and activities to facilitate such activities. The term "space development project" means projects for advancing space development and projects for facilitating the development of education, technology, IT, industries, etc. related thereto. Other definitions which can be found are: “space object”, “artificial space object”, “natural space object”, “meteorite” or “space accident”, “dangers in space. The definitions of „satellite information” means information processed with images, voice, sound, data, or combinations thereof acquired using a satellite (including those obtained by processing or utilizing such information). Art. 3 is very important, because it is about the responsibility of government, who observes any outer space- related treaty it has entered into with any other country or international organization and shall pursue the peaceful use of outer space. The Government is also obliged to establish and promote a comprehensive policy for space development.

For the promotion of space development and the use, management, etc. of space objects, the Government shall formulate a basic plan for the promotion of space development (“basic plan") which prescribes mid- and long-term policy objectives and basic direction-setting on space development every five years (Art. 5). This plan will include inter alia the following: matters concerning objectives and direction-setting of space development policies; systems and strategies to

pursue space development; plans to pursue space development; the expansion of infrastructure necessary for space development or concerning financing and investment plans for space development; research and development for space development or international cooperation for the invigoration of space development. Detailed procedures concerning the formulation and alteration of a basic plan shall be prescribed by Presidential Decree. In accordance with a basic plan, the Minister of Science, ICT and Future planning shall formulate and execute an action plan thereof every year in consultation with the heads of relevant central administrative agencies: Provided, That where necessary for national security, the head of a relevant central administrative agency may formulate a separate special action plan within the scope of the basic plan in consultation with the heads of relevant central administrative agencies prescribed by Presidential Decree. In order to promote the dissemination and utilization of satellite information, the Government shall formulate a master plan for the utilization of satellite information. A master plan for the utilization of satellite information shall include the following: matters concerning objectives and direction of policies for the dissemination and utilization of satellite information, the acquisition of satellite information; concerning a system for the dissemination of satellite information and a plan for the utilization thereof etc. Detailed procedures concerning the formulation and alteration of a master plan for the utilization of satellite information shall be prescribed by Presidential Decree. Article 6 is creating the National Space Committee under the control of the President to deliberate on matters concerning space development; including the formulation of master plans (national security issues may be omitted). The Committee shall deliberate on the following: matters concerning a basic plan, a master plan for the utilization of satellite information, and a basic plan for preparing against dangers in space, matters concerning the coordination of important policies of the Government with major duties of relevant central administrative agencies, important matters concerning the designation, operation,

etc. of institutions specializing in space development, matters concerning evaluation on the use and management of space development projects, concerning financing and investment plans for space development projects, permission to launch space launch vehicles; the correction of space development.

The Committee is comprised of no more than 15 members, including one chairperson. The Minister of Science, ICT and Future Planning shall take the chair of the Committee, and the following persons shall become the members thereof: The Vice Minister of Strategy and Finance, the Vice Minister of Foreign Affairs, the Vice Minister of Trade, Industry and Energy, and public officials of the vice-minister level of relevant central administrative agencies prescribed by Presidential Decree. The government may contribute money to cover all or some expenses incurred in implementing space development projects (Art. 6.2).

The Minister of Science, ICT and Future Planning may designate and support specialized institutions for promoting space development projects systematically and efficiently (Art. 7). Art. 8 states about domestic registration of artificial space object. Every citizen or corporation of the Republic of Korea who intends to launch an artificial space object (excluding space launch vehicles shall file a preliminary registration with the Minister of Science, ICT.

Future Planning, as prescribed by Presidential Decree, by no later than 180 days before the scheduled date of launch. Any person intending to file preliminary registration of an artificial space object shall attach a launch plan stating the following: purpose of use of the artificial space object, ownership or licensee of the artificial space object, basic orbit of the artificial space object, fulfillment of the liability for damages in the event of space accidents, other matters concerning the launch, use, and management of artificial space objects, prescribed by Presidential Decree. The owner of a meteorite discovered in the Republic of Korea and a meteorite brought into the Republic of Korea from a foreign country may file an application for registration of the relevant meteorite with the Minister of Science, ICT and Future Planning. Any meteorite discovered

in the Republic of Korea shall not be taken out of the Republic of Korea (Art. 8). The Minister of Science, ICT and Future Planning shall register such space object with the United Nations through the Minister of Foreign Affairs pursuant to the Convention on Registration of Objects Launched into Outer Space. The Minister of Science, ICT and Future Planning shall maintain and manage the registers of preliminary registration and registration of artificial space objects, as prescribed by Ordinance of the Ministry of Science, ICT and Future Planning (Art. 10). The Minister of Science, ICT and Future Planning shall take the following matters into consideration when granting permission for launch, such as appropriateness of the purpose of use of the space launch vehicle, appropriateness of safety management for the space launch vehicle and other things used for the launch, financial ability, such as subscription to compensation liability insurance in preparation for the event of space accidents or other matters prescribed by Ordinance of the Ministry of Science, ICT and Future Planning, which are necessary for launch and preparation for launch, such as moving of the space launch vehicle (Art. 11). Art 12 is about grounds for disqualification. Article 12 states about Grounds for Disqualification.

Art. 13 is about revocation of permission for launch and hearings and Art. 14 refer to the liability for damages caused by space accidents. Any person who has launched a space object shall hold the liability for damages arising from space accidents caused by the artificial space object. In such cases, the scope of compensation for damages, limitation of liabilities and other relevant matters shall be prescribed by other Acts.

Article 15 refers to the Basic Plan for preparing against dangers in Space. The government shall formulate a basic plan for preparing against dangers in space which prescribes mid- and long-term policy objectives and basic direction on securing preparation against dangers in space every ten years. A basic plan for preparing against dangers in space shall include the following: matters concerning environmental protection and surveillance of space, matters concerning forecasts

and alarms of dangers in space, matters concerning research and development for the prevention of and preparing against dangers in space, matters concerning international cooperation for the prevention of and preparing against dangers in space. In accordance with a basic plan for preparing against dangers in space, the Minister of Science, ICT and Future planning shall formulate and execute an action plan thereof every year in consultation with the heads of relevant central administrative agencies. This Minister may designate a space environment surveillance agency which will conduct the following affairs for the efficient establishment and operation of a system for the prevention of and preparation against dangers in space. Where would be necessary to prevent and prepare against dangers in space, the Minister of Science, ICT and Future Planning may establish and operate Headquarters for Countermeasures against Dangers in Space, headed by the Vice Minister of Science, ICT and Future Planning. If space accidents prescribed by Presidential Decree occur, the Minister of Science, ICT and Future Planning may establish a Space Accident Investigation Committee under his/her jurisdiction to investigate space such accidents (Art. 16). The Space Accident Investigation Committee shall be comprised of not less than five but not more than 11 members, including one chairperson, and the members thereof shall be commissioned by the Minister of Science, ICT and Future Planning from among relevant experts who satisfy the qualifications prescribed in Presidential Decree, whereas the chairperson thereof shall be appointed by the Minister of Science, ICT and Future Planning among the Committee members: Provided, That as for matters prescribed by Presidential Decree in view of national security, a separate space accident investigation committee may be organized as prescribed by The Presidential Decree.

The Minister of Science, ICT and Future Planning may adopt measures necessary to facilitate the dissemination and utilization of satellite information acquired by satellites developed in accordance with master plans, such as the designation and establishment of an organization exclusively dedicated to such

activities. In such cases, he/she shall consult with the Minister of Land, Infrastructure and Transport about national spatial data under the Framework Act on National Spatial Data Infrastructure, and with the heads of relevant central administrative agencies about national security (Art. 17). The Minister

of Science, ICT and Future Planning shall adopt measures to promote space development projects and induce expansion of investments in research and development in the private sector, such as supply of outstanding human resources for space development, taxation and financial support, preferential purchase, etc. (Art. 18).

According to Article 19 When the Minister of Science, ICT and Future Planning receives a request from the Minister of National Defense during a war or upheaval, or in any emergency situation similar thereto to suspend a space development activity being carried out by a citizen of the Republic of Korea for the purpose of undertaking military operations, he/she shall issue an order to the citizen to suspend the space development activity. Ministry of Science, ICT and Future Planning may request for Assistance or Cooperation in Space Development (Art. 20). When the Minister of Science, ICT and Future Planning implements a space development project related to national security, he/she shall consult in advance with the heads of relevant central administrative agencies (Art. 21). Art. 22 refer to the rescue of Astronauts and necessary assistance of the Government. Art. 23 are about return of Artificial Space Objects. Article 24 gives the right to the Minister of Science, ICT and Future Planning to collect data on space development and aerospace industries or survey the actual conditions thereof in order to promote space development systematically and efficiently. Articles 25-26 concern confidentiality. Art. 27-29 refer to penalties and administrative fines.

Enforcement Decree of Space development promotion Act comes from 2017.[7] The purpose of this Decree is to provide for matters delegated by the Space Development Promotion Act and matters necessary for the enforcement thereof.

---

7) Presidential Decree No.28210, 26. Jul, 2017. 02-2110-2428

Such of matter is Master Plan for Promotion of Space Development, which shall be formulated by the Minister of Science and ICT in consultation with the heads of related central administrative agencies (including the National Intelligence Service). Matters prescribed by Presidential Decree are such as policies on the protection and management of intellectual property rights or facilitation of exchange between and among industrial circles, academic circles and research institutes. Minor matters prescribed by Presidential Decree means details of the plan for the promotion of space development or matters having no significant impact on the master plan for the promotion of space development, which are specified by the National Space Committee. An action plan for the advancement of space development (Art. 3) shall include the following: an overview of relevant projects, a report on the outcomes from implementation of the projects in the preceding year and the business plan for the pertinent year, a detailed action plan to advance space development for each project or others matters the Minister of Science and ICT deems necessary. The Minister of Science and ICT shall formulate an action plan for the promotion of space development by the end of February each year following deliberation by the Working Committee for the Promotion of Space Development and notify the heads of relevant central administrative agencies of the action plan for the promotion of space development: Provided, That the Minister of Science and ICT shall formulate the action plan for the promotion of space development through consultation with a consultative body comprised of the heads of relevant central administrative agencies.

The Minister of Science and ICT shall formulate a master plan for the utilization of satellite information, in consultation with the heads of relevant central administrative agencies. The same shall also apply where he/she amends the master plan for the utilization of satellite information formulated. Where the Minister of Science and ICT formulates a master plan for the utilization of satellite information, he/she shall notify the heads of relevant central

administrative agencies of his/her schedule for the formulation of the master plan for the utilization of satellite information and guidelines for the preparation thereof, and where necessary for formulating the master plan for the utilization of satellite information, he/she may request the heads of relevant central administrative agencies to submit necessary data.

An action plan for the utilization of satellite information shall include the following matters: outline of the projects; outcomes from implementation of the project in the preceding year and a project plan for the relevant year; detailed action plan for the utilization of satellite information for each project; matters concerning the construction of the integrated system for the dissemination and utilization of satellite information or other matters deemed necessary by the Minister of Science and ICT. The Minister shall formulate an action plan for the utilization of satellite information by the end of February each year following deliberation by

the Working Committee for the Utilization of Satellite Information and notify the heads of relevant central administrative agencies of the action plan for the utilization of satellite information. In Article 4 (Composition of National Space Committee) it states that public officials of the vice-minister level of relevant central administrative agencies prescribed by Presidential Decree" means the following persons: the Vice Minister of National Defense; the Administrator of the National Disaster and Safety Management Administration, Vice Minister of Environment; one Vice Minister of Land, Infrastructure and Transport designated by the Minister of Land, Infrastructure and Transport; the Vice Minister of Oceans and Fisheries; the Administrator of Korea Meteorological Administration, one Deputy Director of the National Intelligence Service designated by the Director of the National Intelligence Service.

The National Space Committee shall have one secretary to carry out its administrative affairs, who shall be appointed by the chairperson of the Committee from among public officials of the Ministry of Science and ICT. Art

5 provides the operational procedure of Committee. Article 6 describes the composition and operation of Working Committee for Promotion of Space Development. Article 7 specifies the activities of Institutions Specializing in Space Development, which can be defined as activities for international cooperation in space development or assistance in the investigation of space accidents. Article 8 gives criteria for designation of institutions specializing in Space Development. Article 9 describes the details of support for Institutions Specializing in Space Development. Article 10-11 refer inter alia to the preliminary registration of Artificial Space Object or application for registration of Meteorites and application for permission to launch space launch vehicles. Launch plan is defined in article 13. In this article a lot of details are given which are necessary in the plan such as projected launch date and the trajectory in the atmosphere, data and performance of the launch vehicle, safety analysis report or payload operations plan. Later in this article there is information about master plan for preparation against dangers from outer space and criteria for designation of space environment monitoring institution.

Article 14 is about scope of space accidents subject to Investigation, art 15 about Space Accident Investigation Committee, its management (art. 16), mission (art. 17). Art. 18 give the procedure for Investigations of Accidents. Art. 19 cover the investigation of accidents matters that involve national security. Paragraph 2 concerns the satellite information concerning national security, 7- satellite information security. Article 19 is about supply of exceptional human resources for Space Development and art. 20 are about request for assistance or cooperation in space development. Art. 24 refer to the administrative fines.

There is another legislative document about Space in Korea. This is the Space Development Basic Plan[8] which is enforced every five years for systematic promotion of space development. The first Space Development Plan is dated from 1996. This plan was modified few times and later new space development

8) Third Space Development Basic Plan, Korea, February 2018

promotion general plans were in force. The latest comes from 2018 till 2022. It contributes to space-related investment inducement and research activations by securing consistency of policy and improving predictability by suggesting vision and goal until at the same time. The plan describes the space budget with comparison to the other states; like the US, Japan or India. The plan states about research and development issues and expanding investment and improvement (ex. science rockets and Korean launch vehicle's independent development, engine development). It explains also the use of satellite and its limit, such as 24-hour observation data of Korean peninsula through operation of high-definition low-earth orbit satellite (optic 0.55m~0.7m, infrared light 5.5m, radar 1m) and geostationary satellite (ocean, weather) or through provision of satellite pictures (About 90 thousand pictures including 42 thousand for public use, 44 thousand for commercial sale, 3 thousand for international cooperation, etc.) support production of maps, management of national territory and resources, observation of ocean and weather, communication during disaster, and UHD broadcasting. One of the projects is enforcing a moon exploration or participation of a large-scale and international cooperation. One of the targets of the plan is to promote space industries through methods such as actual enforcement of private transfer of national space technology, export satellite, ground equipment, satellite pictures, and support establishment of venture companies and commercialization, etc.

Ⅲ. Poland in Space

The beginnings of Polish astronomical activity date back to the 15th century and the Copernican revolution. The most famous figure of this period was Nicolaus Copernicus, whose work "On the rotation of celestial spheres" presented in detail the heliocentric vision of the planetary system. In the 16th and 17th

centuries, Jan Hevelius (mathematician, astronomer) and Kazimierz Siemienowicz (engineer, rocket constructor) contributed to the development of Polish cosmic thought. In the 20th century, Polish scientists were involved in cooperation with the USSR, among others, in the Interkosmos programme. The first Polish device for measuring solar radiation was sent into orbit on board of the Copernicus satellite - 500 (in 1973). Other achievements include the experiment of crystallization in microgravity conditions. Three years later the Space Research Centre of the Polish Academy of Sciences (CBK) was established for space exploration and development of space technologies. In the 1970s, the practical use of satellite images and satellite communications in Poland also began. The 1970s also saw participation in several space missions (by 1999, a total of 60 Polish devices for performing experiments in physics had been deployed). In 1978, the Polish astronaut Mirosław Hermaszewski travelled in Space on board the Soviet ship Soyuz-30. The purpose of the journey was an 8-day mission to carry out experiments at the Soviet station Salut-6.

The research of Polish scientists included mainly astrophysics (solar system), the study of planets and small celestial bodies of the solar system, the study of the sun, the study of phenomena occurring in space plasma in interplanetary and peri-planetary space, earth exploration by satellite geodesy and satellite remote sensing (checking the degree of pollution of ponds, forests, soil moisture, weather forecasts), the discovery of planets outside the sun, cooperation in the construction of a telescope in South Africa.

After 1989, political changes made it possible to develop cooperation with countries outside the Eastern bloc. In 1994, Poland signed an agreement with ESA on cooperation in the peaceful use of space, which was extended in 2002. On its basis, Poles could participate in ESA's scientific programmes, which resulted in the presence of Polish devices on most of ESA's flagship research missions (Cassini-Huygens, Integrat, Mars Express, Rosetta, Venus Express and Herschel). The beginning of the 21st century brought an intensification of

cooperation with ESA. In 2007, an agreement on a European Collaborating State (PECS) was signed with ESA, and thanks to the creation of this mechanism, 45 projects were financed by Polish companies, research institutions and universities in cooperation with ESA.[9)]

Ⅳ. Polish Space Legislation

Poland is more active in space and legislation since the Polish Space Agency was created (POLSA). This Agency is a governmental executive body, subject to the Prime Minister. It consists of civilian and military personnel. It was established by the Act of 26 September 2014 and became fully operational at the end of 2015[10)]. The agency participates in fulfilling the strategic goals of the Republic of Poland by supporting the utilization of satellite systems and the development of space technologies. The main tasks of POLSA cover the following 5 areas: coordinating the activity of the Polish space sector on the national and international level, representing Poland in relations with international space sector organizations, supporting national science and business projects associated with space technologies, popularizing the use of satellite data by public administration and increasing the defensive capabilities of the country. The agency is executive in nature in accordance with the Act from 27 August 2009 in public financing (art. – Act of 26 September 2014) and it can create local branches of the agency. The headquarters of the Agency is located in Gdansk (Art. 3. The activities of the Agency are under the auspice of the President of the Council of Ministers (Art.2). The duties of the agency are written in Art. 3 of the Act. The President of the POLSA Council is composed of representatives

9) M. Polkowska, J. Ryzenko, Aktywność Polski w przestrzeni kosmicznej- nauka, polityka I prawo. Stan obecny, Gdańskie Studia Prawnicze, Tom XXXVI, 2016, p. 339

10) Dz. U, 2014, poz. 1533

of the government- one from each administration and four representatives of scientists and the industry with recognized achievements in research or business and chosen based on their knowledge competence in areas concerning POLSA activities (Art. 14).[11)]

Polish Space law is still waiting for the Parliamentary approval. Several versions of the draft have been developed; at present, the Government Legislation Centre website has published a draft law on space activities and the National Register of Space Objects. The Act regulates: the rules of performing space activities and the rules of maintaining the National Register of Space Objects. Earlier, however, the amendment of the Act on POLSA will be processed. The changes proposed in the draft act are aimed at: to streamline and clarify the scope of tasks of the Polish Space Agency, as an executive agency to provide the necessary expert support and technological knowledge to other public administration bodies involved in space activities, and responsible for the preparation and coordination of the implementation of the National Space Programme; and to adapt the supervision of POLSA to the solutions in force in other European countries, especially in the Member States of the European Space Agency (ESA), as well as to introduce improvements in the organisation of POLSA.

Polish Space Strategy was published by the Polish Ministry of Economic Development in February 2017). The objectives are: increasing competitiveness of the Polish space sector and its share in turnover (increasing participation in the EU space programmes: SST Support Framework), Development of satellite applications, strengthening capacities in the area of security and defense using space (establishment of Space Situational Awareness System), creating favorable conditions for the development of space sector in Poland, building human resources for the Polish space sector. The Strategic issue is to obtain 3% of the EU market in 2030. National Space Plan (2019-2021) from 2018 states about the

11) M.Polkowska, Polish Space Agency pursues task of developing country's space expertise, Room, The space journal nr 2(8) 2016, p. 68-69

establishment, development and operation of a National Space Situational Awareness System (SSA) in cooperation with the EU SST consortium. The objective of the project is to enhance the security of citizens and infrastructure (Earth and space) in the context of space threats, to build national Space Situational Awareness (SSA) capabilities and to prepare for commercial exploitation of services provided in the area of SSA. The first stage of the activity is to launch basic functionalities of the national SST system (Space Surveillance and Tracking), inter alia, through the development of infrastructure and capabilities enabling the implementation of tasks envisaged within the framework of Poland's future membership in the European SST consortium. 19th of December 2018- Poland joined the European SST Consortium related to the tracking of space debris threatening infrastructure in space and on Earth.[12)]

Poland has become a full member of the European Space Surveillance and Tracking Consortium. The accession agreement was signed on 19 December 2018 at the seat of the Polish Space Agency in Warsaw. Joining the consortium will enable national entities to participate in projects financed by the EU, whose budget in the current and future financial perspective may amount to more than EUR 350 million. Membership in the consortium will allow for faster development of the Polish SST system, which will provide our country with data necessary to protect the planned missions of Polish satellites and will support national security and defense in monitoring threats from artificial space objects. Participation in the European programme also brings great scientific and business potential. Ensuring the operability of the observation sensors forming the Polish SST infrastructure, the possibility of their modernization and the demand for new ones - all this will facilitate a faster growth of competence in the area of SST and optical and radar observations for Polish entities, which already today gain experience by implementing projects under the optional SSA programme in ESA.

---

12) M. Polkowska, European challenges in SSA. Poland example, presentation at the Space Situational Awareness Workshop: Perspectives on the Future, Directions for Korea, Seoul 24-25 January 2019

In view of the progressing commercialization of products related to situational awareness in space, domestic entities providing solutions and services in this area will be able to direct their offer also to the global market, which will grow as a result of the New Space trend, the increasing number of micro and smaller satellites, the planned development of mega-costellations and new areas such as satellite in-orbit servicing or, in the longer term, the sourcing of raw materials from celestial bodies.[13] The Polish National Space Programme comes from December 2018 and still is in public consultations. Polish Space Agency (POLSA)[14] will be responsible for the implementation of the programme. POLSA has considered a few areas of public support within the programme, such as, „Development of satellite systems" – with one of the priority projects: „Space Situational Awareness System". The vital goal of the project is to provide a long-term access to the European and national space infrastructure and the services crucial for securing its operations. As a consequence, a network of sensors (telescopes, lasers, radars) responsible for space object observation and tracking is to function on the territory of Poland and staff is to be trained in order to perform tasks in the frame of SST.[15]

Ⅴ. Polish and the European Approach - Rising Stakes for Civilian Space Programmes

The European Space Situational Awareness System (SSA) consists of three separate segments: Space Surveillance and Tracking, especially in the context of Space Debris (Space Weather) and Near Earth Orbit (NEO) observation. The

13) www.polsa.gov.pl
14) The Polish National Space Programme (www.polsa.gov.pl)
15) M.Polkowska, European challenges in SSA. Poland example, presentation at the workshop Security World Foundation, Seoul 24-25 January 2019.

European SSA system has dual-use civilian and military applications. Additional components to the SSA system may be added in the near future. They are built on the basis of military requirements and compiled by the European Defence Agency (EDA). The conference also devoted a lot of space to the development of the STM (Space Traffic Management)[16] system, which does not yet exist in Europe, unlike the USA. The goals for Space Situational Awareness are the following: society heavily dependent on critical space and ground assets, critical assets need to be protected against adverse effects from space, SSA Programme Declaration calls for independent European access to SSA data and services. There are three main areas: Space Weather, Near Earth Objects, Space Debris clean space. The participants in ESA SSA programs are 19 participating states. The good progress in the development of a SSA system in Europe has been observed and many actors involved: Member States, ESA, and EU. Distribution of roles needs to be finalized: development vs exploitation. There is still a performance gap in surveillance radars that is why there is a need to agree on a suitable governance scheme for the exploitation of future high performance European surveillance radar. There is a development of a high performance radar can be achieved within 3 years SWE and NEO systems will reach pre-operational status by 2020.[17]

Thus, Europe has started its own preparatory programme of the SSA. International negotiations on permanent exchange of information and coordination, mainly with the USA, are also foreseen. Poland should also participate in these studies, which this year is to eventually become a member of the European SSA Consortium, where they play the biggest role: France, Germany, Great Britain and Italy.[18] Much of the data to be dealt with by the

16) STM- "Space Traffic Management (STM) is the set of technical and regulatory provisions for promoting safe access into outer space, operations in outer space and return from outer space to Earth free from physical or radio-frequency interference."

17) N. Bobrinsky, Forging ahead: from SSA to space safety, ESPI Conference 27th of September

18) C. Portelli, EU SST Consortium governance, initial operation and current status Nov

established Consortium can be found in public satellite catalogues created by the USA and other countries, which are available on the Internet and can be freely used. That is why transatlantic cooperation is so crucial. Orbital paths are constantly changing or are disturbed by a number of factors, such as inconsistent degrees of attraction, solar activity or the effects of gravity of other orbital objects. International cooperation on SSA data sharing is weakened by issues such as liability and property concerns, data formatting standards and compliance with catalogued tools, and finally security (some satellites do not provide data to the public). These issues are still being discussed in various international fora, including UN COPUOS (United Nations Committee on the Peaceful Uses of Space). The author follows these discussions on an ongoing basis and makes use of them in her scientific work. Space security has a multidimensional concept. It can be understood as Security in Outer Space, Outer Space for Security or Security for Space. The first means the protection of the space infrastructure against natural and man-made threats or risks, ensuring the safety and sustainability of space activities. The second means the use of space systems for security and defence purposes. Security for Space means the protection of human life and the Earth environment against natural threats and risks coming from space.

There are also several meanings of such definitions as: Space Situational Awareness (SSA) which can be understood as current and predictive knowledge and understanding of the outer space environment including space weather and location of natural and manmade objects in orbit around the Earth; SEPP (Space Environment Protection and Preservation, which is preventive and curative mitigation of negative effects of human activity in outer space on the safety and sustainability of the outer space environment and Space Infrastructure Security (SIS) as assurance of the infrastructure ability to deliver a service that can justifiably be trusted despite a hazardous environment.

21th 2017, Roma

There are some challenges to space infrastructure security, such as unintentional hazards (space debris, accidental interferences), Intentional threats (ASAT, malicious interferences, and cyberattacks), Space weather hazards (geomagnetic storms, solar storms).

There are rising challenges to space infrastructure security. Space is an increasingly congested and contested resource. Space is multiple and diverse, there are different mitigation and protection measures. There are many actors playing in the Space, so interdependence between them has been noticed. There are various trends in Space, such as increasing space activity, new concepts, connected space, strategic target, "space control" capabilities, etc. The most important is growing dependence on space for society and economy at large.[19)]

Growing security threats to civilian space programmes (access to space, cybersecurity in space, safe operations in space). Space is a critical infrastructure: satellites (jamming, spoofing, blinding), ground stations (hacking). Threats (military, non-military, natural) are understood and accepted and now are more properly and precisely assessed. Readiness to face and respond to threats is growing in governments and private sector. It seems that there is a possibility to invest in handling threats is developing and to find political solutions in managing threats.[20)]

Ⅵ. SSA in Europe - Next Steps

It seems that awareness of the importance of a European SSA system should be raised and increased. It should be made clear to decision-makers and to the

19) S. Moranta, Security in Outer Space: Perspectives on Transatlantic Relations, 12th ESPI Autumn Conference Vienna, September 27th 2018

20) K. Uwe Schrögl, Security in Outer Space: Rising Stakes for Civilian Space Programmes, ESPI Conference September 27th 2018

public that an interruption of space services would cause most severe damage to European and global well-being. Public outreach will be more difficult to achieve here, because a European SSA system will not offer tangible benefits to the citizens as space applications do. A European SSA system should be broadly supported and backed at the highest political level. Important stakeholders have already expressed their interest. This now has to translate into sufficient funding that must be managed efficiently. An optional ESA programme for SSA could be an adequate solution. In addition, the EU should become involved in line with its general role and under the auspices of European Space Policy. Eventually, this could make SSA another European space flagship project like Galileo or GMES. A European SSA system must offer added value with regard to currently available SSA information from the United States. Such added value could consist in completeness, increased reliability and timeliness, new products and services and the availability of data on a contractual basis implying liability. The motivation for Europe to have a SSA system should not just be to free itself from dependence on the US. Rather, Europe should try to establish an own capability so that it has something to offer and is able to interact with others on equal grounds. This is a precondition for setting up a possible global SSA system in the long run.

With a view to such a potential global SSA system, Europeans should acquire a SSA system that, beyond necessarily duplicating core functions of other regional SSA systems, has the potential to supply additional information complementary to other systems' data. This will facilitate exchange between all systems. Space Weather data are a prime candidate for initiating global cooperation in SSA. International and regional cooperation should also be supported by common definitions to establish a sound basis of understanding. The notions of "civilian", "military", "public", and "institutional", "private or commercial" should be clarified and used in a uniform way. Furthermore, the different implications of the terms have to be considered. For example, Space

Situational Awareness is understood to be self-standing in Europe, while the US tends to see it as a pre-stage of both defensive and offensive counterpace concepts. Being envisaged as user-driven, a European SSA system has to be set up in a genuinely multiple use fashion. In this context, multiple uses should not be seen as a feature introducing additional complexity and cost. Instead, it should be recognized as an optimum usage of available assets. Taking into account military interests will be a challenge for ESA that has been reconsidering its understanding of security and its treatment of associated issues. Various hardware and architectural solutions for a European SSA system have been suggested by different studies. A Rep ort 10, January 2008 22 decision on the final set up should take into account the desired amount of system profit orientation. A key role will be played by data policy. However, a chicken and egg situation where data policy design waits for hardware configuration and vice versa has to be avoided. Accounting for the fact that there is a strong interlink between the two processes, they should initially be run in parallel with iterative adjustments on both sides.

The first step in building up a European SSA system should be to enhance cooperation between existing national and European facilities. Common features of different architectural solutions should be identified and implemented as a scalable precursor. Interoperability should be increased by means of standardization, connectivity and procedural harmonization. Setting up what has been called a European SSA system of systems will involve not only adding new facilities to the existing ones, but also linking them together in a 3C manner: comprehensive, coherent and clever. Provisions should be made for the SSA system to support a global STM regime. This would include an interface to air traffic control systems, since STM will have to govern the whole domain of space travel, comprising access to space, the operation in space and the return from space. Covering all three of these phases will account for a possible future situation where Member States and private “spaceliners” operate side by side.[21)]

The SSA is generally considered to cover three main areas: observation and tracking of space objects, monitoring and forecasting of space weather and control of objects close to the Earth. Activities in these areas aim to protect space infrastructure and ground-based infrastructure from space debris (rubbish). Space debris has been identified as a serious threat to the safety, security and sustainability of space activities and the tracking of space objects needs to be strengthened. In order to prevent damage to spacecraft (as a result of collisions) and the spread of space debris, it was agreed that precise information should be provided to government and civil protection services, including on the trajectory of space assets.

The Space Surveillance and Tracking (SST) programme should contribute to securing the availability of European and national space infrastructure and services necessary for the security of the European economy, society and all European citizens. The provision of SST services will benefit all public and private space infrastructure operators, also for the Union in view of its responsibility for EU space programmes, in particular the European satellite navigation programmes "Galileo" and "EGNOS" (established by Regulation (EU) No 1285/2013[22]) of the European Parliament and of the Council) as well as the "Copernicus" programme (established by Regulation (EU) No 377/2014[23]) of the European Parliament and of the Council).

Early warnings of uncontrolled re-entry into the atmosphere and estimates of collision time and collision risk area will also be useful for national public authorities responsible for civil protection. In addition, these services may also be

---

21) W. Rathgeber, ESPI report January 2008, Europe's way to Space Situational Awareness (SSA)

22) Rozporządzenie Parlamentu Europejskiego i Rady (UE) nr 1285/2013 z dnia 11 grudnia 2013 r. w sprawie realizacji i eksploatacji europejskich systemów nawigacji satelitarnej oraz uchylające rozporządzenie Rady (WE) nr 876/2002 i rozporządzenie Parlamentu Europejskiego i Rady (WE) nr 683/2008; Dz. Urz. WE L 347 z 20.12.2013.

23) Rozporządzenie Parlamentu Europejskiego i Rady (UE) nr 377/2014 z dnia 3 kwietnia 2014 r. ustanawiające program Copernicus i uchylające rozporządzenie 9UE) nr 911/2010. Dz. Urz. WE L 122 z 24.4.2014, s. 44.

of interest to other users, such as private satellite insurers. Moreover, in the long term, free access to processable public information on the components of space objects that remain in orbit around the earth should be foreseen.

Observation and tracking services should be complementary to research activities related to the protection of space-based infrastructure carried out under Horizon 2020. (established by Regulation (EU) No 1291/2013 of the European Parliament and of the Council[24]), the Union's leading space programmes "Copernicus" and "Galileo", the initiative: The Digital Agenda for Europe (referred to in the Commission Communication of 26 August 2010) and other telecommunications infrastructures that support the establishment of the information society, security initiatives and ESA activities.

The SST consortium (through networking and use of national assets) should help to ensure the peaceful use and exploration of space. The need to cooperate with foreign partners (e.g. the US) or international organisations was also recognised.

The preamble to Decision 541/2014 of the European Parliament and of the Council of 16 April 2014 establishing a framework to support the observation and tracing of space objects states[25], inter alia, that this Decision should not address strictly military purposes. The Commission should provide, where appropriate, a mechanism for regular review and updating of the performance requirements with the participation of representatives of the user community. To this end, it should continue the necessary dialogue with relevant parties, such as the European Defence Agency (EDA) and ESA. It was further recognised that Member States should retain ownership and control of their assets and be responsible for their

---

24) Rozporządzenie Parlamentu Europejskiego i Rady (UE) nr 1291/2013 z dnia 11 grudnia 2013 r. ustanawiające „Horyzont 2020"- program ramowy w zakresie badań naukowych i innowacji (2014-2020) oraz uchylające decyzję nr 1982/2006/WE. Dz. Urz. WE L 347z 20.12.2013, s. 104.

25) Decyzja Parlamentu Europejskiego i Rady (UE) nr 541/2014 z dnia 16 kwietnia 2014 r. ustanawiająca ramy wsparcia programu obserwacji i śledzenia obiektów kosmicznych, Dz. Urz. UE L 158 z 27.5.2014, s. 227.

operation, maintenance and exchange. The European Union Satellite Centre (SATCEN - The European Union Satellite Centre) is a Union agency which offers geospatial imaging services and information products with different classifications to civilian and military users and could assist in the provision of SST services. Member States, through the Security Committee as appropriate, should take into account relevant security considerations when establishing and operating the network, including the network of SST sensors and the capacity to process and analyse SST data, as well as when providing SST services. The total expenditure related to the achievement of the SST objectives, mainly for the establishment of the network, has been estimated at 70 million euro.

Due to the sensitive nature of SSAs, the operation of sensors and the processing of data used in the provision of SST services were considered to take place in the Member States and the national assets of SSTs would remain under the control of the Member States' authorities responsible for their operation and control.

The specific objectives of the SST support framework concern: (a) the assessment and mitigation of risks associated with the operation of European spacecraft relating to the The specific objectives of the SST support framework concern: (a) the assessment and mitigation of the risks associated with the operation of European spacecraft with regard to in-orbit collisions and to enable spacecraft operators to plan and implement risk mitigation measures more effectively; (b) the mitigation of the risks associated with bringing European spacecraft into space; (c) the observation of the uncontrolled re-entry of spacecraft or space debris into the earth's atmosphere and more accurate and effective early warning in order to reduce possible threats to the safety of European citizens and possible damage to ground infrastructure; (d) actions to prevent the further spread of space debris; (d) actions to prevent the further spread of debris in space.

Article 4 of this Decision of 16 April 2014 concerns activities supported by

the SST support framework, including the development of a network of national ground-based sensors in the Member States and space-based sensors for observation and tracking of space objects and the creation of a database and the processing, analysis and sharing of SST data. Article 5 of the Decision concerns civil services. These include: (a) assessing the risk of collision between spacecraft or between spacecraft and space debris and issuing collision warnings during the launch, early orbit, in-orbit and in-orbit phase and disposal of physical debris from space missions; (b) detecting and characterising fragmentation, destruction or collision in orbit; (c) assessing the risk of uncontrolled re-entry of objects and space debris into the Earth's atmosphere and generating information on this subject, including estimating the time and likely location of possible impact. SST services are provided, inter alia, to all EU Member States, the Council of the EU, the EU Commission, public and private owners and operators of spacecraft and public bodies involved in civil protection.

SST services shall be provided in accordance with the provisions on the use and exchange of SST data and information set out in Article 9. Participating Member States and the European Commission shall not be liable for: (a) any damage resulting from the failure or interruption of SST services; (b) delays in the provision of SST services; (c) inaccuracies in the information provided through SST services; (d) any action taken in response to the provision of SST services.

Article 6 of the Decision concerns the role of the European Commission which, inter alia: (a) manages and ensures the implementation of the SST support framework; (b) takes the necessary measures to identify, control, reduce and monitor the risks associated with the SST support framework; (c) ensures that the SST user requirements are updated accordingly; (d) lays down general guidelines or the management of the SST support framework, in particular to facilitate the establishment and operation of the consortium referred to in Article 7; (e) facilitates the widest possible participation of Member States in all relevant cases.

The Commission shall adopt implementing acts establishing the coordination plans and appropriate technical measures for the activities concerning the SST support framework. The Commission shall provide the European Parliament and the Council of the EU with all relevant information on the implementation of the SST support framework in due time in order to ensure transparency and clarity on: (a) the indicative scope of activities and different EU sources of funding; (b) participation in and activities based on SST support; (c) changes in the networking of Member States' SST assets and changes in the provision of SST services; (d) exchange and use of SST information.

The Commission shall publish and update the list of participating Member States on its website. Responsibility for sensor operation, data processing and data policy shall lie with the participating Member States. The assets of the participating Member States shall remain under their full control. Article 8 of the Decision deals with the role of SATCEN (European Union Satellite Centre) and Article 9 with SST data and information. The use and exchange of SST information provided by the consortium and its use are subject to certain restrictions, including that it may not be made available to unauthorised persons, as determined by the instructions and security rules of the originator and owner of the space facility.

Article 10 of the Decision provides for the coordination of operational activities. Designated national consortium members shall conclude an agreement laying down the rules and mechanisms for their cooperation. (a) the use and exchange of SST information, taking into account the approved recommendations of the 'European Space Agency'. "The agreement shall include, inter alia, provisions on: (a) the use and exchange of SST information, taking into account the approved recommendations on 'Space Situational Awareness Data Policy - Recommendations on Security Aspects'; (b) the establishment of a risk management structure. (c) cooperate with SATCEN with a view to achieving its objectives.

Articles 11 and 12 of the Decision deal with control procedures. In 2016 The EU Commission issued an implementing decision on the coordination plan for a support framework for space observation and tracking and on the procedure for the participation of Member States.[26] In accordance with Article 8 (Conformity and safety assessment), the Commission shall consider a requesting Member State to be compliant if an initial risk assessment of each SST asset has been carried out and approved by that Member State, as described in Annex I, Part IV (Safety Aspects) and where the Member State concerned has demonstrated compliance with the criteria set out in Article 7(1) and (5) of Decision No 541/2014/EU and in Part IV of Annex I to this Decision.[27] The Commission shall notify the requesting Member State, the Member States already participating in support of SSTs and the national bodies already designated by the participating Member States of the results of the conformity and safety assessment phase. The decision shall also contain the overall procedure, including its stages, for the conclusion of the SST contract and its compliance. In May 2018. The Commission issued a report to the European Parliament and the Council on the implementation of the SST system.[28]

In one of the recommendations was stated that the EU SST delivered results for all actions and three services foreseen in the SST Decision and created EU added value. However, implementation needs to be stepped up in the next phase and the EU SST needs to evolve to improve its effectiveness. The following operational milestones would facilitate achievement of the overall objective of helping to ensure the long-term sustainability of European space infrastructure and services:

defining an effective future EU SST architecture and suitable arrangements for

---

26) Brussels 19.12.2016 r. C(2016) 8482 the final decision KE 19.12.2016 r.

27) Annexes to the Commission Implementing Decision on the coordination plan for a support framework for space observation and tracing and on the procedure for the participation of Member States, Brussels, 1 January 2008. 19.12.2016 r. C(2016) 8482 final ANNEXES 1 to 3

28) COM 2018 (256) final

service delivery – this is critical to optimisation and European added value. Future development needs to ensure that the EU SST builds on complementarity between national assets and optimizes the EU SST architecture while avoiding unnecessary duplication across the functions. Investments in existing and new sensors, on the basis of the architecture studies, are necessary to improve the EU SST's capacities and service. To this end, the next steps must include establishing a sound development plan leading to the future EU SST architecture.

a common EU database of orbital objects, building on national data – this is indispensable for Europe's future SST autonomy. To this end, progress is needed in the near future on the networking between NOCs and the exchange of SST data and information. In parallel, the EU should decide on the level of ambition to guide the strategic development of the EU SST. It should determine an appropriate, acceptable and achievable degree of autonomy and consider possible strategies for ensuring complementarity with key partner countries; outreach to, and active engagement with, potential users, supported by further development of EU SST services – the EU SST has helped to attract users for its services and raise awareness of space threats, but a large pool of potential users has yet to be reached. To this end, the quality and efficiency of EU SST services needs to be improved according to the needs of users, including in terms of added value and operational handling of the fleet. This should be supported by: intensified outreach campaigns; further development of the user feedback mechanism and common EU SST operational procedures and standards for service provision; and inclusion of added value services to the common guaranteed baseline; consideration of the needs for, and possible means of realising, synergies with other segments of space situational awareness and the need for SST services covering space hazards over the life-cycle of entire spacecraft missions; formulation of a long-term vision, strategic objectives and general guidelines at the EU level – these should be supported by implementation roadmaps and multi-annual plans, and taking account of the preparatory work carried out so far;

further simplification of the EU SST grant management scheme – this is needed to address the challenges linked to the complex and administrative burdensome EU funding arrangements and provide predictability and stability for future EU SST development; and governance changes to ensure the cost-effective management – this is crucial to accommodate possible broader Member State participation and EU SST development. The Commission's involvement in EU SST should be stepped up to enable providing more guidance and monitoring at the strategic, policy and organisational levels. The role of SATCEN in facilitating the provision of EU SST services should be further explored.

The SSA system is evolving. It is now planned to extend the European SSA system to new areas such as the SWE and NEO. In terms of Space Weather, most capabilities have also been developed at a national level, leading to a fragmented approach and limited operational use for SWE, without 24/7 coverage to catalogue the risks. The assets have also been developed primarily for scientific purposes rather than space weather services, and hence are not tailored specifically for end-user needs. However, the European Space Agency (ESA) has been developing a Space Weather Service Network in order to provide information in the form of scientific observations, results, models, and processed, usable data in the form of SWE products. Its SSA Space Weather Coordination Center (SSCC) is located in Brussels, Belgium, and there are also five Expert Service Centres (ESCs), which focus on different areas of space weather research/expertise (e.g. geomagnetic storms, solar radiation storms). No EU-wide programme exists however, and there is still a significant reliance on US data. Finally, for Near-Earth Objects, Europe's NEO survey and tracking capabilities have been historically limited to nationally operated telescopes, of which most have a primary goal other than NEO, sporadic observation campaigns, and the effort of small research centres with high scientific experience but limited finance and operational resources. As a result, NEO observatories and universities in Europe provide contributions to the central US database, but users in Europe

remain highly dependent on the US for information and data to take any potential mitigation action. However, in recent years ESA has strengthened Europe's NEO capabilities by introducing a more structured approach under its SSA-NEO segment, federating several systems under its new NEO Coordination Centre (NEOCC).[29)]

Ⅶ. European Space Policy

There is an European approach for policy drivers which secure the results of the continuous and substantial investment made by public and private actors, protect the European economy and society against risks related to its pervasive and sizeable dependence on the space infrastructure, contribute to a service oriented policy by assuring the ability of the infrastructure to deliver a service that can be justifiably be trusted, in particular for users in defense and security. There is a guarantee that in Europe there is an autonomy and freedom of action in the field of security in outer space with implications on the space domain at large (non-dependence). European approach in long term stakes is responsible to "promote Europe's position as a leader in space, increase its share on the world space markets, and seize the benefits and opportunities offered by space. "Space security now holds a central position in space diplomacy: there is a need to play a prominent role on the international scene, as a promoter of a clear, united and consistent "European way". Security plays an increasing role in commercial space markets. Security supports the European industry competitiveness and stimulates the emergence of a commercial market. European Space Agency (ESA) is a key

29) "An assessment of the possible EU Space Situational Awareness initiative", Price-Waterhouse Cooper 2018; Discussion paper Strategic evolution and possible extension of the EUSST- Ref. GROW(2017)‐SSTEG-2-00 2nd meeting of the Space Surveillance and Tracking (SST) Commission Expert Group 27 November 2017.

player of capability-building. ESA launched a number of initiatives including an SSA programme (limited SST[30] component on MS request), a Cybersecurity excellence centre, the CleanSpace initiative, IADC etc.). ESA made efforts to improve its capacity/legitimacy to handle security-related activities.

In ESA-EU joint statement a lot has been said about the European identity, spirit and cohesion: full integration of space into European economy and society, a globally competitive European space sector, European autonomy in accessing and using space in a safe and secure environment. In a document Elements of ESA's Policy on Space and Security[31], one of the objectives recognizes that space technology and derived services contribute to providing solutions to security challenges and invites the Director General to establish a strategy concerning ESA space security activities, in coordination with its Member States and other national and European actors;[32] Another European Institution, such as EUMETSAT is deeply engaged in issues relating to the security of its space assets to safeguard its core operational mission (ex. radio Frequency, Space Debris Avoidance and Prevention, Space Weather, Protection of assets, provider of in-situ data, engaging with Member States and partner organizations to define future possible operational roles to support the wider Space Weather user community).[33]

There are some studies on the European Policy in Space. European Institute of Space Policy (ESPI) provided some of them.[34] As it was stated in the European Union only, at least 10% of the GDP depends to some extent on space assets. At the 10th ESPI Conference in January 2018, Frederica Mogherini, High

30) SST- Space Surveillance and Tracking; In EU the framework for Space Surveillance and tracking Support has been established. Consortium was created thanks to the decision541/2014/EU. R. Peldszus, EU Space Surveillance and Tracking Support Framework, ESPI Conference 27th of September 2018

31) ESA/C/ESA/C(2016)106, objective 5F

32) K. Uwe Schrögl, Security in Outer Space: Rising Stakes for Civilian Space Programmes, ESPI Conference September 27th 2018

33) A. Monham, Securing EUMETSAT's Mission from an Evolving Space Environment

34) ESPI report June 2018 Security in Outer Space: Rising Stakes for Europe, report 64

Representative of the European Union for Foreign Affairs and Security Policy and Vice-President of the European Commission (EC), delivered a keynote speech on the role of space in security and defense matters. The growing importance of space infrastructure raises new stakes concerning its protection from harm. Experts routinely caution governments and operators about the rising threats to space infrastructure security, underlining that space is increasingly congested and contested, which poses an intensifying challenge to safely deploying, operating and exploiting space assets. Challenges to the security of space infrastructure include the proliferation of space debris, accidental or malicious radio interferences, cyber-attacks, anti-satellite technologies (ASAT), and natural space hazards such as geomagnetic and solar radiation storms. ESPI ranks space security as a short-term priority for space policy development and considers it one of the key challenges for the future of Europe´s activity in space.

It seems that Europe has joined with full-rights the small club of space power s.[35] As a result, Europe is equipped today with a complete and operational space infrastructure, including orbital systems (i.e. spacecraft), ground stations, launchers, spaceports and, in general, all systems and facilities required to develop, manufacture, deploy, operate and exploit space systems. The European Union, as a supranational institutional actor, owns the space infrastructures of the current flagship programmes Galileo, EGNOS and Copernicus. Development, operation and exploitation of EU space infrastructures are delegated to partner organizations including the European Space Agency[36], the European GNSS Agency (GSA), EUMETSAT[37], Frontex, the European Union Satellite Centre (EU SatCen), the European Maritime Safety Agency and other public and private

35) A. Vernile, The rise of private actors in the Space Sector, ESPI, Springer 2018, p. 61

36) The European Space Agency, as an inter-governmental organization, develops, owns and operates a variety of space systems and ground infrastructures funded from annual contributions by its Member States.

37) EUMETSAT, as the European operational satellite agency for monitoring weather, climate and the environment, operates a system of meteorological satellites. It re-lies on ESA for the design and development of its space segment;

entrusted entities. Member States, who conduct both civil and military programmes and whose na-tional institutions (e.g. space agencies, department of defence) own, operate and exploit national space infrastructures. Commercial Operators, such as Eutelsat, SES or Inmarsat, own, operate and ex-ploit private space infrastructures for a commercial purpose.

In Europe, the number of satellites operated by private entities (124) exceeds the number of satellites operated by public civil and military institutions (95). This is a direct consequence of the leading position occupied by European satellite operators on global markets, in particular for satellite telecommunication. Satellites operated by European institutions include a total of 44 space systems: 17 operated by ESA (including 5 EU Sentinel satellites), 5 operated by EUMETSAT and 22 Galileo satellites owned by the EU and operated by the GSA with the support of private operators. Satellites operated by national civil and military institutions include 45 space systems: 23 operated by national space agencies and 22 by military related organisations. The remaining 23 satellites include mostly smaller private operators such as Airbus, Skynet (for the UK Ministry of Defence), or DMC International Imaging, for example. Each individual European space infrastructure comprises ground stations that can be isolated, colocated in hubs, or shared with other systems. Lastly, Europe has an autonomous access-to-space capability comprising the required industrial setup, an operational spaceport, and a broad family of launchers covering small, medium and heavy lift capacities.

Europe can therefore rely on a wide space infrastructure comprised of numerous space and ground systems functioning together to provide end-users with a broad range of space-based data and services. The rising need for space security also lies in the increasing areas of application, in particular in the field of (ground) security. This strategic area encompasses various activities such as civil protection, police forces, border control, peace keeping, external actions and crisis management. In fact, although European countries' investment in military

space activities has remained rather limited in comparison to the United States, space infrastructure has always pro-vided services and data to defense and security actors in Europe. Space-based capabilities sought by users in the security sector range from high-resolution imagery to secured tele-communications through signal intelligence and early warning, among others. These services and data can be provided by space as-sets owned/operated by national military bodies, by commercial companies, or by civil institutions.

Another essential driver is related to the strategic need for Europe to guarantee the security of its space infrastructure autonomously through independent capabilities, in particular for space situational awareness (i.e. systems, data, technologies). European autonomy and freedom of action in the field of security in outer space is a condition to fully achieving the 'independence' objective that initially motivated the launch of programmes such as Galileo. A share of European capabilities relies/depends on a series of Sharing Agreements with the U.S. signed by European intergovernmental organisations (i.e. ESA and EUMETSAT), Member States institutions (i.e. France, Germany, UK, Italy, Spain, Belgium) and a number of European commercial satellite operators and launch service providers. Cooperation on security in outer space is unavoidable for the overall success and efficiency of a variety of actions and measures including, in particular, the development of advanced SSA capabilities and safety of operations in outer space. Transparency, data sharing and coordination between international partners bring clear benefits for all, ranging from improved monitoring capacities (e.g. quantity of objects tracked, precision of measurements) to enhanced security (e.g. collision avoidance, monitoring of proximity operations). From a strategic perspective however, cooperation with third countries, as beneficial as it may be, cannot become the sole corner stone.

ESA' scope in security and defense has progressively evolved, first in the domain of space environment protection and preservation with the adoption of a resolution on the protection of the space environment in 2000 by ESA Council.

The resolution established a task force, coordinated by ESOC (European Space Operations Centre) in Darmstadt, with the objective of working on the definition of standards for the safety of orbiting satellites. The task force brought together ESA and national agency representatives and in 2002 introduced preventive measures covering the entire space activities lifecycle and the principle of orbit protection. There were other tasks on environment, such as a feasibility study in 2005 for a space surveillance mission based on secondary optical payloads on board space-craft in LEO and GEO to detect small debris. In November 2008, ESA established a Space Situational Awareness (SSA) Programme. Through this optional programme, counting on the financial participation of 19 ESA Member States, ESA aims to support the development of an independent European capability to assess space-based threats to systems in orbit or on the ground. ESA has become an official operational actor of the European approach to space security, giving a pan-European dimension to the domain. ESA has developed a capability to receive, store, and produce classified information and exchange classified information with third parties such as the EU Council, marking a step forward in the role that the Agency could play in the field of space security in the future.

A PwC study from 2017 con-ducted for the European Commission on the dependence of the European Economy on Space Infrastructures identified three main options: Space infrastructure security, alternative solutions and redundancy and crisis management and emergency response. In line with these concerns and in the field of GNSS, the European Commission published in March 2018 the first edition of the European Radio Navigation Plan, which aims to identify and mitigate risks associated to dependence on GNSS[38]. A large number of EU initiatives currently rely on space assets and space-enabled solutions to achieve the strategic objectives of the Union. This includes, among many others, the Common Agricultural Policy, the Digital Agenda and Digital Single Market, the

38) https://ec.europa.eu/docsroom/documents/28325/attachments/1/translations/en/renditions/na-tive

Energy Union, Single European Sky, Intelligent Transport Systems and road safety policy for example. Clearly these initiatives are not limited to just a few areas of intervention but rather encompass a large part of EU policy activity. Just as the extent of dependence varies across economic sectors, dependence on space assets varies across these initiatives, from a critical level in the case of air transport, control of fisheries and enforcement of the Common Fisheries Policy to a more limited level of dependence in the case of the Urban agenda where space assets provide partial means to achieve some objectives. Among the potential strategic impacts of the loss of space assets, the impact on Defense & Security holds a particular place as military and civil protection operations rely substantially on space assets for navigation and positioning, communication and intelligence.[39)]

The significant progress of EU programmes over the period 2014-2020 is also amplifying the importance of a service-oriented space policy to build user confidence, encourage the uptake of space services, and consequently maximise the benefits of the European space infrastructure.

The rising need for enhanced space security in Europe is driven in the short-term by four key policy rationales: secure the results of the continuous and substantial investment made by public and private actors; protect the European economy and society against risks related to its pervasive and sizeable dependence on the space infrastructure, contribute to a service-oriented policy by assuring the ability of the infrastructure to deliver a service that can justifiably be trusted, in particular for users in defense and security and guarantee European autonomy and freedom of action in the field of security in outer space, and in the space domain at large.[40)]

Beyond these short-term policy stakes, the need for a reinforced approach to space security is also driven by longer-term considerations stemming from the

---

39) Dependence of the European Economy on Space Infrastructures Potential Impacts of Space Assets Loss, PwC, 2017, p. 146

40) Ch. D. Johnson, Handbook for new actors in space, Space Security Foundation 2017

strategic ambition of Europe to "promote its position as a leader in space, increase its share on the world space markets, and seize the benefits and opportunities offered by space." Europe must therefore play a prominent role in international dialogues and negotiations, as a promoter of a clear, united and consistent "European way". In this respect, European activities and initiatives on the international scene, and in particular the elaboration of a Code of Conduct for Outer Space Activities and subsequent international diplomatic efforts, have demonstrated Europe's willingness to work with the international community on space issues. Building European autonomy and authority in the field of space security will also be essential to foster European leadership on the global scene. Equipping Europe with a system providing comprehensive and independent SSA capabilities is a priority to position Europe as a credible interlocutor on the international scene; hence capacity-building alike in SSA. Such effort is also essential in view of the development of a civil space traffic management framework. Stakes for Europe are high to develop its own approach to STM and play a prominent role in the construction of an international framework. European policy should also be aware that space security will play an increasing role in commercial space markets.[41)]

Ⅷ. Final Remarks

In this article the attention was paid to the legislation issue on space security. It seems that both states: South Korea and Poland (as an EU state) find this topic important and regulate this issue in the internal and regional (EU) law. Policy, strategy or plans on Space security are sensitive for both states, even though Poland has not achieved yet such a progress in this matter as South Korea. The

41) B. Baseley Walker, Current international space security initiatives.. op. cit., p. 116-117

reason is probably very simple- Korea is much more experienced state as a regulator because of the longer history of using Outer Space on daily basis (institutions, regulators and space activities). Korea though is a good example to follow in the legislation on SSA for Poland. The proper and practical legislation should be updated in case to serve to the public and not making not necessary barriers to the space market, having still the priority of security for all entities engaged in Space. This stabilized legislation is a great tool for international collaboration and cooperation in Space.

Reference

Ch. D. Johnson, Handbook for new actors in space, Space Security Foundation, 2017.

S. Moranta, *Security in Outer Space: Perspectives on Transatlantic Relations*, 12th ESPI Autumn Conference Vienna, September 27th 2018.

M. Polkowska, *European challenges in SSA. Poland example*, presentation at the workshop Security World Foundation, Seoul 24-25 January 2019.

M. Polkowska, *Polish Space Agency pursues task of developing country's space expertise*, Room, The space journal nr 2(8) 2016.

M. Polkowska, J. Ryzenko, Aktywność Polski w przestrzeni kosmicznej- nauka, polityka I prawo. Stan obecny, Gdańskie Studia Prawnicze, Tom XXXVI, 2016

C. Portelli, *EU SST Consortium governance, initial operation and current status*, Nov 21th 2017.

W. Rathgeber, *Europe's way to Space Situational Awareness (SSA)*, ESPI report, January 2008.

K. Uwe Schrögl, *Security in Outer Space: Rising Stakes for Civilian Space Programmes*, ESPI Conference, September 27th 2018.

A. Vernile, *The rise of private actors in the Space Sector*, ESPI report, Springer 2018.

Rozporządzenie Parlamentu Europejskiego i Rady (UE) nr 1291/2013 z dnia 11 grudnia 2013 r. ustanawiające „Horyzont 2020"- program ramowy w zakresie badań naukowych i innowacji (2014-2020) oraz uchylające decyzję nr 1982/2006/WE. Dz. Urz. WE L 347z 20.12.2013.

Decyzja Parlamentu Europejskiego i Rady (UE) nr 541/2014 z dnia 16 kwietnia 2014 r. ustanawiająca ramy wsparcia programu obserwacji i śledzenia obiektów kosmicznych, Dz. Urz. UE L 158 z 27.5.2014.

Rozporządzenie Parlamentu Europejskiego i Rady (UE) nr 1285/2013 z dnia 11 grudnia 2013 r. w sprawie realizacji i eksploatacji europejskich systemów nawigacji satelitarnej oraz uchylające rozporządzenie Rady (WE) nr 876/2002 i rozporządzenie Parlamentu Europejskiego i Rady (WE) nr 683/2008; Dz. Urz.

WE L 347 z 20.12.2013.

Rozporządzenie Parlamentu Europejskiego i Rady (UE) nr 377/2014 z dnia 3 kwietnia 2014 r. ustanawiające program Copernicus i uchylające rozporządzenie 9UE) nr 911/2010. Dz. Urz. WE L 122 z 24.4.2014.

Abstract

Legislation on Space security: *South Korean and Poland Challenges*

Małgorzata Polkowska*

This article refers to the Space security legislation in South Korea and Poland. Both states have already prepared some legislation on Security in Space- the question is the following- if there is still a need of progress and if those presented legislation are sufficient for the practical purposes of the peaceful uses of Outer Space. South Korea is a much more experienced state in using space than Poland; the same seems with the legislation.

Poland as less experienced state in this matter has lots of ambitions to create the efficient legislation on Space security, so it must follow the good examples of states and institution in this matter. One of them is Korea. On the other state, Poland as a Member of EU must implement the European law in space security (in particular SSA), which seems to be priceless and efficient for the international cooperation in Space.

Key words : Space Security, Legislation, Policy, Space Situational Awareness, Strategy

* Professor at the War Studies University (Warsaw, Poland).