Nearly 60 years have passed since a satellite was launched into outer space for the first time in the history of mankind. In recent years, technology leveraging outer space has been applied to various areas. No state is allowed to own outer space, and it is freely available to all nations. Major countries thus make proactive efforts to use outer space.\(^1\) For example, observation satellites such as meteorological satellites are used to observe weather as well as land and waters; communication and broadcasting satellites are used for the Internet and broadcasting; and positioning satellites are used to navigate aircraft and ships. These satellites have widely prevailed in social, economic, scientific, and other areas as essential infrastructure for the public and private sectors.

In the security field, military forces in major countries are actively involved in outer space activities and utilize a variety of satellites. There is no concept of national borders in outer space, meaning that the utilization of satellites enables the observation of, communication at, and positioning on any area on Earth. Thus, major countries make efforts to enhance the capabilities of a variety of satellites and launch them for the purpose of enhancing C4ISR functions.\(^2\) Such satellites include imagery reconnaissance satellites reconnoitering military facilities and targets, early warning satellites that detect the launch of ballistic missiles, satellites gathering radio wave information for military communications, communication satellites for military communication, and positioning satellites for navigating naval vessels and aircraft and enhancing the precision of weapons systems.

In outer space, the various countries are also rapidly developing their capabilities to ensure their military superiority. As various countries launch military satellites, China conducted a test to destroy its aging satellite with a ground-launched missile. The resulting space debris\(^3\) spread across the satellite’s orbit, and came to be seen as a threat against space assets such as satellites owned by countries.\(^4\) Furthermore, countries including China and Russia are thought to be also developing anti-satellite weapons (ASAT) that do not directly hit and destroy a satellite by a missile, thus creating less space debris.

For example, it has been noted that ASATs under development include an ASAT that brings a “killer satellite” to maneuver itself close to target and utilize a robot arm to capture it to disable its functions. In this area, China has carried out experiments in outer space in which they have mobilized satellites close to other satellites to simulate the movements of a killer satellite. It has been noted that Russia too, has launched killer satellites.\(^5\) Furthermore, it has been pointed out that both China and Russia are developing ASATs that disable the functions of the target satellite by using a jammer to interfere with communications between the target satellite and the ground station.

As the above illustrates, the risk to the stable use of outer space has become one of the critical security challenges for countries, thus it has become necessary to deal with this risk effectively in an effort to ensure stability in the use of outer space.

Against this backdrop, the existing framework such as the Outer Space Treaty (The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies) that prescribes the exploration and use of outer space, do not have provisions on prohibiting the destruction of space objects and refraining from actions triggering space debris. International efforts have been under way recently for the creation of the International Code of Conduct for Outer Space Activities and the guidelines for “Long-term Sustainability of Outer Space

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\(^1\) The Outer Space Treaty (The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies) that came into force in October 1967 defines such matters as the use of the Moon and other celestial bodies for peaceful purposes, the freedom in principle of exploration and use of outer space, and the prohibition of ownership. However, no clear international agreement has been reached on the definition of outer space, though according to one of the concepts, outer space is considered space located 100 km or further away from the Earth’s surface.

\(^2\) The term “C4ISR” stands for command, control, communication, computer, intelligence, surveillance, and reconnaissance. The 1991 Gulf War is considered “the first high-tech war conducted in outer space in the history of mankind.”

\(^3\) Unnecessary artifacts orbiting around the Earth, including satellites no longer in use, upper stages parts, and fragments of launch vehicles.

\(^4\) According to an April 2018 issue of the Washington Times (National Digital Edition) of the U.S., Russia carried out an experimental launch of an anti-satellite missile in March 2018. Moreover, it was noted that China also carried out an experimental launch of an anti-satellite missile in February 2018.

Activities. Moreover, countries are working on the Space Situational Awareness (SSA) by monitoring the solar activity with a potential impact on satellites and electronic equipment on Earth, and threats caused by meteors reaching Earth, in addition to threats posed by anti-satellite weapons and space debris to space assets.

2 ■ Trends in the Use of Space by Countries for Security Objectives

1 United States

The United States launched its first satellite, Explorer 1, in January 1958, following the satellite launches by the former Soviet Union. The country has since then proceeded with a variety of space activities in fields including military, science, and resource exploration, such as launching the world’s first reconnaissance satellite and landing on the Moon. Today, the United States is the world’s leading space power. The U.S. Forces clearly recognize the importance of outer space for their actions, and in this regard, actively utilize outer space for security purposes. In June 2010, the United States released the National Space Policy that presents the country’s basic guidelines for space policy.7

The National Security Strategy (NSS) revealed in December 2017 points out that many countries are said to have purchased satellites to back up their strategic military activities, and some countries even pursuing a variety of ASATs on the basis of belief that the capability to attack assets in outer space will give them asymmetrical advantages. But having noted that, the United States indicated that unlimited access to and freedom in activities in outer space were vital interests of the United States, and that the long-term goals in outer space were given consideration by the newly established National Space Council (NSpC) in an effort to develop strategies. The National Space Strategy was announced in March 2018, which demonstrated its recognition that their adversaries had turned space into a warfighting domain, and that the United States would seek to deter, counter, and defeat threats in the space domain that are hostile to the national interest of the United States and its allies. Based on these strategic guidelines, the U.S. Department of Defense (DoD) has set the goal of maintaining and strengthening U.S. space superiority for security purposes, recognizing that the United States needs to prepare for the possibility of conflict extending into outer space.

From an organizational perspective, the National Aeronautics and Space Administration (NASA) is responsible for non-military space development in the United States, while the U.S. DoD works on space development from national security perspective, and the Joint Force Space Component Command under the control of the U.S. Strategic Command oversees the activities in space from a military perspective.

Major satellites used for military purposes include satellites for imagery reconnaissance, early warning, electronic / signals intelligence, communication, and global positioning, and their operations are wide-ranging.

2 Russia

Russia’s space activities have been continuing since the former Soviet Union era. The former Soviet Union successively launched multiple satellites after it launched the first satellite in the history of mankind, Sputnik 1, in October 1957, and had the largest number of launched satellites in the world until the collapse of the former Soviet Union. The satellites included many military satellites, and progress was made in the use of space for military purposes by the U.S. and the former Soviet Union during the Cold War era. Russia’s space activities have declined since the former Soviet Union collapsed in 1991. However, the country has recently started to expand its activities once again.

Regarding the country’s trends in security, the National Security Strategy of the Russian Federation, approved in December 2015, states that the U.S. deployment of weapons into outer space constitutes one of the factors undermining global and regional stability. The Military Doctrine of the Russian Federation, a document...
created in April 2014 to specifically define the principles of the National Security Strategy in the military field, mentions the development and maintenance of a group of orbiting spacecraft to support Russia’s military activities in space as being one of the main missions.

From an organizational perspective, the Roscosmos State Corporation for Space Activities is in charge of space activities related to Russia’s scientific and economic areas, while the Russian Ministry of Defence is involved in space activities for security purposes. The Russian Aerospace Forces\(^8\) conducts actual space activities for military purposes, manages facilities for launching satellites, among other activities.

Major satellites launched by Russia are satellites for imagery reconnaissance, early warning, radio wave information gathering, communication, positioning, and others, all of which are presumed to be used for security purposes. Currently, Russia is developing a new Angara carrier launch vehicle,\(^9\) along with building a new launch site in Vostochny in the Far East.\(^10\)

Regarding European outer space activities, France succeeded in launching its own satellite for the first time in 1965, following the former Soviet Union and the United States, and the United Kingdom succeeded in launching its own satellite for the first time in 1971.

Italy and Germany used launch vehicles developed by the United States to own satellites in December 1964 and July 1965, respectively. Meanwhile, the European Space Agency (ESA)\(^11\) Convention signed in May 1975 established the ESA, which launched a satellite in 1979.

In Europe, the EU, the ESA, and European countries are promoting their own unique space activities and are cooperating with each other to implement space activities.\(^12\) The ESA signed a “framework agreement” with the EU in May 2004 to prescribe that they will coordinate on proceeding with space development and hold regular minister-level council meetings. The joint council meeting held by the ESA and the EU in May 2007 approved the “European Space Policy.”\(^13\) This “European Space Policy” mentions improving synergy effects between space activities for civil and defense purposes, and the importance of implementing space activities based on coordinated efforts among member states and ensuring an internationally competitive space industry. The Policy identifies security as one of its areas of priority.

It is thought that in the future, “Galileo,” a satellite positioning system planned by the EU and the ESA,\(^14\) “Copernicus,” an Earth observation program,\(^15\) and the Multinational Space-based Imaging System (MUSIS),\(^16\) a reconnaissance satellite project implemented by the European Defence Agency (EDA),\(^17\) will be utilized for security in Europe.

China

China began working on space development in the 1950s, and in April 1970, the country launched its first satellite “Dong Fang Hong I,” mounted on the transportation launch vehicle “Long March 1,”\(^18\) using technology enhanced through its missile development.

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8 According to the Russian Ministry of Defence, the Aerospace Forces were created by merging the Air Force and the Aerospace Defence Forces, and started performing its tasks in August 2015. The tasks of the Aerospace Forces include: (1) providing focused combat command to the air force; (2) conducting aerial and missile defense; (3) launching and controlling satellites; (4) warning about missile attack; and (5) monitoring outer space.

9 In July 2014, the first launch of “Angara-1.2PP” was conducted successfully. In December 2014, “Angara-A5” successfully put a dummy satellite into orbit for the first time. The Angara launch vehicle is considered as the first large launch vehicle that Russia developed after the collapse of the Soviet Union. It is expected that the vehicle will be launching commercial as well as military satellites.

10 The new launch site is being built to replace the Russian-leased Baikonur Cosmodrome in Kazakhstan, and Russia aims to have the site fully operational by 2020.

11 The ESA was established in May 1975 based on the ESA Convention targeting to establish a single European space organization focusing on the peaceful use of space research, technology, and application areas. The organization was formally established in October 1980.

12 In September 2000, the European Commission (EC) and the ESA created the European Strategy for Space that committed to pursing Europe’s coherent and effective space activities. The strategy envisioned that the EC would make political and strategic decisions on space policies and that the ESA would function as the implementing organization. For the satellite positioning system “Galileo” currently in operation and the environmental and security monitoring program “Copernicus,” the EU and ESA are complementing each other in carrying these projects forward, with the former mainly taking charge of the policy dimension and the latter the technical dimension.

13 The EC released the European Strategy for Space in October 2016.

14 In December 2016, initial services were launched with 18 satellites. Galileo is set to offer the services in conjunction with GPS because of the insufficient number of satellites. The system is expected to be fully operational by 2020 when all 30 satellites are in place.

15 New observation satellites called “Sentinels” are being launched to collect imagery necessary for conducting Earth observations. Sentinels are classified according to their purpose into: 1) all-weather satellite that takes images of land and ocean; 2) all-weather satellite capable of high-resolution land monitoring to provide imagery of vegetation, inland waterways, and coastal areas; and 3) satellite measuring land- and sea-surface temperature and topography. Six Sentinels are said to be in orbit as of January 2016.

16 The European Defence Agency (EDA) was established in 2004 to improve Europe’s defense capabilities for crisis management purposes and to execute and maintain security and defense policies.

17 The MUSIS was started by Belgium, Germany, Greece, France, Italy, and Spain. The organization was joined later by Poland in December 2010. This is a joint project succeeding such projects as “Helios 2” (a French military reconnaissance satellite), “Pleiades” (a French Earth imaging satellite used for military and civilian purposes), “SAR-Lupe” (a German group of military radar satellites), “COSMO-SkyMed” (an Italian constellation of Earth observation satellites), and “Ingenio” (a Spanish optical satellite).

18 The number of cargo rocket launches in 2016 was 22 in the United States, 22 in China, 17 in Russia, 11 in Europe, 7 in India, 4 in Japan, and 1 in Israel. In terms of the number of rocket launches, China overtook Russia for the first time to equal the U.S. Moreover, the number of rocket launches in 2017 were 29 in the U.S., 19 in Russia, 18 in China, 11 in Europe (France), 7 in Japan, and 5 in India.
China has thus far conducted activities such as manned space flight and lunar rover launches. It is speculated that China’s space development is intended to enhance national prestige and develop space resources.

With regard to the organizational setup, the State Administration for Science, Technology and Industry for National Defense, under the Ministry of Industry and Information Technology of the State Council, oversees industries related to space, nuclear technology, aviation, ships, and weapons. The China National Space Administration enforces the administrative control of the space area for civil and commercial purposes and represents the Chinese Government externally.

China’s defense white paper “China’s Military Strategy” (May 2015) states that outer space is a commanding height in strategic competition among all nations. Meanwhile, China asserts that its activities in outer space constitute “peaceful use of outer space,” and underscores that China is “opposed to the weaponization of and arms race in outer space, and will take an active part in international space cooperation.” China also commits to “[keeping] abreast of the dynamics of outer space, deal with security threats and challenges in that domain, and secure its space assets.” In addition, “China’s Space Activities in 2016,” China’s white paper on space activities released in December 2016, presents a vision to “build China into a space power” and for “the realization of the Chinese Dream.” It also presents a schedule of launches up to 2020, and emphasizes international cooperation and the peaceful use of space. On the other hand, the white paper also notes that China will satisfy its needs for security, which does not deny the country’s military use of space.

China is indeed actively using space for information collection, communications, and positioning for military purposes. While the details of the tasks and organization of the Strategic Support Force, established in January 2016, have not been revealed, it is pointed out as being in charge of outer space, cyber, and electronic warfare. Also, in addition to the continuation of the launch of Long March series cargo rockets, China has announced the plan for developing a cargo rocket capable of carrying extra heavy payloads. Carrier launch vehicles are developed and manufactured by Chinese state-owned enterprises, which are thought to be also developing and manufacturing ballistic missiles. It is expected that China will pursue space development through close collaboration between the public sector, military, and private sector. Moreover, it is regarded that China is focusing also on the development of satellite ground stations and opened China’s first satellite data receiving station outside of China, near Kiruna in Sweden in December 2016. Furthermore, the country has launched a manned space program with the aim of constructing its own space station. The first unmanned cargo spacecraft, Tianzhou 1, was launched in April 2017 from Wenchang Space Launch Center on the carrier rocket, Long March-7 Y2. After that, Tianzhou 1 succeeded in being docked with Tiangong-2, a space laboratory. Other than that, the Hainan Sheng Institute of Remote Sensing is planning to launch a series of 10 satellites between 2019 and 2021. Also, China is considered to have become one of the space powers through investments, research and development,
India’s space development promotes space programs aimed at social and economic development in line with the five-year national plan. The country’s 12th Five-Year Plan focuses on non-military projects including communication, positioning, Earth observation (e.g., disaster monitoring, resource exploration, and weather observation), transportation systems, space science, and spinoff promotions.

The Space Commission (SC) determines the country’s space policy under the leadership of the Prime Minister and assumes responsibility for securing space development budgets and implementing space development programs. The Space Agency, managed by the SC, oversees the Indian Space Research Organisation (ISRO), which implements space development policy following the country’s space policy, develops and launches launch vehicles, and develops and manufactures satellites.

In April 2016, India operated a positioning satellite that can position itself around India as well as launched an Earth observation satellite, which are supposedly used also for security purposes. In February 2017, India successfully launched a satellite launch vehicle loaded with 104 satellites, marking the largest number ever carried on a single rocket in the world. In the future, the country plans to implement planetary explorations and conduct manned space flight.

**Republic of Korea**

The Republic of Korea (ROK) is considered to have started full-scale space development from the latter half of the 1990s. The ROK carries out space activities based on the three key plans it established in November 2013, namely: the “Mid- and Long-Term Plan for Space Development (2014-2040),” which plans to move up the first launch of launch vehicles manufactured by the ROK to June 2020; the “Space Technology Industrialization Strategy,” which prompts the private sector to lead space development; and the “Revision of the Korean Rocket Development Plan,” which outlines the use of ROK-made launch vehicles and the ROK’s own development of planetary and space exploration satellites and high orbit satellites.

On the organizational front, the Korea Aerospace Research Institute leads research and development as an implementation agency. Furthermore, the Korea Agency for Defense Development is engaged in the development and use of various satellites.

Major satellites used by the country include imagery reconnaissance and communication satellites. The ROK relies on other countries to launch its satellites.

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26 The February 2015 “Worldwide Threat Assessment” of the U.S. Director of National Intelligence notes that in July 2014, China tested an anti-satellite missile not involving the destruction of a satellite. In addition, it states that China has satellite jamming capabilities and is making progress on an anti-satellite system.
27 According to the “Annual Report to Congress: Military and Security Developments Involving the People’s Republic of China” published by the U.S. DoD in June 2017, China continues to develop directed-energy weapons, electronic countermeasure systems (jammers), and a variety of capabilities including capability to counter satellite, designed to limit or block the use of space assets by adversaries during a crisis or conflict.
28 The 12th Five-Year Plan covers the period between April 2012 and March 2017. The 13th Five-Year Plan has yet to be announced.
29 In April 2016, India succeeded in launching the seventh satellite constituting the Indian Regional Navigation Satellite System (IRNSS), which completed the deployment of the constellation.
30 The 104 satellites were placed into polar orbit at the same time. They comprised India’s roughly 700 kg Cartosat-2D Earth observation satellite and 103 small satellites weighing less than about 10 kg each (1 each from Israel, Kazakhstan, the Netherlands, Switzerland, and the UAE, 2 from India, and 96 from the United States).
31 In December 2014, the ISRO succeeded in the test launch of a large launch vehicle carrying an unmanned capsule.
32 In January 2013, for the first time on its third attempt, the ROK successfully launched the space launch vehicle “Naro (KSLV-1)” that was developed based on the first stage of the Russian Angara rocket.
33 The ROK had planned to launch a test space rocket in December 2017, but has postponed this launch until October 2018 due to technical issues.
34 The Mid- and Long-Term Basic Plan for Space Development (1996-2019) released in 1996 is considered to be the ROK’s first space plan.