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Japan's Multi-Domain Defense Force:

The Space, Cyber, and Electromagnetic Domains

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This article sheds light on Japan's "Multi-Domain Defense Force" formulated in the National Defense Program Guidelines (NDPG) as well as the Medium Term Defense Program (MTDP) (FY2019-FY2023) approved by the Cabinet decision of December 18, 2018. In the NDPG, the Ministry of Defense sets forth a concept of "cross-domain operations" in which the Self-Defense Forces (SDF) conduct operations not only in the conventional domains (land, sea, and air), but also in new domains (space, cyberspace, and electromagnetic). The Japanese government thus decided to increase its annual defense budget for the fiscal year 2020 to create its Multi-Domain Defense Force in preparation for the cross-domain operations.[1] Why does Japan seek to improve these three new security priorities? This article aims to clarify the nature of these three defense priorities in Japan's security policy to adapt to today's rapidly changing security environment.

Japan's Evolving Space Strategy

First, Japan's space strategy has been evolving in collaboration with the United States. In recent years Japan has begun to be considered a "space power,"[2] with its technological advancements in key areas such as robotics being a key contributing factor. Since 2008, the Japanese government has sought to develop its space policy as a national strategy. Its outer space aspirations are tied in with the framework of "peaceful uses of outer space" in accordance with the 1967 Outer Space Treaty that stipulates exploration and use of outer space for "peaceful purposes."[3] However, Japan's space policy has long been restricted by the influence of its "peace clause," or Article 9 of the Japanese post-war Constitution. Owing to the normative influence of the peace clause as well as the so-called culture of "antimilitarism,"[4] a "resolution on the development of outer space and its basic use" was adopted in the Plenary Session of the House of Representatives on May 9, 1969.[5]

Japan's "Non-Military" Space Policy and the 1969 Diet Resolution

Based on the 1969 resolution, Japan's space policy on the development and launch of rockets was limited to being "non-military" in nature and of "peaceful purpose." Based on the 1969 resolution as a "principle of peaceful use of space," it was decided that the Japanese Self-Defense Forces (SDF) would be prohibited from researching and developing its own satellites.[6] In the budget committee of the House of Representatives on February 6, 1985, the Japanese government explained that the "peaceful purpose" clause in the 1969 resolution meant a "non-military" purpose and that the SDF was not allowed to possess satellites for lethal and destructive purposes, let alone acts of aggression. However, the government also argued that SDF use of general satellites, such as Inmarsat[7] and Intelsat,[8] should not be restricted by the 1969 resolution. The 1985 official view of the Japanese government confirmed that the SDF would be able to utilize satellites for peaceful purposes. Still, the Japan Defense Agency (JDA) was not allowed to research and develop its own satellites.

> ***Notably, the Basic Space Law does not limit the use and development of outer space to "non-military purpose..."***

The Basic Space Law and the Dual-Use Nature of Japan's Space Technologies

Takeo Kawamura, a senior legislator of the Liberal Democratic Party (LDP) as a former Minister of Education, Culture, Sports, Science, and Technology (MEXT),[9] played a leading role in deliberating the necessity of a legal framework to modify the 1969 Diet resolution. Notably, Kawamura contributed to forming a bipartisan study group and reforming Japan's space policy over the years.[10] As a result, the Basic Space Law was created on May 21, 2008, promulgated on May 28, and entered into effect on August 27.[11] The Basic Space Law modified the conventional Japanese space policy. It stipulates that Japan's space policy needs to contribute to international peace and security as well as the security of Japan on the basis of the Japanese Constitution as well as international agreements. Notably, the Basic Space Law does not limit the use and development of outer space to "non-military purpose" and allows the Japanese government to conduct research and development of satellites for Japan's defense and the maintenance of international peace and security.[12] Since then, the dual-use nature of space technologies has facilitated the evolution of Japan's space policy both in the civilian and defense fields.[13]

On May 18, 2020, the Ministry of Defense (MOD) established the Space Operations Squadron as part of the Air Self-Defense Force (ASDF) with 20 personnel in the Fuchu Base in Tokyo.[14] The mission of the Space Operations Squadron is to monitor space debris and suspicious satellites so that they do not collide with Japanese satellites. The Defense Ministry plans to expand the Space Operations Squadron into a unit with 100 personnel and cooperate with the U.S. and the Japan Aerospace Exploration Agency (JAXA) to establish a space monitoring system by 2023. According to the National Aeronautics and Space Administration (NASA), more than 500,000 space debris between one and ten centimeters in diameters exist in outer space.[15] Moreover, there are

5,000 satellites orbiting the earth, and only 3,000 of them are active,[16] so it is important to prevent space debris from colliding with each other.[17] The squadron is also designed to "monitor the activities of satellites of countries that may seek to disrupt Japanese and/or U.S. satellite operations through, for instance, the use of anti-satellite missiles, laser irradiation, communication jamming, or so-called 'killer satellites'."[18]

Advancing Japan's Space Strategy in the Japan-U.S. Alliance System

The establishment of the Space Operations Squadron has strategic implications for Japan's space strategy and the Japan-U.S. military alliance. The unit will cooperate with the U.S. Space Command established by the Trump administration in 2019, much due to the "growing Japanese concern that China and Russia are seeking ways to interfere, disable or destroy satellites."[19] At a launch ceremony of the squadron, Defense Minister Taro Kono stated that "It is important that we gain superiority in the space domain as well […] We must adapt to the new security environment as soon as possible."[20] Indeed, China succeeded in its anti-satellite weapons test in 2007, trying to catch up with the space technology of the United States, and therefore, Washington has encouraged Japan to cooperate in facilitating U.S. supremacy in the military utilization of outer space over China and Russia.[21]

From a perspective of military technology, modern weapons systems are dependent upon the military use of outer space. In particular, global positioning system (GPS) satellites of the United States are essential to control military drones and monitor military units. Since Russia and China have demonstrated military capabilities to destroy satellites in outer space, the U.S. Space Command must defend its military and commercial satellites from possible attacks.[22] Therefore, the Japanese government is expected to play a supplemental role in defending U.S. GPS satellites.[23]

In this sense, Japan's space policy has been developed by the occurrence of "new threats and uncertainties" in East Asia.[24] Because Japan has relied on U.S. Forces' "defense support program" (DSP) satellites, which can detect the exact moment when ballistic missiles are launched, the protection of the DSP satellites is vital to the defense of Japan, and especially its ballistic missile defense (BMD) system.[25] Thus, Japan's space policy has been continually evolving. It is speculated that Japan and the U.S. could be the first military alliance to conduct defense cooperation in outer space; this could have profound strategic implications for the Japan-U.S. military alliance.[26]

Japan's Right to Self-Defense in Cyberspace

Second, in the National Security Strategy (NSS), announced by the Shinzo Abe administration in December 2013, it was noted that "cyber-attacks" were recognized as one of the new threats to the peace and security of Japan. The NSS reported that risks of cyber-attacks to fundamental infrastructure and defense systems had become serious issues and underscored enhancement of cybersecurity and protection of cyberspace as one of the most significant security priorities.[27] However, a question remains over whether Japan can exercise its right to self-defense in the event of cyberattacks under the current Constitution.

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Japan's Right to Self-Defense Against Cyberattacks

Following the 2013 NSS, the Japanese government enacted the Basic Act on Cybersecurity on November 6, 2014.[28] The law clarifies Japan's cybersecurity policy and the responsibilities of national and local governments as well as individuals. In accordance with the law, the Cybersecurity Strategic Headquarters

(CSH) was established with the mission to effectively and comprehensively improve Japan's cybersecurity strategy.[29] Moreover, the National Information Security Center was upgraded as the National Center of Incident readiness and Strategy for Cybersecurity (NISC) under the CSH in 2015.[30]

On May 16, 2019, Prime Minister Shinzo Abe stated in the Plenary Session of the House of Representatives that "Under the Constitution, Japan will be allowed to exercise force for self-defense" when cyberattacks that constitute armed attacks on Japan occur.[31] Regarding the definition of armed attacks, the prime minister explained that they are "cases in which extremely serious damage on par with that caused by attacks by physical means arises."[32] As for the conditions for exercising Japan's right to self-defense against cyberattacks, Abe mentioned that "It should be judged on a case-by-case basis."[33]

> ***"Japan's right to exercise individual and collective self-defense can be justifiable in the light of the Japanese Constitution and international law."***

Under the current Constitution, the threat or use of force to settle international disputes is restricted by Article 9.[34] Still, the Japanese government has explained that Japan possesses the right to self-defense and that the right to exercise individual and collective self-defense is constitutional based on the Peace and Security Legislation. The three conditions for the use of force as measures of self-defense under the legislation are: (1) an armed attack situation or survival-threatening situation occurs, (2) When there are no other appropriate means available to repel the attack and ensure Japan's survival and the protection of its people, (3) Use of force limited to the minimum extent necessary.[35]

Japan's Use of Force in Cyberspace under International Law

The use of force as a self-defense measure against cyberattacks can be justifiable in the light of international law, especially the law concerning the use of force (jus ad bellum) and the laws of armed conflict (jus in bello).[36] Concerning jus ad bellum, Article 2 (Paragraph 4) of the Charter of the United Nations does not legalize the use of force in international conflict resolution. However, the exercise of the right of individual and collective self-defense until the United Nations Security Council takes appropriate measures is legitimate as stipulated in Article 51.[37] "Necessity" and "proportionality," as a 1986 International Court of Justice (ICJ) ruling illustrates, are among the criteria that must be satisfied to justify the use of force as a self-defense measure.[38]

It would seem that Japan's three conditions for the use of force formulated in the Peace and Security Legislation can be consistent with these criteria. Likewise, the use of force as a measure of self-defense against cyber-attacks would need to satisfy the so-called "Webster formula" or the "Caroline test," a legal principle that requires "a necessity of self-defense, instant, overwhelming, leaving no choice of means and no moment for deliberation."[39] In addition to jus ad bellum, the use of force as a measure for self-defense against cyber-attacks should adhere to jus in bello in cyber warfare as examined in the so-called Tallinn Manual.[40]

Japan's right to exercise individual and collective self-defense can be justifiable in the light of the Japanese Constitution and international law. On the basis of the domestic and international legal frameworks, the Japanese government has attempted to increase its defense expenditure for the development of cybersecurity equipment and personnel. In the 2020 fiscal year, the Japanese Ministry of Defense invested some 25.6 billion yen (237.12 million dollars) to develop cybersecurity, including the development of artificial intelligence (AI) application to the cybersecurity defense system.[41] The defense budget

for the AI-powered anti-cyber-attack system, which can automatically detect harmful emails and judge the level of cyber-attack threats, was estimated to be some 30 million yen (277,711 dollars).[42] Moreover, the Japanese Defense Ministry expanded its Cyber Defense Group from 220 to about 300 staff members and acquired the Cyber Information Gathering System for 3.4 billion yen (31.5 million dollars).[43] Japan has planed to continue its investment in the cybersecurity field in the 2021 fiscal year as its defense budget has been increased for nine years in a row.[44]

Japan's Cyberspace Cooperation with the United States and other Partner States

Furthermore, Japan has sought to expand its cybersecurity cooperation with the United States and its partner states. The Defense Ministry seeks to secure and develop a cyber workforce by dispatching the Self-Defense Forces staff members to U.S. Cyber Commander Education Courses.[45] In response to the threat of Chinese cyber-attacks, Japan and the European Union have deepened their cybersecurity cooperation by launching the "Japan-EU Cyber Dialogue."[46] Japan has also facilitated bilateral cybersecurity collaboration with Israel in order to combat cyber terrorism. Thus, Japan's cybersecurity strategy has been evolving, and its cybersecurity networks have been globalized over time. Given the nature of cybersecurity in modern military operations and tactics, Tokyo will exercise its right to individual or collective self-defense in response to an external or foreign cyber-attack recognizable as an attack against Japan or a foreign country in a close relationship with Japan.

Japan's Emerging Electronic Warfare Capability

Third, in March 2020, the Japanese government deployed a cutting-edge vehicle-mounted network electronic warfare system (NEWS) to the Signal School of the Ground Self-Defense Force (GSDF) in Yokosuka, Kanagawa Prefecture.[47] Moreover, the Ministry of Defense of Japan plans established an electronic warfare capability unit of 80 personnel as part of the GSDF at Camp Kengun of Kumamoto Prefecture, located in Kyushu, southwestern Japan, in March 2021. The unit collaborates with the amphibious rapid deployment brigade at Camp Ainoura in Sasebo, Nagasaki Prefecture, which has a mission for recapturing remote islands in the event of a military emergency. Previously, a cybersecurity unit consisting of some 40 personnel was set up as part of the GSDF at Camp Kengun in March 2019.[48] The electromagnetic spectrum has become a strategically critical domain in Japan's defense, and the Japanese Self-Defense Forces intends to strengthen its electronic warfare (EW) capability in the upcoming years.

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Increasing Significance of Electronic Warfare Capability

Electronic warfare, or electromagnetic warfare, is defined as "military action involving the use of electromagnetic and directed energy to control the electromagnetic spectrum or attack the enemy."[49] In electronic warfare, the electromagnetic spectrum is used in terms of three major areas: 1) electronic attack (disrupting, denying, degrading, destroying, or deceiving opponents), 2) electronic protection (preventing a receiver from being jammed or deceived), and 3) electronic support (sensing of the electromagnetic spectrum).[50] For instance, Russian Peresvet, as a mobile laser system, can emit high-power laser beams to destroy multiple unmanned aircraft.[51] Meanwhile, Sweden's Giraffe 8A is capable of automatically selecting frequencies that are invulnerable to jamming.[52] Although electronic warfare includes the term "warfare," it has been regarded as an appropriate operation for Japan because "electronic warfare does not involve weapons that kill people," as mentioned by an SDF official.[53]

Historically, Japan's EW capability dates back to the Russo-Japanese War (1904-1905), during which Japan intercepted and analyzed Russian naval radio transmissions. The ability of signals intelligence is thought to be one of the critical factors to the Japanese victory in the war.[54] In the Cold War period, Japan deployed an EW unit to Camp Higashi-Chitose of Hokkaido, able to intercept signals and collect information from the Soviet Union and the interior of the Asian continent.[55] Japan's EW capability was developed as a countermeasure against the military threats of the Soviet Union/Russia in the past.

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Meanwhile, the EW capability of Russia has evolved to the extent that it has astonished western European countries, especially the North Atlantic Treaty Organization (NATO) member states. For instance, during the invasion and annexation of Crimea in 2014, Russia conducted a hybrid war against Ukraine, which combined information warfare, cyberattacks, and EW operations. The hybrid operations by Russia damaged and destroyed command-and-control networks, radar systems, and signals of the GPS of Ukraine.[56] Moreover, during the 2018 combat in Syria, the Russian EW system nullified a swarm of drones carrying explosive munitions directed at Russian soldiers, showcasing the significance of EW superiority in modern armed conflicts.[57]

Similarly, it has been observed that China has steadily enhanced its EW capability commensurate with its economic power. Indeed, the People's Liberation Army has strengthened its EW capability as an important "force multiplier."[58] Given Beijing's rapid military modernization and massive military budget, it is no wonder that the Chinese EW system could be a potentially game-changing technology. Tokyo is especially concerned about the possible application of EW capabilities to the remote southern islands of the Japanese territory, which could be regarded as a key fault line between the two nations.[59] In this sense, Russia's EW operations in Crimea and Syria have strategic implications for the case of a Sino-Japanese territorial conflict in the East China Sea. However, the Japanese government does not admit the existence of such a bilateral dispute.

The Development of Japan's EW Capability

In an effort to improve its defense capabilities in the electromagnetic domain, the Ministry of Defense has attempted to acquire EW capabilities, such as F-35A/B fighters equipped with EW systems, and add EW equipment to the existing F-15 fighters. The Defense Ministry has also developed: a standoff jammer aircraft that can emit disrupting radio waves, non-nuclear electromagnetic pulse (EMP) weapons that could be a game-changer by paralyzing opponents' basic infrastructure system, high-energy laser weapons, and high-power microwave (HPM) weapons which could instantly destroy or nullify electronic components of adversary's weapons systems.[60] Furthermore, it has been reported that Japan has considered acquiring the Boeing EA-18 Growler, which could enhance Japan's capability of electronic attack and protection.[61]

Intending to deter a possible invasion of remote islands, the Japanese government has deployed a surface-to-ship missile unit to the Amami-Oshima Island of Kagoshima Prefecture. Similar unit deployments are planned for the Nansei Islands as well as Ishigaki Island of Okinawa Prefecture, the administrative unit to which the Senkaku/Diaoyu Islands are assigned within the Japanese government's claim.[62] Therefore, the establishment of Japan's new EW unit seeks to improve the defense of Japan facing security challenges and threats in the East China Sea, where Chinese vessels enter into the waters surrounding the Senkaku/Diaoyu Islands.[63] Japan's EW capability has been evolving in response to the rise of Chinese military power and a possible

military emergency in the remote islands.

A Possible Game Changer in the Electromagnetic Domain

The electromagnetic spectrum has become one of the most critical domains for Japan's defense. Japan's EW capability has been developed as a countermeasure against the military threats of Russia and China. EW operations are regarded as an integral part of Japan's "multi-domain defense force" and its "cross-domain operations" that would combine conventional fields (land, sea, air) with new domains (space, cyberspace, electromagnetic). Therefore, Japan's defense budget for the fiscal year of 2020 prioritized the development and acquisition of EW systems, including standoff EW aircraft and NEWS. Since the so-called "exclusively defense-oriented policy" has been adopted while Tokyo still depends upon the U.S.' strike capability and extended deterrence, the development of Japan's electronic warfare capability has profound strategic implications for both national defense and the Japan-U.S. military alliance in the Indo-Pacific.[64] Now that Japan has developed and deployed the EW systems, it is imperative to enhance its training/exercise and education in the electromagnetic domain.[65] Although the EW capability is regarded as a nonlethal defense system in Japan, it has an unmeasurable potential to become a game-changer technology for its multi-domain defense force.

Conclusion

To note briefly, the developments of Japan's technology for three defense priorities (space, cyberspace, and electromagnetic domains) are critical components of the Multi-Domain Defense Force. First, it has been discussed that Japan's space policy shifted from a non-military principle to a defense-oriented nature in response to the anti-satellite weapons test conducted by China in 2007. Japan's space strategy has been evolving in cooperation with the United States that has pursued military superiority in outer space. Second, it has been observed that Japan can exercise the right of individual and collective self-defense as a countermeasure against a cyberattack. Japan's security policy in cyberspace has been improved by the enactment of a domestic legal framework. Yet, it would be necessary for Japan to abide by international law and cooperate with the United States and partner countries to deter and deal with cybercrimes and cyberattacks effectively. Third, it has been clarified that Japan's EW capability has been developing in response to the Russian and Chinese EW capabilities. In particular, EW capability could be a possible game-changer in the event of a military emergency in the East China Sea. Therefore, the Japanese government is expected to enhance its EW capability to prevent illicit game-changing actions against the Japanese territory from occurring. These three defense technologies are consistent with Tokyo's exclusively defense-oriented security policy as well as the security strategy of the United States. The Japanese government will continue to develop the Multi-Domain Defense Force in preparation for possible cross-domain operations in the conventional and new defense domains.■

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