# Establishment of a Space Operations Squadron at the Japan Air Self-Defense Force in 2020: current status and future prospects

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**ABSTRACT**

The Ministry of Defense of Japan has established on 18 May 2020 a Space Operations Squadron at the Air Self-Defense Force (ASDF). Being the first unit officially devoted to space activities in the history of the Japanese armed forces, it is expected to play a core role in the progressive development of space-related capabilities for national defense. Currently only partially staffed and equipped, the squadron has yet to reach its cruising speed. This article explains the reasons for the very late development of military space capabilities in the Japanese armed forces and investigates the expected impact of this new squadron, domestically and concerning relations with Japan's allies worldwide.

In 1969, the National Diet passed a resolution restricting the use of space technology to "exclusively peaceful purposes", hence strongly limiting the ability of the SDF to rely on this critical infrastructure. Although a series of governmental decisions relaxed the constraints established by the 1969 Diet resolution, it was only with the enactment of the Basic Space Law of 2008 that the uses of space for national security became authorized and encouraged by the Government of Japan. After more than ten years of political, academic and inter-ministerial discussions, the government released in December 2018 two key national defense planning documents emphasizing the development of cross-domain capabilities, and *a fortiori* of space capabilities: the *National Defense Program Guidelines for FY2019 and Beyond* and the *Mid-Term Defense Program (FY2019-FY2023)*. One of the main instructions of these planning documents was the creation of a space unit at the ASDF. Since then, and the official establishment of the Space Operations Squadron, numerous questions remain with regards to its actual functioning: what will be the exact missions of the squadron? When will it reach its final size (around 100 personnel)? What will be the profiles and fields of expertise of the squadron's personnel? How will the squadron cooperate with both domestic counterparts (e.g. Japanese Aerospace Exploration Agency) and foreign allied militaries? What concrete technical capabilities will be developed at the SDF to enable the squadron's missions? Etc.

This article proposes the first comprehensive analysis the newest structure of the Japanese SDF, relying on available documents and on interviews of direct stakeholders. It is organized as follows. After providing a brief historical overview of Japan's complicated relations with the military uses of outer space, this article details the progressive development of strategies and associated capabilities having led in 2020 to the creation of the Space Operations Squadron. Then, it proposes a detailed evaluation of the squadron's current status and provides a realistic outlook on its expected build-up in the next few years and on its concrete impact on domestic and international space activities, based on a careful assessment of Japan's whole-of-government approach to space security. A special emphasis is placed on the development of space situational – or domain – awareness capabilities at the Japanese SDF and the contribution of this new structure to space security, safety and sustainability.

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## 1. BACKGROUND: BRIEF HISTORY OF THE SECURITY USES OF OUTER SPACE IN JAPAN

Compared with other major historical space powers, Japan has not developed a dual space program, focusing almost exclusively on civil applications. Willing to send a strong signal regarding Japan's attachment to peace and stability, the National Diet passed in 1969 a resolution prohibiting the use of space technology for security purposes, based on a very strict interpretation of the peaceful uses of outer space. Instead of aligning with the international consensus around the understanding of peaceful as non-aggressive, Japanese lawmakers knowingly and unanimously decided to interpret peaceful as non-military [1,2].

### Consequences of the 1969 Exclusively Peaceful Purposes Diet Resolution

What was nicknamed the "Exclusively Peaceful Purposes Resolution" has a deep and durable impact on the Japanese space program and the structure of its governance, until the reform of 2008:

1. The responsibilities of the National Space Development Agency (1969-2003), and of the Japanese Aerospace Exploration Agency (JAXA) from 2003, were restricted to research and development (R&D) on space technology for "exclusively peaceful purposes", per their laws of establishment [1,3]. This focus on civil R&D was also reinforced by the 1990 US-Japan Agreement on Satellite Procurement, requiring "to procure non-R&D satellites on an open, transparent and non-discriminatory basis", motivating the Japanese government to concentrate NASDA's efforts on technology demonstration satellites [4].
2. Space policymaking responsibilities were concentrated at the Ministry of Education, Culture, Sports, Science and Technology (MEXT), therefore reinforcing the civil R&D focus of Japanese space policies. Created in 2001 through the fusion of the Ministry of Education – supervising academic space development activities at The University of Tokyo's Institute of Space and Astronautical Science (ISAS) – and the Science and Technology Agency (STA) – supervising NASDA – the MEXT became the sole administrative supervisor of all Japanese governmental space efforts, role which was further reinforced when these various entities were merged into the Japanese Aerospace Exploration Agency (JAXA) in 2003. At the same time, the inter-ministerial Space Activities Committee was downgraded to an internal MEXT committee [1,5].
3. The integration of space technologies into the national defense posture of Japan was very limited. Although the 1969 Resolution banned the uses of space technology for defense purposes, it has been proven that the Ministry of Defense (MOD) indirectly used satellite applications for some of its activities since the late 1970s [6], but on a negligible scale compared with equivalent world powers. Aware of the unclear legality of such practices and understanding the importance to introduce some flexibility, in particular when conducting joint operations with allies, the Government of Japan (GoJ) issued "Governmental Unified View" of February 1985" allowing the MOD to benefit from satellites primarily destined for civil applications or "with similar functions" [1].

### Impact of Japan's security context

The advances of the North Korean ballistic missile development program however put some strain on the very restrictive Japanese approach to space security. The launch of intermediate-range ballistic missile Taepodong-1 on 31 August 1998, flying above Japan before disappearing into the Pacific Ocean, sent shockwaves in the GoJ. It was then decided that Japan should be equipped with advanced satellite intelligence capabilities, to monitor North Korean and Chinese activities primarily [1,2]. The GoJ therefore launched the Intelligence-Gathering Satellite (IGS) program, described as using civil multipurpose satellites, with an emphasis on disaster management to comply with the stringent 1969 Resolution [2,7]. In addition, the program was assigned to the newly created Cabinet Satellite Intelligence Centre (CSICE), housed in the Cabinet Secretariat's Cabinet Intelligence and Research Office (CIRO), a civilian intelligence agency directly reporting to the Prime Minister. With its first launch in 2003 and several commissioning and decommissioning, the CSICE now operates eight IGS satellites [8]. In addition, Prime Minister Koizumi decided in 2003 to initiate a domestic ballistic missile defense (BMD) program, capabilities highly reliant on satellite data, which again created some frictions with the 1969 Resolution. Aware that the situation was untenable in the long run, lawmakers of the Liberal Democratic Party (LDP), which has dominated Japanese politics since 1955, decided that it was time to act [2].

**The Basic Space Law of 2008 and its consequences**

After years of party and parliamentary work, the Japanese Diet adopted in 2008 the Basic Space Law, first national space law in the history of Japan, which repealed in its article 2 the interpretation of the 1969 Resolution to align Japan with the international consensus around the interpretation of 'peaceful' as 'non-aggressive'. In addition, article 14 of the Basic Space Law called for efforts towards the development of space security capabilities [9]. This major change in the Japanese space program led to a series of strategic, policy and legal modifications on the GoJ's approach to space security, the main of which are listed below:

- January 2009: the MOD issued the Basic Guidelines for Space Development and Use of Outer Space, calling for the development of long-term strategies for the integration of space technologies in the ministry's operations [10].
- December 2010: the Cabinet issued the National Defense Program Guidelines (NDPG) for FY2011 and Beyond and the Medium Term Defense Program (MTDP) (FY2011-FY2015), first national defense strategies ever mentioning the word 宇宙 (*uchuu*, outer space in Japanese) [11,12], but with limited considerations.
- June 2012: the JAXA Establishment Law was amended to authorize the agency to engage in space research for security purposes [13].
- April 2013: JAXA and the then-Technical Research Headquarters of the MOD signed a technical cooperation agreement on space technology development and utilization [14].
- December 2013: the first National Security Strategy (NSS) ever drafted by the GoJ devoted an entire section to the security applications of space technologies, titled "Ensuring the Stable Use of Outer Space and Promoting Its Use for Security Purposes" [15]. Released on the same day, NDPG for FY2014 and Beyond and the MTDP (FY2014-FY2018) also contained limited considerations on space security activities [16,17].
- August 2014: the MOD issued a revised Basic Policy on Space Development and Utilization [18].
- December 2018: the Cabinet issued the NDPG for FY 2019 and Beyond and the MTDP (FY2019-FY2023), most ambitious space security strategies to date, described in the next section [19,20].

## 2. EVOLUTION OF THE NATIONAL DEFENSE POSTURE ON SPACE ISSUES SINCE 2018

The NDPG for FY 2019 and Beyond and the MTDP (FY2019-FY2023) contain the most advanced considerations ever released by the GoJ on the integration of space technologies and applications into the Japanese national defense posture. The NDPG and MTDP sit at the second and third ranks in the hierarchy of Japanese national security documents. At the top is the NSS of 2013, followed by NDPGs covering around ten years of military programming, followed by the MTDP, lower-level implementation document providing directions for the next five years of national defense budget. Then, an annual defense budget is approved every year by the National Diet. Figure 1 describes this hierarchy.

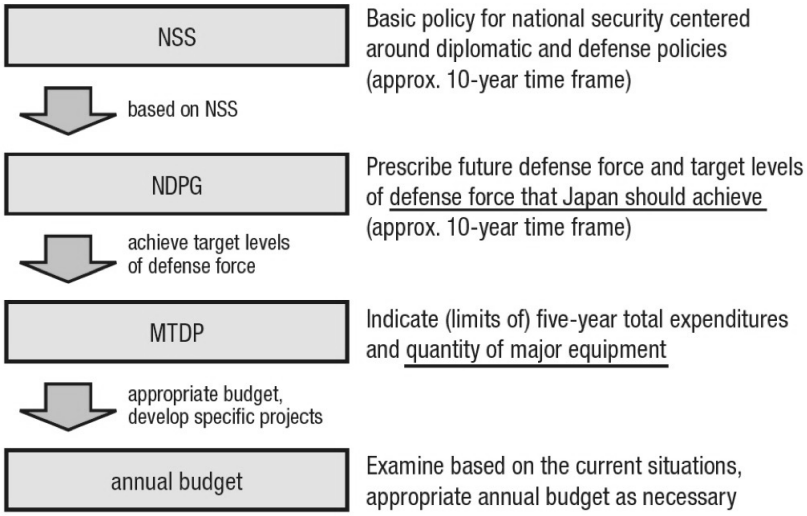


**Figure 1. Hierarchy of Japanese defence strategy documents [21]**

### Space security considerations in the 2018 NDPG and MTDP

The dominant feature of the 2018 NDPG is the requirement to the Japan Self-Defense Forces (SDF) to enable cross-domain operations, with an emphasis on new domains. Section I lists among the main objectives of the NDPG to "achieve superiority in new domains, which are space, cyberspace and electromagnetic spectrum" and to "build a new defense capability that combines strengths across all domains".

Concretely, the NDPG instructs the SDF to develop a series of space-related capabilities (IV.2.1.a):

- Satellite-based information-gathering, communication, and positioning capabilities.
- Ground and space-based space situational awareness.
- Space mission assurance.
- "Capability to disrupt opponent's command, control, communications and information".

To achieve this ambitious space capacity development, included in the establishment of "comprehensive architecture for national defense" (III.1.1), the NDPG emphasizes cooperation with domestic entities (public and private) and close allies: "SDF will actively leverage civilian technologies and work to enhance cooperation with relevant agencies including the Japan Aerospace Exploration Agency (JAXA) and with the United States and other relevant countries" (IV.2.1.a). In particular, it suggests "consultations and information sharing with relevant countries and active participation in multilateral exercises among others" (III.3.2). In terms of institutional and personnel implications, the NDPG indicates that the SDF will "engage in organization building such as the creation of units specializing in space and dedicated career field, and develop human resources and accumulate knowledge and expertise in the space field" (IV.2.1.a). These requirements are addressed in the next section. Finally, from a diplomatic standpoint, the MOD and the SDF should work with other government entities, local governments, and private organizations to promote space-related international norms (III.1.1).

As lower-level implementation document, the MTDP goes a bit further in the detail of the space capabilities to be developed by the MOD/SDF, such as an "SSA system", space-based optical telescopes, SSA laser ranging devices, X-band satellite communication, etc.

**Space capabilities in annual budgets**

However, the actual implementation of the NDPG and MTDP requirements can only be monitored by analyzing the MOD's annual detailed budget, which has a section dedicated to outer space, but excluding BMD-related items. Table 1 below presents the major space-related budgetary lines in annual MOD budgets from FY2019 to FY2021.

**Table 1. Main space-related MOD budgetary items (FY2019-FY2021)**

| Fiscal year | Main budgetary items under the section "Capabilities in Space Domain" | Budget value (billion JPY2) |
|---|---|---|
| 2019 [22] | Development of Space Situational Awareness (SSA) System: deep space SSA radar (above 5800 km) and associated data management infrastructure | 26 |
| | Research and Study for Strengthening the C4ISR Functions by Utilizing Space | 0.18 |
| | Research and Study on SSA Capability Enhancement, Including Space-based Optical Telescope | 0.03 |
| 2020 [23] | Establishment of Space Operations Squadron (tentative name) and other minor space-related units for planning and satellite communications. Dispatching personnel to the Space Operations Course by the United States military in Colorado | Unspecified |
| | Capability to Secure Stable Use of Outer Space<br>Research and Study on capability to disrupt opponent's C4I in collaboration with electromagnetic domain<br>Procure devices to grasp the state of electromagnetic interference against Japanese satellites<br>Procurement of SSA Satellite (space-based optical telescope)<br>Procurement of SSA System (deep space radar) | 22.3 |
| | Strengthening Information-Gathering Capability Using Outer Space, in particular by research and development on satellite-based infrared sensors | 4.3 |
| | Utilization of Satellite Communication, in particular X-band | 13.7 |
| | Use of Data from Imagery Satellites | 10.1 |
| | Other Measures related to Space Policy<br>Capacity building in Colorado (see above)<br>Participation in space operations table-top exercises<br>Involvement in international effort to establish international rules regarding space domain | 0.13 |
| 2021 [24] | Procurement of SSA satellite (space-based optical telescope): initial design and conceptual study on the operation of multiple SSA satellites | 17.5 |
| | Development of SSA systems (deep space radar and data management systems) | 11.3 |

[2] JPY 1 billion ~ USD 10 million

| | | |
|---|---|---|
| | Study on concept of Hypersonic Glide Vehicle detection and tracking systems utilizing satellite constellation | 0.2 |
| | Research on infrared sensor with high sensitivity and broad detection range | 1.2 |
| | Enhance resiliency of satellite communication system | 0.9 |
| | Enhance resiliency of satellite positioning capability by utilizing "QZSS" | 0.4 |
| | Use of data from imagery satellites | 15.1 |
| | Utilization of satellite communication | 9.6 |
| | Establishment of new units including a Space Operations Group (tentative name) | Unspecified |
| | International cooperation with other countries for capacity building on space operations | 0.2 |

A close look at the budgetary items help to shed some light on the actual SSA capabilities to be developed by the MOD: the combination of a deep space radar, an optical SSA satellite and ground-based laser-ranging devices, to be operated in coordination with existing JAXA capabilities.

In addition to actual capabilities and equipment, the detailed budgets of the MOD provide an overview of the institutional reorganization efforts happening in the SDF.

## 3. INSTITUTIONAL REORGANIZATION AT THE JAPAN AIR SELF-DEFENSE FORCES

The previous section indicated the NDPG's requirement to the MOD/SDF to work on "organization building" to serve as the vector of space-related capacity building. While it remains unclear on the extent of these institutional modifications, it precisely requires the creation of, at least, a space-related unit:

> SDF will maintain an ASDF unit that specializes in space domain missions, and strengthen its posture for joint operations in order to conduct persistent monitoring of situations in space, and to ensure superiority in use of space at all stages from peacetime to armed contingencies through such means as mission assurance and disruption of opponent's command, control, communications and information (V.1.2).

The table in annex of the 2018 NDPG provides more detail on the Space Domain Mission Unit by specifying that it would be composed of one squadron, which means around 100 staff. But more importantly, the annual defense budgets of Japan help understand the precise institutional changes currently happening in the MOD/SDF. Both annual budgets for FY2019 and FY2021 include budgetary lines corresponding to the establishment of new space-related units. While table 1 has shown that some units would oversee program planning or the satellite communication capabilities of the SDF, this section focusses primarily on those in charge of space operations.

### Establishment of structures for space operations

In accordance with the requirements of the 2018 NDPG and the credit allocations of the MOD budget for FY2019, the Space Operations Squadron (renamed from the initial Space Domain Mission Unit) was established at the ASDF on 18 May 2020 with an initial personnel of 20 people [25]. It is currently housed at the Fuchu ASDF Base, in the western suburbs of Tokyo. After this initial unit, it was announced in the MOD budget for FY2021 that the ASDF would create a Space Operations Group as supervisory entity of both the Space Operations Squadron and a new squadron focusing on command and control, as described on figure 2. At the time of writing this paper, the two new structures have yet to be established.

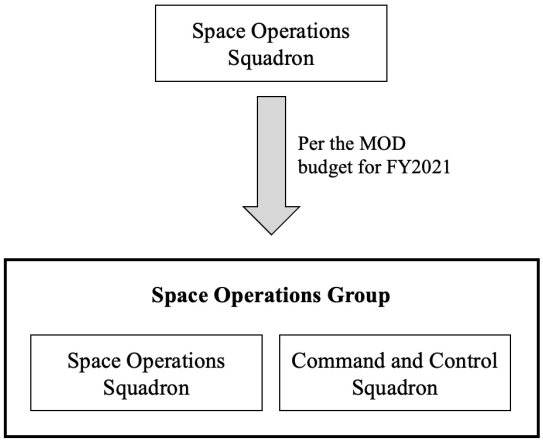


**Figure 2. Planned reorganization of space-related structures at the ASDF**

According to interviewees familiar with the matter, the Space Operations Group and Squadron will primarily focus on operating the MOD's SSA capabilities – mostly consisting of an upcoming long-range radar (above 5800 km) developed by Mitsubishi Electric Corporation based on existing BMD technologies [ITV-4] – and interfacing with the US military's SSA network [ITV-1].

### Motivations for the establishment of a space operations structure at the ASDF

Apart from the official reasons stated in the 2018 NDPG and summarized above, the establishment of a space operations structure at the ASDF seems to have been motivated by the need to find an appropriate counterpart for the US DoD, which is the primary external source of SSA data of the GoJ. In fact, while in the US, SSA capabilities are primarily operated by the armed forces, in Japan, JAXA had a quasi-monopoly on SSA capabilities and expertise. However, owing to the civil focus of JAXA, it was not an appropriate counterpart for the US in this critical bilateral relationship. It was therefore decided to build the capacity of and establish relevant structures at the MOD, natural Japanese counterpart of the DoD. The willingness of the US Government to collaborate on SSA on a military-to-military basis is also said to have influenced the Japanese decision [ITV-1].

In addition, there was a clear understanding at the MOD of the importance to build capacity in space operations after MOD officials and officers participated for the first time in the Schriever Wargame of 2018. They understood during this game the high level of threats against space assets and the lack of preparedness and capacity of the MOD, which an interviewee described as having left some ASDF officers "in shock" [ITV-4].

### Staffing and personnel capacity building

Although the establishment of these units is an important step towards the progressive integration of space technologies into the Japanese national defense posture, uncertainties remain on the ability of the MOD/SDF to find appropriate staff to conduct military space operations. As of April 2021, the Space Operations Squadron had a staffing of around 20 officers sharing shifts of 8 hours in the squadron's facilities in Fuchu [ITV-1], which remains approximately the same number as when the squadron was established a year earlier. These officers were chosen for their technical expertise in fields related to space operations such as communications, signal processing and electronics. The final target of around 100 personnel will consist only of MOD staff, including civilian and uniformed [ITV-2].

The lack of expertise of the GoJ – especially at the MOD – regarding matters of space security applications makes it likely that the Space Operations Group will need a few years to be fully staffed and will require capacity building support from relevant domestic and foreign entities.

For both capacity building and operational support, the primary domestic partner of the MOD is JAXA. Since the establishment of the squadron, the space agency has been providing MOD personnel with trainings on space operations and SSA, and has been dispatching experts to Fuchu to support and participate in the daily operations of the squadron [ITV-2]. In addition, to deal with JAXA-MOD cooperation, in particular to facilitate technology and knowledge transfer, JAXA established in April 2021 a National Security Technology Cooperation Division as part of its Strategic Planning and Management Department [26]. Among other issues, the division is currently working on creating an SSA data sharing mechanism between JAXA and MOD [ITV-2].

Overall, the personnel capacity building approach chosen by the MOD can be summarized in four arrows [ITV-2]:

- Basic trainings on space operations and SSA by JAXA (see paragraph above).
- Advanced space warfare trainings in the US, at the Peterson Space Force Base in Colorado Springs, Colorado, housing the Headquarters of the US Space Command and the US Space Force's Space Training and Readiness Command (STARCOM).
- Operational experience development through wargames and simulations such as the annual Schriever Wargame and Global Sentinel.
- Secondment of ASDF officers and civilian personnel to other relevant Japanese organizations (Joint Staff, Cabinet Office's National Space Policy Secretariat and JAXA) as well as to the US, for instance as liaison officers to the US Space Command [ITV-2] [27].

## 4. CONCLUSIONS AND CHALLENGES

After 40 years of heavy limitations and 10 years of strategic planning, the GoJ has finally started to strongly engage into the acquisition of space capabilities in support of its national defense and security. Motivated in part by its special relationship with the US, the Japanese government has emphasized the development of SSA capabilities at the MOD, including the procurement of sensors (e.g. long-range ground-based radar, optical SSA satellite), the establishment of new organizational structures and the development of qualified human resources. The main outcome of the two latter was the creation of the Space Operations Squadron in 2020 and the initiation of an important capacity building program in cooperation with JAXA and US military.

### Limitations

However, despite the strong willingness of the GoJ, it is unlikely that space capabilities will be integrated into the daily operations of the SDF anytime soon. In fact, most of the systems currently in use at the MOD were built before there was any plan for space technology integration. According to experts familiar with the matter, the huge costs of integration are considered prohibitive by the MOD leadership. In addition, considering that, apart from very exceptional cases, Japan does not intend to project its forces beyond its close surroundings (e.g. Taiwan, the Philippines), the SDF does not consider it a priority to invest time, efforts and money into the large-scale integration of space technologies in their activities [ITV-1]. For similar reasons, the MOD and SDF have currently no plan for further institutional building, for instance by setting up a space command [ITV-2,3]. The current structure appears to be proportionate the level of ambition of the SDF. Finally, the MOD chose to fully separate SSA capabilities from the existing BMD infrastructure [ITV-1,2], without clear rationale.

### Challenges

Based on a careful analysis of the ambitions and current status of the Japanese national space security program, the author identified two challenges ahead for the GoJ, that will need to be carefully monitored in the next few years:

- Despite having the financial resources to acquire high-quality SSA sensors and processing capabilities, the MOD and the SDF lack trained human resources in the field of space operations and SSA. The proper implementation of the capacity building efforts listed above will be the primary determining factor of the success or failure of current Japanese efforts in SSA capabilities development.

- Whereas before 2008, the CSICE was the only Japanese government agency engaging in space security activities (satellite intelligence, surveillance and reconnaissance), there are now multiple organizations involved (e.g. the MOD and its sub-organization, JAXA, the Cabinet Office with QZSS). The second determining factor of the success or failure of current Japanese efforts in SSA capabilities development will be the ability of all these agencies to coordinate properly, often a very complex venture in the Japanese government.

Finally, an additional issue, not addressed in this paper, requires further considerations. Although the Japanese aerospace industry has a long experience in supporting the GoJ's civil space programs (e.g. launchers, satellites, International Space Station), it is unclear to what extent it will be able to accompany the development of space capabilities for security purposes.

## 6. LIST OF INTERVIEWEES

[ITV-1] Member, National Space Policy Committee, Cabinet Office, Government of Japan. Interviewed by the author on 8 April 2021 in Tokyo, Japan.

[ITV-2] Senior official, Japanese Aerospace Exploration Agency, Government of Japan. Interviewed by the author on 12 April 2021 in Tokyo, Japan.

[ITV-3] Senior official, National Space Policy Secretariat, Cabinet Office, Government of Japan. Interviewed by the author on 13 April 2021 in Tokyo, Japan.

[ITV-4] Senior officer, Air Self-Defense Forces, Ministry of Defense, Government of Japan. Interviewed by the author on 21 April 2021 in Tokyo, Japan.

[ITV-5] Flag officer, Japan Coast Guard, Ministry of Land, Infrastructure, Transport and Tourism, Government of Japan. Interviewed by the author on 8 June 2021 in Tokyo, Japan.

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