

Limitations of Taiwan's Satellite Capabilities in a China-Taiwan Conflict

Tiffany M. Phan

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Abstract

Space satellites are critical in a China-Taiwan conflict. However, Taiwan's lack of space capabilities is detrimental to Taiwan's ability to fight China and increases Taiwan's dependence on U.S. defense, which exposes the U.S. to greater aggression from China. Current Taiwanese capabilities are limited in number and purpose, with no Taiwanese satellites designated for military ISR use, no Taiwanese space launch program, and dependence on foreign entities' support to help grow Taiwan's burgeoning space program. U.S. committed involvement in this conflict requires the U.S. to consider options on how to bolster Taiwanese space capabilities to alleviate Taiwan's dependence on U.S. defense. Preventing Taiwanese development of space capabilities is the fear of a Beijing response. Due to the diplomatically contested nature of this conflict, U.S. support is best provided through diplomacy.

Introduction

Without international help, Taiwan is at a great disadvantage in a conflict against China. The U.S.'s commitment to Taiwan's defense through the Taiwan Relations Act has made this result less apparent, and the Biden administration recently reaffirmed this commitment (Chai, 2007; Wang and Matossian, 2021). It is in the U.S.'s best interest to bolster Taiwan's capabilities in preparation for a China-Taiwan conflict to alleviate Taiwan's reliance on the U.S. One area of focus is to analyze Taiwan's space capabilities.

Space capabilities are critical in modern warfare. While there currently are no conventional warfare capabilities via space, space assets provide a range of capabilities to the modern fight, especially in terms of intelligence, surveillance, and reconnaissance (ISR). Satellites provide communications for remote operations; observe Earth meteorological weather; and provide position, navigation, and timing to networks and services. ISR satellites are capable of gathering data on ground, air, and sea assets; can monitor missile activities and other enemy critical infrastructure; and can track enemy force movements. Their capabilities also deter enemy forces from engaging.

In a China-Taiwan conflict, ISR satellites are critical to early warning of enemy forces and weapons and are critical to monitor operations following initial strike (Stokes, 2018). Without the same conventional warfare resources as China, Taiwan needs time to protect its position and respond to China (Wang and Matossian, 2021). ISR satellites provide Taiwan the timely intelligence it needs to do so. The mere perception of Taiwan's lack of ISR capabilities puts Taiwan at a disadvantage. In fact, from unclassified reports alone, China is more likely to engage in conflict given Taiwan's lack of capabilities (Jaffe, 2021). Without early warning and right-of-launch ISR capabilities, Taiwan cannot succeed against China.

Taiwan's Current Space Capabilities

Taiwan's space capabilities today are insufficient for such a conflict. Whereas China is launching space objects at a rate that surpasses other states, Taiwan lags even further behind (Jones, 2020). Unlike China, Taiwan does not have a military branch dedicated to space support (Jaffe, 2021). Instead, Taiwan's space agency, the National Space Organization (NSPO), develops space capabilities in support of economic development and disaster response, not military operations (Borroz, 2021). Taiwan has launched rockets, but these were short-lived scientific experiments (Jaffe, 2021). In fact, Taiwan lacks a domestic space launch program, and no Taiwanese satellite has launched for military surveillance purposes (Stokes, 2018; Jaffe, 2021). Taiwan's current space infrastructure does not support a symmetric war with China.

In fact, Taiwan's present defense strategy is heavily dependent on missiles that are guided by satellite data (Chai, 2007). Taiwan possesses counterspace capabilities that can jam or spoof signals of Chinese satellites (Liu, 2020). Additionally, Taiwan has a system to detect frequencies used by Chinese satellites and to send these frequency bands to Taiwanese jamming vehicles (Liu, 2020). Taiwan also has air-to-ground cruise missiles that can attack Chinese satellite operations centers on the ground (Liu, 2020). Taiwan's defense strategy does not sufficiently address how space satellites would allow it to fight an unconventional war against China. This is likely because Taiwan's space satellite inventory is limited in number and purpose.

Taiwan's telecommunication satellite is primarily the ST-2 (Chang, 2011), but Taiwan also uses some frequencies from the ST-3, which is owned by China's ABS company (Gunter's Space Page, n.d.). The Formosat-5 and Formosat-7 are both remote sensing satellites designed to collect weather data and to measure ionospheric plasma and earthquake anomalies (Tseng,

2018). In other words, these satellite constellations are used for research, disaster preparedness, and weather monitoring. Taiwan is increasing its research satellite output, two of which (IDEASSat and YuSat) were launched in 2021, with the NutSat also planned to launch the same year (Central News Agency, 2021; Varindia, 2021). These satellites are a major milestone for Taiwanese space innovation efforts and indicate its potential, but none of the aforementioned satellites are dedicated to military ISR purposes.

Even more, none of Taiwan's satellites are completely domestic projects. In fact, NSPO often engages with foreign firms and government organizations (Borroz, 2021). The ST-2 is shared with Singapore Telecommunications, was contracted by Japan's Mitsubishi Electric Company, and was launched on a European Space Agency rocket (Chang, 2011; Stokes, 2018). The Formosat satellites are a collaborative effort with various U.S. entities, including the National Oceanic Atmospheric Administration, and were launched through SpaceX from Vandenberg Air Force Base (Tseng, 2018; Borroz, 2021). SpaceX also launched Taiwan's IDEASSat and YuSat, and it is expected that Taiwan will continue to use the foreign rockets and launch sites for future satellites (Wu, 2017; Varindia, 2021). Satellites that Taiwan uses for military purposes are not Taiwan-owned, and access to their data is given by partnerships, such as with Israel (Moltz, 2014).

Limitations in Current Taiwanese Space Capabilities

Taiwan needs an independent space program to give it more freedom for defense capability development and to remove any concerns from its partner nations about the risk of Taiwan's capability development inciting conflict. Non-domestic satellites pose a risk to Taiwan. Especially for satellites used for defense purposes, Taiwan is relying on partnerships that are not reliable during contingencies. If those satellites are disabled or the agreement to

share data is broken, Taiwan does not have its own military remote sensing capabilities. There may be interoperability issues with these satellites, especially as Taiwan upgrades its systems asynchronously to its partners.

There is also no guarantee that Taiwan receives accurate, full, or timely information from these satellites. It is important that Taiwan has its own reliable capabilities so that it can independently verify Chinese activity (Stokes, 2021). Independent communications satellites will also shield Taiwan from Chinese propaganda and allow Taiwan to accurately broadcast its own collection of events to the international community, which is a concern given China's investment in propaganda activities that shape public opinion on Taiwan-related matters to curtail Taiwan's global political and commercial influence (Brady, 2015).

Taiwan also lacks a domestic launch program. A domestic launch program would allow Taiwan to put more than just research satellites into orbit. Constellations of small satellites are more likely to survive space-based attacks (Stokes, 2018). Therefore, Taiwan needs domestic space launch capabilities to ensure it has its own resilient satellite architecture that would allow it to maintain operations in any contingency. Otherwise, it will have to fight a conventional war against China, which it will lose (Hagt and Durnin, 2011). Only with full ownership of its satellites does Taiwan guarantee problems during a China-Taiwan conflict are minimal and contained.

Barriers to Taiwan's Space Capability Development

Taiwan's lack of space capabilities is not from a lack of interest. Rather, Taiwanese business leaders and academics are eager to invest in space (Jaffe, 2021). In fact, the NSPO plans to add more satellites by 2028 for weather observation and high-resolution remote sensing ("Tsai lauds Taiwan-US satellite project," 2019). Taiwan has also been investing in space

technology and innovation. In fact, Taiwan's superconductor industry is one of the world's best, with companies like MediaTek already breaking boundaries on satellite technology (Yang, 2020; Varindia, 2021). Taiwanese universities, like the National Central University, have been developing hardware and software for satellites (Tseng, 2018). Military use of known Taiwanese satellites is not mentioned in reports, which indicates that international pressure is a major barrier.

In fact, Jaffe (2021) believes that international relations prevent Taiwan from developing satellites for military use. He names the U.S. as a key barrier force; in order to prevent an aggressive response from China to Taiwan's space capability development, the U.S. has denied Taiwanese intent to launch military assets (Jaffe, 2021). Even if Taiwan had a military ISR satellite in development, it lacks a launch facility, using instead SpaceX rockets and U.S. sites as well as European and Japanese resources. It is unlikely that the U.S. would allow Taiwan to launch a military satellite from U.S. soil. The U.S. is already a major backer of Taiwan's military, and U.S. satellites provide Taiwan essential early warning against Chinese ballistic missiles (Chai, 2007). U.S. launch of game-changing Taiwanese space assets would create a greater risk of inciting Chinese aggression. As such, Taiwan has only openly pursued its own non-military satellites, gaining other capabilities through foreign entities and private industry.

U.S. Support of Taiwan's Space Capability Development

While the U.S. must be cognizant of acts that may incite Chinese response, it is invested in Taiwan's space development. The U.S. is committed to enter the fight in a China-Taiwan conflict. Some data from Taiwanese satellites are processed by the U.S., and Taiwan's lack of counterspace capabilities increases the chance that China can disrupt and exploit Taiwanese satellites that the U.S. uses (Borroz, 2021). Exploiting the weaker link, China's attacks on

satellites connecting Taiwan and the U.S. are a threat to the U.S. defense plan on which Taiwan relies. A lack of satellite capabilities will turn the war into a conventional one, and the U.S. fighting abroad has more to lose than China (Akita, 2021).

Therefore, the U.S. is interested in forging the path to Taiwan's development of independent space capabilities. The U.S. would not ask China to accept that Taiwan be allowed to develop space capabilities to weaponize space assets. Rather, the U.S. must ask the international community to provide the means for countries like Taiwan to develop space capabilities to bolster defense of their sovereignty without inciting aggression from other nations. Give that satellites can be threatened by electronic jamming, cyber-attacks, and lasers, the U.S. must also support of Taiwan's counterspace development (Landale, 2020). This support requires protecting Taiwan from a probable Beijing response. While this protection can be viewed in military terms, it can also be viewed in diplomatic terms.

Given that China has been pursuing satellite diplomacy similar to its Belt and Road Initiative (for example, Nigeria and Venezuela are benefactors of China's satellite development projects), the U.S. must not drive Taiwan towards satellite partnerships with China (Sustarsic, 2011). However, while U.S. companies and organizations have made space launch more accessible, the U.S. must regulate foreign uses of its launch capabilities. To promote Taiwanese space capability development, U.S. government entities and private companies can continue to encourage Taiwan to continue expanding their own domestic ventures. Partnerships with Taiwanese universities and private research companies are critical to advance Taiwan's domestic space technology capabilities.

However, the U.S. needs to take a larger leadership role in international diplomacy regarding space use. International law today is insufficient to solve space-related conflict

(Landale, 2020). For example, it is not prohibited for China to perceive Taiwan's military space development as a threat and thus engage. The U.S. must work with the international community to make the space domain more transparent and predictable. In fact, the U.S. National Space Policy calls on U.S. leadership to promote a framework for "responsible behavior in outer space, including the pursuit and effective implementation of best practices, standards, and norms" (Flanagan and McClintock, 2021). By defining these standards and norms, the U.S. can help make the space domain more accessible to Taiwan, a country in a precarious situation requiring it to bolster its space capabilities in defense of the state. This includes clearly defining hostile military use of space so that Taiwanese defense capability building in space is protected from a Beijing response.

Conclusion

In a China-Taiwan conflict, Taiwan lacks space capabilities to sufficiently defend itself, forcing it to rely on U.S. defenses. To mitigate Taiwanese dependence on U.S. forces, the U.S. should pursue options in helping bolster Taiwan's space capabilities. These options include continuing ISR data partnerships and helping Taiwan develop and launch satellites. However, these options do not remove Taiwan military dependence on the U.S. Instead, the U.S. needs to address this issue with international diplomacy in order to protect and support Taiwan's development of space capabilities for defensive purposes, like military ISR satellites. In order to fully support Taiwanese space and counterspace development, the U.S. needs to engage on the international level to drive standards, practices, and norms that encourage space innovation and defense in more countries without fear of retaliation from other nations. This way, Taiwan can freely bolster its space capabilities to a level that reduces its dependence on the U.S. in a conflict with China.

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