Marines in the Space Domain

To what extent should the Corps use and affect space assets?

by Maj Jared A. Cooper

While outer space has been militarized since the days of Sputnik and spy satellites, the 1967 Outer Space Treaty attempted to limit its weaponization.[1] Nations have largely adhered to its articles with a few exceptions, such as China's testing direct-ascent anti-satellite (ASAT) weapons on orbiting satellites. While some would argue that the weaponization of space was unlikely, it is now a reality. The executive and legislative branches of the U.S. government have recognized this fact and established both the Space Force, an independent Service branch of the armed forces, and U.S. Space Command, a geographic combatant command focused solely on operations, doctrine, and plans in the space domain. Further illustrating the point is the publication of a *U.S. Space Strategy* in 2020.[2] These recent developments demonstrate the space domain's importance to American national interests and the significance of space to U.S. military operations.

The *2018 National Defense Strategy* directs the Military Services and Combatant Commands to conduct globally integrated operations as described in the Joint Concept for Integrated Campaigning. During his term as the Chairman of the Joint Chiefs of Staff, Gen Joseph Dunford highlighted the importance of making decisions at the speed of relevance. Space is unique when compared to the land, air, and maritime warfighting domains; special consideration must be made for the operational factors of time, space, and force when planning and executing operations that leverage outer space. The Marine Corps must better integrate across all domains to fight and win in today's modern strategic environment. Future competitors, be they superpower or not, already have a presence in the commercial and military space industries. They possess enhanced communications, situational awareness, and an increasing ability to blind and deafen the space-based assets that the U.S. intelligence enterprise relies on most. Operations in outer space impact those at every geographic location on earth and in multiple regions simultaneously and without warning. Yet, the Marine Corps has done little more than consume imagery and space-based communications.

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The force composition and disposition of Marine Corps formations must enable it to affect adversary space assets, enable USSPACECOM, and ensure access for follow-on joint forces.[3] Certainly, resources are limited. This factor alone has led to the divestment of several antiquated Marine Corps capabilities. However, those divestments were made with new operating concepts in mind that do not require the same capabilities. All future Marine Corps missions will continue to leverage outer space. As the Marine Corps strives to develop and implement the Expeditionary Advanced Base Operations and Littoral Operations in a Contested Environment operating concepts, it shows little interest in the challenges that a space competitor can bring to bear. To meet these challenges, it must contribute to the development of emerging concepts like Joint All Domain Command and Control—which will require reliable, secure, and survivable space-based sensors and communications infrastructure to reach its full potential. It must also field emerging technologies that can disrupt adversaries from effectively employing space-based platforms and ground-based enablers. Undoubtedly, space will be a domain critical to naval expeditionary operations for the foreseeable future; accordingly, the Marine Corps should strive to integrate with the Space Force and leverage space-based capabilities across the range of military operations. The below vignette provides examples of future challenges facing space competitors and to what extent the Marine Corps should affect space in both competition and conflict. It is an account of how operations in one area of the world will impact operations happening simultaneously in another area of the world.

Vignette

The Problem at Hand. The year is 2035. Since the 2010s, China has poured investments into the Horn of

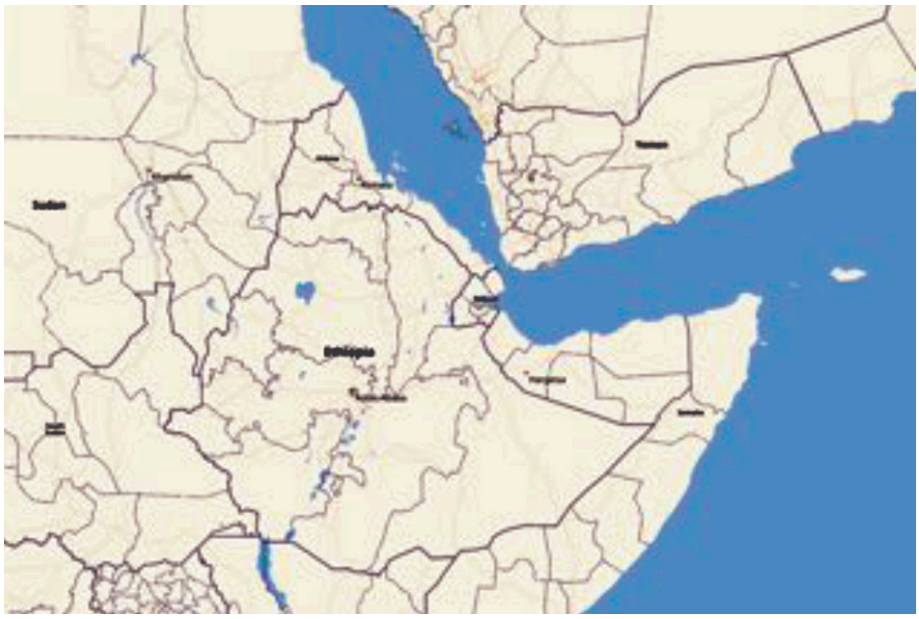
Africa to reinforce its economic "Belt and Road" initiative. Ethiopia's civil war in 2021 resolved itself, but ethnic and geopolitical tensions remained, despite U.N. peacekeeping operations. Ethiopia continued to pit Western powers against China for monetary support, causing the United States to have a confused policy in the region. China is now the strategic partner of choice for Eritrea and Djibouti.

On top of its struggle for soft geopolitical power, China has leveraged its massive production enterprise to bolster several space programs. China overtook the United States in space launches in 2018.[4] It now dominates several nations' economies throughout the Belt and Road, with several choosing it over GPS for market transactions. China also provides global imagery coverage with its Gaofen satellite constellation, though it leaves some gaps. Several Chinese Communist Party agents have started non-profit 501(c)(3) organizations in the United States to access commercial imagery constellations such as Planet to fill these gaps. The Tiantong constellation provides consistent all-weather satellite communications to forces throughout the eastern hemisphere and with very high bandwidth for data transmissions.

BeiDou, its positioning, navigation, and timing satellite constellation, became fully operational in 2020.[5] By 2030, it included a covert constellation of 30 X-band synthetic aperture radar satellites. Each of the satellites in this "Assassin's Mace"[6] constellation was designed to provide weapons quality data on targets within the Andaman-Banda-Philippine-Japan Sea Arc.

China's developments in artificial intelligence (AI) and investment in space have paid dividends in the commercial sector for years, but this would be the first test of China's assumed omniscience along the first island chain.

Violent protests once again erupted in the Tigray region in 2024, this time with significant and overt support from Eritrea. Egypt and Sudan have experienced significant drought and have demanded that Ethiopia increase the output of the Grand Ethiopian Renaissance Dam built in 2020. Ethiopia has threatened to fill its reservoir even further if Sudan involves itself in Ethiopia's internal affairs.



The "Horn of Africa." *(Map provided by author.)*

In July 2035, Eritrea threatens to invade Ethiopia's Tigray region with liberation as a *casus belli*. China pressures Djibouti to remove all U.S. and European forces within a month, promises to forgive Djibouti's debt in return, and calls on Djibouti and Eritrea to shut off the Bab-el Mandeb strait after having provided the necessary means to do so over the past decade. Chinese reasoning is to "prevent outside influence" in the Horn of Africa. Sudan's drought has crippled its agricultural and food production, so it invades Ethiopia to secure the Grand Ethiopian Renaissance Dam. China withdraws its peacekeepers from the UN mission in Ethiopia, leaving the UN with only enough forces to defend a few small stations.

U.S. Response. The United States issues warnings to Djibouti and Eritrea to allow trade to flow through the straits. During a freedom of navigation operation, U.S. naval convoys report an "unsafe and unprofessional" interaction with small Djiboutian maritime vessels. The U.S. Seventh Fleet has a similar engagement with Chinese vessels as it transits the South China Sea. The U.S. President authorizes limited strikes on Djibouti. Still, the outcome of those strikes proves indecisive. The United States begins air-dropping aid to Ethiopia in an effort to gain the favor of Africa's largest economy in the aftermath of the conflict.

Meanwhile, III MEF finishes an exercise in the first island chain and keeps Remotely Operated Ground Unit Expeditionary missile launchers with Ground/Air Task-Oriented Radars in the area. The United States extends warnings to China to include the South China Sea. China sets a red line on Djibouti. The United States interprets that red line to mean they will not interfere with U.S. intervention in Eritrea.

I MEF prepares to conduct forcible entry operations into Eritrea. III MEF increases forces in the first island chain at the request of regional allies and partners, as China has increased threatening naval activity in light of the growing tensions.

The Marines

III MEF: The Staff. "John, do you understand this whole TACSIT thing? G-3 wanted me to talk to you." John is a major at III MEF G-2. The man talking to him was Dave, a Navy Liaison to the MEF G-3.

"No, man, I don't have a clue. I thought TACSIT was just a Navy thing," John said, frustrated.

Dave responded, "It is, but now it looks like we're doing it for those bases

you've got." The concept that the G-3 came up with was fairly straightforward. It was a way of applying the Navy's Tactical Situation concept to Expeditionary Advanced Bases (EABs). The G-3 wanted to know when adversarial satellites were overhead, where their persistent sensors could see and hear, and from there inform the Marines on the EAB when they could leave their overhead cover or move small watercraft to and from the base. In fact, it was a wholly necessary concept. Chinese media published a propaganda video a few years back that showed every movement the Marines made during an exercise. The narrative was essentially, *we are watching you*.

"But they already know we've got forces on that island," John said a bit cynically.

The G-2 jumped in: "That's not the point. For one, we're planning to move assets across EABs within the next few weeks. It'll get them to think we're in multiple locations, but first, I have to know what they can and cannot see and when." The assets in question were Remotely Operated Ground Unit Expeditionary missile launchers. They did not have enough in theater to cover a large swath of the massive South China Sea, so the G-3 was essentially trying to deceive Chinese intelligence and make Beijing think III MEF had several in the area.

"Before I go, John, I MEF needs some help installing their SPACECOM cueing software. Details are in your email." It took the Pentagon years to get a contract for AI cloud computing that could integrate with its imagery satellites. In the old days, imagery intelligence analysts would have to scan every satellite image that came in and decide whether it was useful for further analysis. The process itself relied heavily on knowing where to look in the first place, especially on naval shipping, where communications systems operate in a delayed/disconnected, intermittently connected, low-bandwidth environment. The new software acquired by SPACECOM uses AI across all forms of satellite intelligence to locate an adversary's assets and cue those locations to the units that needed to know for further analysis.

This construct had just one problem. The United States relied increasingly more on commercial imagery, and the companies responsible for creating it did not always agree/align with U.S. foreign policy. Consequently, one company completely shut off government access to imagery surrounding East Africa. This was a severe shortfall because the software provided locations of anti-air and anti-ship missile systems that the United States needed to strike before I MEF forcible entry operations. Luckily, the space economy thrived in the United States, and several other companies were eager for the contract. They would launch another constellation just weeks before the operation and need to integrate with the AI software.

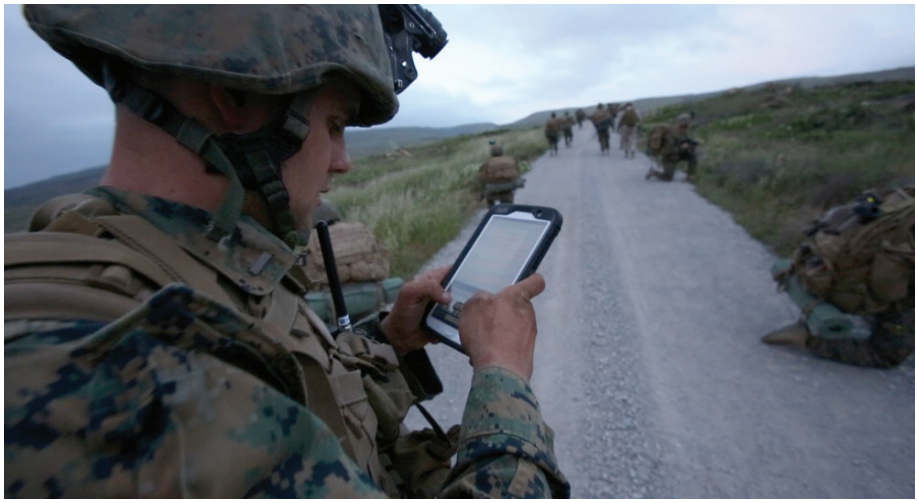
China was wary of targeting commercial satellites, which was the main reason the U.S. intel community was more accepting of OSINT integration. However, China benefited somewhat from the commercial imagery by setting up front companies in the United States. The companies were set up as 501(c)(3) organizations, typically using the tracking of maritime trade effects on whale migration patterns as a cover. While the FBI had to deal with the problem, the Marine Corps just had to know it was being watched.

As the staff prepared for escalation and deterrence measures, III MEF already had forces in the South China Sea. 3rd Littoral Combat Team (LCT), 12th Marine Littoral Regiment (MLR) (3/12) arrived in the Philippines two weeks before Sudan invaded Ethiopia. The LCT was meant to support Exercise GREAT AUGUR 2035, and the entire LCT expected to be home before family separation allowance kicked in. The Marines' deprecating joke was that GREAT AUGUR was named after the Iranian Strait of Hormuz closure exercises because it was just as pointless. They had no idea how pivotal they would be in the weeks to come.

From the Chinese perspective, this iteration of the Philippine-American exercise was nothing special. In fact, the electromagnetic signature management of the American units was suboptimal compared to their previous baseline. Radio waves in particular were easy to see from monitoring satellites. Now that the exercise was over, the Chinese analysts were more focused on their post drill leave than their data feed updates.

The Chinese South Sea Fleet command center watched Exercise GREAT AUGUR 2035 intently. Suddenly, the steady hum of the watch floor was interrupted by an outburst from a senior Chinese Communist Party member as the briefing room door slammed shut. The AI flash update stunned the Analysts; "(3) American unit locations UNKNOWN."

Increased tensions between the United States and China meant 3/12 needed to disperse across the Philippines.[7] They employed a combination of anti-ship missiles and jamming capability to pro-



Marines employ numerous systems that are dependent on space assets. *(Photo by Sgt Isaac Lamberth.)*

vide a deterrent for Chinese involvement in the Horn of Africa and, if necessary, to buy the Navy time and space. Using their integrated Space Effects Company, 3/12 monitored Chinese satellites and their ground-based spoofers and jammers disrupted the Beidou constellation. At the order of USSPACECOM, 3/12 used truck-mounted lasers to blind China's observation satellites. The UN declared such actions a violation of China's right to access space but did little to enforce the rhetoric. Since China also determined this a threat to its nuclear indications and warning, it escalated further. The PLA Navy sent FC-31 fighter aircraft to locate and do a low fly-over of the Space Effects Company. It found nothing, as the company departed a day prior. Without satellites, China's targeting systems were severely degraded.

I MEF. While III MEF managed escalation in the South China Sea, I MEF prepared to support the joint force's forcible entry of Eritrea. 11th MEU was the most forward force, and its commander had to answer to the JFMCC after a strike in Djibouti missed.

"What do you mean, you didn't check the space weather, Colonel? It's on the internet. It's a part of the strike package I'm looking at right now. Why on earth would you not use a laser-guided bomb instead of a GPS-guided bomb when GPS is this degraded?" The MEU Commander never liked modern technology. He thought the space command liaison officer was just there to give the communications officer an excuse when networks were not fully functional. He preferred to do things the way they taught at Marine Corps University: with maps and map pens. Unfortunately for him, this was not the first time it became a problem. Since it was starting to look like the MEU would take part in the forcible entry of Eritrea, another colonel would replace him two days later.

As time went on, the strikes grew more difficult. China still managed to push materiel to the Eritrean forces via Sudan almost weekly. U.S. forces kept to their mission timeline. While the force amassed, I MEF prepared to support D-Day. Aviation assets would jam satellite communications and data links.

"Listen up, folks. Today we are going to be covering the landing force in a new way." LtCol Michael "Light Year" Zheng looked around the *USS Doris Miller's* ready room at the collected F-35 pilots of VMFA-232. "Your electronic attack pods have all been filled with the needed frequencies to jam Chinese ... er ... 'Eritrean' satellite links. Our job today is to conduct electronic attack deep behind LZs Sparrow and Cardinal." Light Year paused to point to the electronic map illuminated behind him.

"Eritrean targeting relies on Chinese SATCOM and data links. Their bombs rely on the Beidou constellation to make the shots count. We're here to fly ahead of the main force and prevent all of that. We're not taking them offline permanently, but we are buying our maneuver elements time to get on the deck, disperse, and take cover before the Chinese can either reroute to emergency frequencies or figure out a way around our jamming. We're also buying our Fleet some maneuver space so they can get into a better position to support the landing force."

Meanwhile, the Maritime Raid Force would locate and target ground stations and anti-satellite weaponry.

"That space debris can destroy all of our satellites. We can't control where it goes. Satellites are fragile and space debris can move fast enough to rip through anything."

The MRF commander briefed the 11th MEU staff: "We've got to buy the fleet maneuver space. Think of it as a game of leapfrog. Air is clearing the way for our air assault. We will then move in, destroy the anti-ship missiles and their control centers. That sets conditions for the Navy to push north of the strait. The Navy's new laser weapon system is strong enough to burn-out the optics on any satellite that happens to be looking our way. The problem is they have to be close enough to us to 'see' any satellite peaking at us.[8] If they can't blind it, they'll have to resort to physical destruction. And that can't happen."

"Wait, why?" The new MEU commander jumped in, looking at the SPACECOM liaison officer.

She responded, "That space debris can destroy all of our satellites. We can't control where it goes. Satellites are fragile and space debris can move fast enough to rip through anything.[9] Plus we couldn't replace them. All launches are grounded because China called the nuclear card after III MEF blinded the first satellite."

"So be it," The MEU commander replied. "Alright, so the VMFA jams the satellites, Recon targets the ground stations and ASAT sites." He got a nod of approval from the SPACECOM liaison.

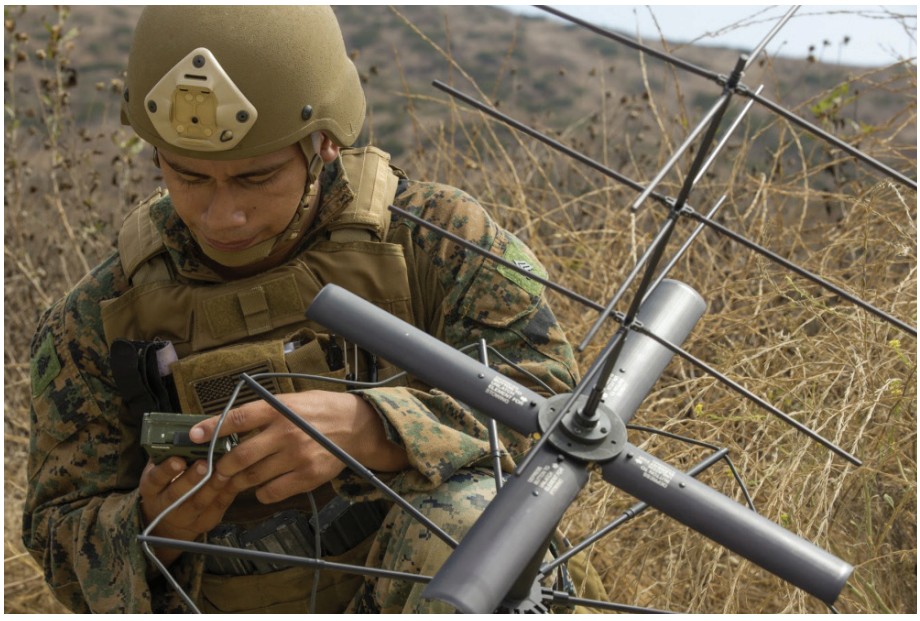
D-Day would be messy but dealing with space threats gave the joint force back its technological advantage. Ultimately, the Marines of I MEF took this mission because they were the most forward force and had the most practice at operating without large-scale foreign basing. In dealing with threats to the Navy and joint force from land and space, they set conditions for the joint force to establish a foothold and defeat Eritrean aggression. Not only did this mission roll back Chinese influence in the area but the limited attacks on space-based assets set a new precedent for modern warfare without compromising U.S. or commercial satellites.

Analysis

The rapid destruction of the Iraqi military in the 1991 Gulf War revealed the vast technological advantage of

the United States over foreign powers. Heavily reliant on space-based intelligence, communications, and positioning assets, the lethality of America's precision strike regime stunned China in particular. Determined not to fall victim to U.S. hegemony, China entered the space race.[10] In the vignette above, several challenges reflect China's very real developments and aspirations in both space and the geopolitical sphere. Further, the challenges will not be limited only to China. If the military space industry continues on current patterns, less-developed nations will be heavily reliant on superpower space launches and satellites in the future. These challenges are inevitable developments that cannot be ignored. As a result, the Marine Corps must focus on three lines of effort.

The first regards the intelligence, C2, force protection fires, and information warfighting functions, which will perhaps be the most heavily impacted by space. These factors will endure regardless of force restructuring or changes in the Marine Corps mission. Intelligence collection will be impacted by space weather while satellites will continue to support collection efforts and battle-tracking. There are even potential cost savings related to leveraging commercial satellites in low earth orbit for intelligence collection in place of manned and UAS. The command, control, communications, and computers community will continue to leverage narrow and wideband single and multi-channel satellite radio connectivity to establish the C2 system backbone required at every level of command. The Marine Corps will also rely upon the unique early warning capability of the Space Force's space-based infrared system and hedge against adversaries by taking advantage of commercial satellites to improve the force protection warfighting function.[11] Space operations and the space domain will also continue to play an integral role in supporting the fires and information warfighting functions. For example, ASATs could be used as conventional deterrents at Marine Corps expeditionary advanced bases and future Marine Corps expeditionary assets could be employed to blind and deafen the enemy by jamming and dazzling adversary satellites.



UHF Satellite Communications and GPS navigation and timing are wholly reliant on access to functioning satellite arrays. *(Photo: courtesy Marine Corps Base Camp Pendleton.)*

Second, the Marine Corps must fully leverage space to create operational tempo. To do so, it must take advantage of what space integration can provide. Satellite movements are predictable, as they follow a certain orbit. Accordingly, Marines can know exactly when they are being watched. AI systems are growing exponentially and the DOD has done little to integrate them outside of limited projects available to only a small portion of the force. Existing systems could save thousands of hours of work and cue tactical intelligence assets. Space weather is a highly underestimated factor in communications and precision guidance, but the information is readily available to all. The problem is less one of resources and more of education.

Third, the Marine Corps' expeditionary posture in the "contact layer" of competition means that it will likely have forces forward prior to escalation of geopolitical conflict. These forces will be highly vulnerable to observation and targeting from space. Further, if the Marine Corps is to enable joint forcible entry operations, it must assist in dealing with threats from space. This may take the form of subversion (such as the example using TACSIT for EABs), EM action (such as the F-35 example), or even the threat of ASAT weapons as a form of deterrence. Any of these can be achieved through organic capabilities, such as Marine Corps acquisition of ASAT weapons, or through attachment relationships with the Space Force. Either path requires some change to Marine Corps force design. The former would certainly require greater resource allocations throughout DOTMLPF-P, and this may be too much to ask. Both, however, require significant training and education of Marine Corps leaders on space operations and emerging Space Force capabilities. The nature of outer space and the world's current interactions with it mean that every action taken to affect space will have political, strategic, economic, informational, and even nuclear implications.

Conclusion

This vignette illuminates how future geopolitical conflicts might unfold and how intertwined with space they will undoubtedly be. Operations in one combined joint operating area (CJOA) might very well happen simultaneously with operations in another CJOA. Furthermore, operations in domains such as cyberspace and outer space that have global geographic reach will likely impact operations in every

physical domain. As such, the Marine Corps must be prepared to deter our adversaries or fight and win in every clime and place, as has been the Corps' historical moniker, and in all warfighting domains.

The *2017 National Security Strategy* is primarily focused on great power competition and this has necessitated change throughout the DOD.[12] In July 2019, the Commandant of the Marine Corps published his planning guidance—challenging the efficacy of the MAGTF, maneuver warfare doctrine, and the force composition of Marine formations required to fight and win in a contested littoral battlespace.[13] At least one major historical planning assumption has been invalidated—no longer is it safe to assume that U.S. naval expeditionary forces will move unimpeded from ports of embarkation to assigned amphibious operating areas.[14] Significant improvements in adversary warfighting capabilities and the nascent threat they pose to friendly maritime formations have triggered a paradigm shift in the Marine Corps. Integrated planning teams are refining new operational concepts and tactics that will affect every warfighting function, material solution, element of the joint capabilities integration development system (JCIDS) describing nonmaterial solutions and be the impetus for revolutionary change in the Marine Corps.[15] Accordingly, there will be major implications on operations in space and operations that leverage the space domain.

The Marine Corps plays a key role in the joint force. It is a fully integrated, combined arms formation designed to set conditions for the joint force to flow into a theater of operations. Given that space operations have become so prominent, the Marine Corps must adapt its force to be able to incorporate space warfighters, as this will allow it to affect the enemy's space operations. By gaining this capability, the Marine Corps will be able to more effectively shape the battlespace to temporarily blind the enemy and to gain unobserved maneuver space for the joint force. It must either internally grow and maintain these organic capabilities or fully prepare to integrate Space Force capabilities into Marine Corps force elements. Positioning assets that can affect space within Marine Corps formations will allow the service to ensure space operations are incorporated into all aspects of joint operations, in much the same way that maintaining organic Marine Corps aviation has enabled a fully integrated MAGTF. Failing to do so risks allowing the Marine Corps to become irrelevant through its inability to enable the joint force to maneuver in both competition and warfare.

Notes

1. "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (General Assembly resolution 2222 [XXI], annex), adopted on 19 December 1966, opened for signature on 27 January 1967, entered into force on 10 October 1967, 18 UST 2410; 610 UNTS 205; 6 ILM 386 (1967): 10, available at https://www.unoosa.org.

2. Department of Defense, *Defense Space Strategy of the United States of America,* (Washington, DC: June 2020).

3. To affect space assets in this case means to disrupt, destroy, or neutralize spacebased platforms and ground-based enablers.

4. Haihan, Xu, "China Launched More Rockets into Orbit In 2018 Than Any Other Country," *Technology Review,* (December 2018), available at https://www.technologyreview.com.

5. Ramsey Fargher, "China's Homegrown GPS Is Now Fully Operational," *Forbes*, (August 2020), https://www.forbes.com.

6. Michael Pillsbury, *The Hundred-Year Marathon: China's Secret Strategy to Replace America as the Global Superpower*, 1st Edition, (New York, NY: St. Martin's Press, 2015).

7. Mallory Shelbourne, "Marines Considering 3 Littoral Regiments for the Indo-Pacific," *USNI News*, (February 2021), available at https://news.usni.org.

8. Staff, "Concert Lasers Damage Image Sensors," *Image Sensors World*, June 2013), available at http://image-sensors-world.blogspot.com; and Kyle Mizokami, "Anti-Satellite Weapons Are Becoming a Very Real Threat," *Popular Mechanics*, (April 2020), available at https://www.popularmechanics.com.

9. Carin Zissis, "China's Anti-Satellite Test," Council on Foreign Relations, (February 2007), available at https://www.cfr.org.

10. David Kilcullen, *The Dragons and the Snakes: How the Rest Learned to Fight the West*, 1st Edition, (New York, NY: Oxford University Press, 2020).

11. Nathan Strout, "How the Space Force Foiled an Iranian Missile Attack with a Critical Early Warning," *C4ISRNet*, (January 2021), available at https://www.c4isrnet.com.

12. Office of the Presidency, *National Security Strategy of the United States of America*, (Washington, DC: December 2017).

13. Gen David H. Berger, *38th Commandant's Planning Guidance*, (Washington, DC: July 2019).

14. The term move here refers to the movement phase of amphibious operations.

15. The Chairman of the Joint Chiefs of Staff, *Charter of the Joint Requirements Oversight Council (JROC) and Implementation of the Joint Capabilities Integration and development System (JCIDS), Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 5123.01H,* (Washington, DC: 2018). Revolution connotes a sudden, extreme, or complete change in the force composition of the Marine Corps and the disposition of its formation.

>Author's Note: The geopolitical scenario used as a vignette in this article is entirely fictional. It uses real places and discusses an on-going conflict in the Horn of Africa to add gravity to the scenario, but it is not in any way a prediction. Nor does it depict the opinions of any of the writers on current affairs.