

The Ultimate High Ground

Space considerations for the tactical fight

by Capt Adam M. Fountain

“Only with support from space will it be possible for the Armed Forces to reach maximum effectiveness ... The Russian President has repeatedly stressed that our army and navy must not only meet the requirements of today, but to [sic] be prepared for tomorrow’s means of conducting armed struggle. The solution of this problem doubtlessly depends directly on the availability of a modern orbital constellation of military satellites.”

***—Russian Defense Minister Sergey Shoygu,
6 March 2018***

The intent of this article is to inform commanders and staff about the opportunities that space planning can provide in support of their schemes of maneuver and dispose of any preconceived notions that space support is out of the realm of tactical-level planning considerations.

Scenario

You are the commander of a task force built around an infantry unit and you are preparing to go on the assault. You have been busy planning your attack for days and things have not been going as well as you had expected. Your intelligence section has not been able to give your planning staff a clear picture of the enemy situation and the intelligence that you had to go forward with was inconclusive and somewhat questionable. The hyper-spectral imagery you wanted was not available because your RFIs did not make the cut for sat-

ellite collection. Your intelligence section could not get up-to-date imagery because of increased SATCOM interference over the past few days. The UAVs that were feeding you footage from the objective area and avenues of approach have either gone offline or cannot penetrate the jamming environment. You have nevertheless decided to move forward with the operation because higher headquarters has already started planning the next series of actions, and they are expecting a positive outcome from your attack very soon. You try to call home, but none of the phones are working and the internet is down. You begin to wonder why, but it is time to start getting everyone assembled to do

final coordination and then mount up, get accountability, and cross the line of departure. As you walk to your command and control (C2) vehicle, you hear the comm guys yelling back and forth at each other, “We can’t get anyone beyond line-of-sight!” You attempt to use your Iridium satellite phone to contact higher—no joy. Your nav man tells you that there is something wrong with everyone’s GPSs. They are either jammed or giving current position grids hundreds of miles away. Your OpsO tells you that the first flights running your shaping actions are returning and some of them bombed the wrong locations because of GPS issues. The flights that were able to make it to the objective are returning battle damage assessments (BDA), indicating that almost all the targets were missed. You realize that the only other option is FAC-A self-lasing and dumb ordnance, which will put your aircraft at greater risk of enemy air defenses. Now you send the word to get your staff together because it time to make a decision—go forward with the attack or hunker down and hold position until the fog of war lifts? Before you can assemble everyone, explosions begin hammering your position. There is total chaos unfolding in your assembly area. Enemy ordnance is precise and deadly accurate. They seem to be hitting everything that is essential as if they are running down a target list. Your unit is decisively engaged. The sergeant of

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the guard runs over to you and tells you that the watch officer reports two large formations of enemy vehicles closing in on your position. One from the East and one from the North. You and your OpsO both realize you are the victim of a spoiling attack. What now, commander?

hind when you moved your command post two days ago are under attack, but the fires are mostly ineffective, and the air defense systems are engaging enemy aircraft with success—they have taken the bait. You are spearheading the main effort. Satellite imagery, less than four hours old, enabled very precise

day and night for the next ten days. As you button up your C2 vehicle for the close-in fight, you think to yourself, “War has changed a lot since I was a lieutenant. I’m glad I didn’t kick the space guy out.”

“And the fog of war will not easily clear in that fight, because future adversaries will employ new tools as well, exploiting any cyber and space vulnerabilities they can find and try to negate our advantages in those domains.”

—ADM James A. Winnefeld, Jr. Vice Chairman, Joint Chiefs of Staff, October 2013

Now, imagine this scenario reversed. It is the enemy that is experiencing these effects, and meanwhile, you are ruthlessly exploiting the initiative and maneuvering on their forces. Days ago, your amphibious landing went fairly well, having fought through relatively light shoreline defenses to take your first objective. You established a beachhead and strong foothold from which to fight from. You and your staff evaluated the enemy and determined that their critical vulnerability was their over-extended communications infrastructure and reliance on SATCOM. You planned early for your own space support and the space planner was able to get space support requests through in time for this operation. Through good prior planning and nesting of your actions with operational and strategic-level, space-based collections and targeting actions, you were able to get the timing for this operation perfect for enabling space support. As your staff was finalizing planning, intelligence, surveillance, and reconnaissance (ISR) indicated that the enemy was preparing to go on the attack. Last minute adjustments are made to the shaping series, and you give the order to execute. Shortly after crossing the LD, your rear area gives reports that the fake C2 nodes, tents, and inflatable aircraft and vehicles that you left be-

hind when you moved your command post two days ago are under attack, but the fires are mostly ineffective, and the air defense systems are engaging enemy aircraft with success—they have taken the bait. You are spearheading the main effort. Satellite imagery, less than four hours old, enabled very precise final coordination and confirmed exact locations of enemy C2 nodes, aircraft, anti-aircraft, and artillery positions showed the enemy beginning to build up forces in their assembly area. UAVs are returning live feeds of the destruction unfolding on enemy positions, and the BDAs are coming back with great effects and no targets requiring reattack at this time. Communications with your units, adjacent units, and higher are seamless and unfettered. Space-based METOC assessments show optimum weather for continued operations both

“Maneuver warfare is a warfighting philosophy that seeks to shatter the enemy’s cohesion through a variety of rapid, focused, and unexpected actions which create a turbulent and rapidly deteriorating situation with which the enemy cannot cope.”

—MCDP 1, Warfighting

New Vectors for Warfare

During the past two decades fighting wars in Iraq and Afghanistan, we have enjoyed a vast technological edge against our enemies. We have enjoyed air supremacy, unfettered communications, precision strike capabilities, and



Capt Fountain navigates to the drop zone while in freefall during Multi-Mission Parachute Course in Coolidge, AZ, 2018. (Photo by author.)

live ISR feeds showing us in realtime what our ill-equipped adversaries have been up to. The freedom of action we have had for so long is quickly going away. The tides of war are shifting and while our focus has been elsewhere, adversary nation-states have been scheming against us and developing capabilities to contest our interests and threaten our security at home and abroad. They have been working diligently to develop ways to avoid our strengths and exploit our weaknesses—to avoid our surfaces and target our gaps. Now that we are shifting our focus from the counter-insurgency fight and taking a serious look at our peer and near-peer adversaries, we have begun to realize that we are vulnerable in ways that we had not anticipated—particularly in the information environment (IE). It is important to understand that in this new fight, warfare is being waged in realms beyond the physical. These new vectors for waging conflict span from space to the electromagnetic spectrum, to cyberspace, and even to the minds of individual human beings. If we continue to think and plan only in the physical realm and try to solve all of our problems with ordnance, we are ceding this maneuver space to our enemies and providing them opportunities to out-flank us. We must adjust our way of thinking, include these attack vectors in our planning, and evolve how we fight in this new age of warfare.

Our Dependency on Space

In modern warfare, space-based support is critical to tactical success. It enables us to detect the enemy first, understand them first, take action first, and permits quick and decisive targeting to finish them. It provides redundancy in communications, ISR, and early warning in support of force protection. If we were to only rely on organic Marine Corps assets (the Marine Corps does not own any satellites), we would be allowing an enemy with space support capability to quickly out-pace our decision-making cycle, giving them a position from which to plan and execute against us first. So far, we have not allowed for that to happen. We depend on space support in several ways.



Marines with Alpha Battery, Battalion Landing Team 3/5, 11th MEU, bivouac at Colonel Ernesto Ravina Air Base, Philippines, during Exercise KAMANDAG 3, 16 October 2019. (Photo by SSgt Donald Holbert.)

ISR

For tactical-level planning, one of the greatest capabilities that we bring to bear is space-based ISR. We have the means to pull high-resolution targeting-quality products for any location in the world for use in time-sensitive mission planning, positive identification, dynamic re-tasking of assets, and BDA. Intelligence collection efforts can be prioritized and sequenced to incorporate space-based assets which provides both redundancy and allows for the cueing of other collection assets in order to gain “multi-INT” correlation for targeting purposes. This works much the same way as would a HUMINT team that receives information about a new enemy communications node that is confirmed both by SIGINT and EO sensor collection. This enables a much faster targeting cycle because of the information having been confirmed and correlated across multiple collection platforms.

Position, Navigation, and Timing (PNT)

Commonly referred to as GPS, PNT provides us with everything from current locations, to precision weapons guidance, and the timing that allows our communications systems to work. Location and timing data are derived

from information transmitted via the GPS satellite constellation from a minimum of four different satellites—three or more satellites for position triangulation and one satellite to synchronize timing. This constellation provides two position services. One is a standard positioning service that is broadcast over an unencrypted signal to any user with a GPS receiver. The other is a precise position service that is broadcast over two encrypted frequencies—used primarily by the DOD.² The modern operational environment demands that we enforce discipline when it comes to the types of navigation tools that we use. Many of the commercial navigation tools on the market today can easily compromise or disrupt our operations and can ultimately lead to entire units being killed if we are not careful and disciplined. The unencrypted standard positioning frequency used by these devices is a low-power signal that is more vulnerable to environmental conditions and can easily be jammed or spoofed by our adversaries. This can create additional friction that could easily be avoided by using the encrypted precise position frequencies, which are both harder for our adversaries to target and more reliable in adverse weather conditions. In terms of precision-guided mu-

nitions, high accuracy in PNT equates to highly effective kinetic strikes, minimal collateral damage, and reduces the need for reattack—which makes us more decisive, saves ammunition, and enables us to strike more targets faster. Considering that we are now bringing new HIMARS, ATACMS, and GMLRS capabilities online in support of expeditionary advanced base operations (EABO), accurate PNT will be essential in those long-range engagements where some of our targets may be on the move.³ The timing part of this equation, which is essential for navigation and driving our precision-guided munitions, is also vital for establishing and maintaining communications. Without precise timing, our ability to use frequency-hopping is degraded or denied, and we are forced to off-ramp onto other more easily intercepted and jammed means of communication.

SATCOM

SATCOM is essential for maintaining C2 on the modern battlefield. Far beyond just using a radio to talk voice to another unit or providing worldwide connectivity from remote locations, SATCOM provides a communications infrastructure that is not dependent on groundbased line-of-sight relays and is the go-to means of communications when organic communication range capabilities have been reached. As opposed to standard tactical UHF and VHF antennas, some SATCOM antennas can be focused directionally to provide the user a much lower probability of detection. This can increase the survivability of the user by denying the enemy the ability to direction find our forces. This is crucial in today's battlefield, where to be detected is to be killed.⁴ SATCOM also provides the conduit for the Common Operational Picture, which is the primary tool used by command elements to keep track of friendly and enemy units and maintain a shared situational awareness of the battlefield. This tool significantly shortens the decision cycles of commanders and enables the swift actions of their subordinates.

Missile Warning

Missile warning is done by Overhead

Persistent Infrared satellites that use infrared sensors to detect heat. Though it is primarily discussed at the strategic level in regard to intercontinental ballistic missiles, it can inform tactical-level defensive measures in the event of an enemy missile launch. Missile warning proves helpful in force protection discussions concerning freedom of navigation operations and EABO and can drive communications planning in regard to the lines of communications required to receive timely warning. Missile warning can also inform the targeting process by assisting in BDA and determining reattack options if necessary.

Environmental Monitoring

In the Marine Corps, we like to say that no matter what our plan is, the enemy gets a vote. If this is true, I would venture to say that no matter who is voting, the weather holds veto authority. I can recall numerous times where our sniper missions were scrapped as a result of dust storms shutting down our

weather in any clime and place is absolutely essential for us as a Navy/Marine Corps team. In the middle of the open ocean or in remote areas of the world where no ground weather stations exist, environmental monitoring satellites are the primary observers. With the effects that weather has on both friendly and enemy operations, and many of the systems that we use, our weather satellites are crucial to mission success.

Space Domain Awareness

For the tactical fight, space domain awareness is simply knowing when our satellites are overhead to support us and knowing when the adversary's satellites are overhead to detect us. Using this knowledge can greatly inform planning, specifically in regard to operational security (OPSEC) and military deception (MILDEC). Knowing when enemy satellites are overhead allows us to decide what we want them to see or not to see. We can prioritize actions that involve our essential elements of friendly

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ability to run CASEVAC aircraft, training exercises were cancelled because of hurricanes, and one particular occasion where, after a successful mission, our entire raid force (having only packed for a quick in and out trip) was stranded on the beach for several days in sub-zero conditions and high winds after our amphibious ships had to pull away due to high seas. Weather affects every aspect of our mission planning. For example, in terms of conducting amphibious operations in support of EABO, it can significantly change the underwater topography of the offshore staging areas and beach landing zones that we intend to use. It can affect the timing of our logistical support and change avenues of approach for maneuver. It can ground aircraft and render ships incapable of launching or receiving shore connectors. Having the capability to forecast

information to occur during windows when there are no enemy satellites able to detect us, which is fundamental to OPSEC, or conversely, we can purposely conduct actions designed to fool the enemy and project false intentions as part of a MILDEC plan. Knowing when enemy satellites are overhead can allow us to take such precautions as concealing our positions, changing or halting force movements, or establishing a state of emissions control in order to avoid or mitigate detection by enemy satellites.

The Wild West

There are no national borders in space. There are no rules stopping our adversaries from flying satellites over our country as there are none to stop ours from flying over theirs. The days of spy planes and the political ramifications of them being shot down over enemy

territory have all but disappeared. The satellite flying in space can be likened to a ship travelling in the international waters of the open ocean. There are no borders, and all nations hold the right to traverse it freely. This makes space-based ISR, SATCOM, and PNT more responsive and accessible to adversary territory than via airborne or ground-based means. With this in mind, nations have begun to realize that a large portion of their national security relies upon access to or denial of space capabilities. To this end, there is an ongoing race to develop both ground and on-orbit space infrastructure as well as the means to counter these abilities.

Adversary Counterspace Capabilities

While we have been occupied with the counterinsurgency fight, our peer and near-peer adversaries have watched very closely how we rely upon and use space capabilities to support our operations. They have analyzed our methods and identified numerous ways to deny, disrupt, deceive, degrade, or destroy our space capabilities. They have devised their plans and have been working diligently to develop the means to mitigate or remove our dominance in the space domain. Here are a few ways that they are planning to do this:

1. *Direct-Ascent Anti-Satellite Weapons (ASATs)*: Direct Ascent ASATs are groundbased, sub-launched, ship-launched, or air-launched missiles that are designed to target satellites. They are not designed to reach and maintain a particular orbit, but rather to intercept and kill a satellite much the same way a surface-to-air missile would be used against an aircraft. At this time, both Russia and China have the capability to use Direct Ascent ASATs to engage U.S. imagery and weather satellites in low-earth orbit. Iran and North Korea currently have the missile technology to pursue this course of action if they choose to do so.⁵

2. *Co-Orbital ASATs*: Co-Orbital ASATs are satellite weapon systems that are put into orbit with the intent to engage other satellites at the time and place of their choosing. Once in orbit, these systems can identify target satellites and then move to a firing

position to launch kinetic kill vehicles (think “bullets”) and destroy them. This is essentially armed reconnaissance in space. Currently, both Russia and China have these types of satellites on orbit with the intent to put more in orbit in the near future. Iran and North Korea currently have the launch vehicles to pursue this course of action but do not appear to actively be doing so at this time.⁶

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3. *Electronic Warfare*: Electronic warfare in this context refers to the ability to deny, degrade, or disrupt either the signal uplink (target the satellite) or the signal downlink (target the user). This affects both SATCOM and GPS. Currently, all our adversaries possess, at the very least, the ability to jam commercial grade GPS downlink signals. China and Russia both maintain significant capabilities to deny, degrade, and disrupt our use of space support within the electromagnetic spectrum to target both uplink and downlink.⁷

4. *Directed Energy Weapons (DEW)*: DEWs are systems that use laser energy, high-power microwaves, and other types of radiofrequencies at various power levels to achieve effects on target satellites that can range from temporary disruption of the sensor to destruction of the satellite itself. Currently, China and Russia have ground-based DEW capability that can affect our satellites in low-earth orbit.⁸

5. *Cyberspace*: The use of satellites inherently involves the use of both cyberspace and the electromagnetic spectrum. In this context, cyberspace refers to software programs that are weaponized to attack a computer system within a part of the satellite

infrastructure—either the satellite, the ground station that controls it, or the link between them. Cyberspace weapons can be used to deny, degrade, deceive, disrupt, and destroy any satellite or ground station that can be communicated with and hacked into. Currently, China and Russia are developing anti-satellite cyberspace capabilities.⁹

For Sale: Military-Grade Space Support

Though it would be ideal to our national security if the United States and our allies held a monopoly on space capabilities, it is important to note that the same capabilities addressed in this article are available for purchase through commercial satellite constellations. This implies that, with a bit of funding, any adversary nation, criminal organization, or terror group could potentially enjoy the same cutting-edge spacebased technological capabilities as the world's finest military force.

Recommendations from the Space Planner

1. Use the Space Planner to assist with fires planning with regard to PNT accuracy assessments (also referred to as Dilution of Precision) and coordination for PNT signal power increase requests to make GPS-guided munitions more accurate during times when kinetic strikes are to take place.

2. Use the Space Planner to assist in OPSEC, SIGMAN, and MILDEC planning, specifically in regard to adversary ISR overflight schedules.

3. Be aware of your signature both physically and in the electromagnetic spectrum. Our adversaries have their own ISR satellites or have access to high quality ISR products from commercial satellites. Do your best to blend into the natural environment. Do not disturb the baseline if at all possible. If you have a clear view of the sky, its best to assume that adversary ISR has a clear view of you and can sense whatever EM spectrum emissions are emanating from your position. Make their job of finding you and tracking you as hard as possible. Do not present target indicators to them. Here are a few tips to help with this:

- a. Do not set up tents and COCs in the open.
 - b. Hide your forces in the tree line where there is no clear view of the sky. Where there are no tree lines or overhead cover to conceal your position, use cammie netting and other materials that resist/deny hyperspectral imaging and SAR collection.
 - c. Do not set up your tents or park your vehicles in rows or any other type of pattern. When it comes to tactical operations, establishing a pattern creates a target indicator. Patterns rarely occur in nature and can easily be identified by an enemy imagery analyst.
 - d. Use directional SATCOM antennas whenever possible. If directional SATCOM is not an option, the next best thing is a directional HF antenna because of how it is focused on one on particular azimuth and has to bounce off of the ionosphere to reach over the horizon. Our adversaries have the ability to direction find our transmissions, so using something that only emits in one direction makes sense.
4. Do not let Marines to use commercial GPS devices (Garmin, Magellan, etc). Only use military issued devices using military encrypted frequencies. They are harder to spoof and harder to jam.
 5. If you experience jamming or spoofing, report it immediately. User feedback often serves as the first indication of space assets being targeted. Use the reporting criteria located in CJCSM 3320.02, Joint Spectrum Interference Resolution (JSIR) Procedures.
 6. Whether conducting training or deployed in real-world operations, do not allow Marines to use personal electronic devices or wear smart watches or fitness trackers that talk to the internet or to satellites. Its best to consider all commercial electronics that emit signals compromised. The enemy has the ability to sense and target these users through the electromagnetic spectrum or cyberspace. Marines never travel alone, so if they can sense and locate one or two of our devices, they can easily assume other key elements to enable them to effectively target us.¹⁰
 7. Include the Space Planners, and other Operations in the Information Environment Planners, early on and make sure

that they stay integrated throughout the planning process. Don't put them in a room down the hall to plan in a vacuum while the "real" planning is going on elsewhere. There should be no such thing as separate OPTs for Information Warfare and Fires. All capabilities should be considered for input to achieve an all-inclusive whole-of-effects approach to fires.

"If you can't explain it simply, you don't understand it well enough."
—Albert Einstein

Conclusion

No matter what MOS you hold in the Marine Corps, we all either directly or indirectly support the infantry. Until a new main effort is designated, the tip of the spear will continue to be those young hard-charging 0311s, and we must do everything within our power as supporting units to ensure that they are crossing the line of departure with the absolute best support that we can provide. The infantry values simplicity and directness, and has little patience for things that seem outside of the scope of the mission. Unfortunately, many of the new concepts and capabilities coming online for the Marine Corps fall outside the realm of kinetic capabilities and can come across as somewhat irrelevant to someone whose mission is to locate, close with, and destroy the enemy by fire and maneuver.¹¹ To be fair, this can be said for most other MOS's that are not inoculated to working with and through the IE. The other side of this coin is that some of us as information warfare professionals do not know how to effectively communicate—sometimes very technical IE planning considerations—to someone that has been trained to solve problems with ordnance. This language barrier is one of the major obstacles that we must overcome if we are to fully integrate our lethal and non-lethal capabilities and

remain relevant in a world where the means by which we conduct warfare is quickly changing. We share a responsibility to try and bridge this gap in understanding. We must think through the lens of the infantryman, decide how our particular skillset can best support them, and develop the language skills necessary to clearly and concisely convey to everyone at the planning table what can seem like new and strange concepts. If and when we finally achieve this planning synergy, we will be ready to fight and win the wars of today and tomorrow. Though the nature of war is unchanging, the character of war is not; thus, it is existential imperative that we adjust to the changing character by which we wage war.

Notes

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4. Gen Robert D. Neller, *CMC Message to the Force 2017: Seize the Initiative*, (Washington, DC: February 2017).
5. Staff, *Challenges to Security in Space*, (Washington, DC: Defense Intelligence Agency, January 2019).
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8. Ibid.
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