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Space Warfare

A LITERATURE REVIEW



A Literature Review By
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Introduction

The five atmospheric layers, such as troposphere, stratosphere, mesosphere, thermosphere, and exosphere, create a vast expanse beyond Earth. However, most of the U.S. Military applications occur in Low Earth Orbit (LEO), Middle Earth Orbit (MEO), and Geosynchronous Earth Orbit (GEO). The distance of 3100 nautical miles from Earth's surface is called the lower earth orbit, where most of the navigation, reconnaissance, and weather satellites orbit. More powerful satellites such as communication, navigation, missile defense, and early warning systems, reside in the Geosynchronous orbit, which at least 22,300 nautical miles from Earth's surface.

The advancements in Space began immediately after World War II, and the cold war between the United States and the Soviet Union paved the way for many of the space programs in both the countries because the competition between the countries was primarily to generate international prestige.

Since then, both the United States and the Soviet Union have developed warfighting capabilities in Space. With the recent antisatellite missile tests conducted by Russia highlights their superior military capability in outer Space.

Likewise, in January 2007, China surprised the West by testing an antisatellite weapon and emerging as a surreptitious adversary, demonstrating its potential capabilities that could threaten U.S. Space assets vital to national security, early warning tracking, weather, reconnaissance, intelligence, surveillance and other indispensable functions for military operations.

With the prospect of warfare in Space, many of the political and military analysts felt the necessity to generate a theological basis for combat operations in Space. This literature will build its framework deductively by exploring the military history and theories on Space warfare and the nature of war in Space, as a means for war fighters to best address and win any potential conflict in Space.

The Warfighting Strategy

In the book *On War*, (Clausewitz, 1832), Clausewitz mentions that Every battle requires a strategy, and War in Space is no different. When planning for war, the first business is to gather the requirements to create a conceptual framework or an effective warfighting strategy that maximizes the warfighter's opportunities for success while also assessing the opponent's strengths as well as one's weaknesses, disadvantages, and defeat. Therefore, war is the action of force in compelling the opponent to satisfy our intention (Clausewitz, 1832). The underlying elements must explore and exploit the advantages by all means and all kinds.

In *Strategy, 2nd rev. ed.*, (Liddle-Hart, 1991):, 334–337, the author explains that the Strategy must also include deception and misdirection tactics. One achieves the perfection of Strategy if one is capable of producing a decision without actually engaging in serious combat. Even if the goal was for a decisive battle, it must manifest only under the most disadvantageous circumstances, because the more advantageous the situation, the lesser the opportunity of going into battle. In modern language, this means deploying the military forces in a favorable dominant position on the battlefield (Liddle-Hart, 1991).

War and Deception

In *The Art of War for Security Managers, 1st Ed*, (Heinemann, 2007), Heinemann quotes Sun Tzu on war and deception. When far, appear near, if active, appear inactive. If the opponent has an advantage, entice them, if they are confused, take them. If they are substantial, prepare for them, and if they are strong, avoid them. If they are agitated, disturb them, if they are humble, make them disdainful. When relaxed, toil them; if united, separate them. Attack when they least expect. These deceptive tactics will lead to victory (Heinemann, 2007).

In *Strategy, 2nd rev. ed.*, (Liddle-Hart, 1991):, 334–337, Captain Little-Hart states that successful deception leads to surprise and disruption of the enemy because warfare is based on deception; hence our ability to attack must be clandestine in nature. When using forces, we must seem inactive; when we are near, we must appear farther. We must make the enemy believe that we are away, and when far away, we must make them think that we are near.

Charge and lure the enemy, and when they surface, overwhelm them (Liddle-Hart, 1991).

According to the above writings, the lesson imparted is that any means that provides unexpected access to the enemy's assets, line of resistance, defense strategy, and doctrine, becomes the most vulnerable point in the enemy's national security or defense edifice. In combat, the path of least resistance is the idea that the victorious always plan. They are hence guaranteed victory even before the battle begins. The reason being, the Strategy is executed so swiftly that the enemy is not expecting a sudden defeat because the unexpected route can be physical or psychological.

In *The Art of War Site on Modern Strategy and Leadership* (Staff, 2006), the author quotes Sun Tzu on the path of least resistance and emphasizes that the one who takes the path of least resistance deserves all the praise because he hardly steps into the battlefield. Sun Tzu, implies that the most laborious work, however, precedes the battle itself in the planning stage (Staff, Sun Tzu, the Art of War Site on Modern Strategy and Leadership, 2006).

Space as a Warfighting Domain

In *War in Space* (Dawson, 2018), the author states that to be capable and an active participant or sponsor for space travel, developing and launching rockets, spacecraft, or participating in any space-based activity is known as spacefaring. The Countries that can launch rockets powerful enough for space launches and those who have launched their satellites into orbit are called spacefaring countries. There are 14 different spacefaring countries capable of building and launching vehicles beyond Earth's orbit. They are United States, United Kingdom, Russia, Iran, North Korea, France, Canada, China, India, Japan, Israel, New Zealand, Ukraine, and South Korea (Dawson, 2018).

In *The Art of War*, Sun Tzu explains that War, as understood, is inevitable but must be faced by conceiving about winning and not persistence. In our everyday lives, the war is the constant battle against our ignorance against acquired habits, and all that separates us from our goals (Sun Tzu, Art of War, 5th Century BC).

The rising geopolitical tensions and increasing technological capabilities of many countries, some allies, and some adversaries, in the areas of nuclear weapons, intercontinental

ballistic missiles (ICBM), space weapon technologies, satellite systems in orbit, antisatellite missile systems and hypersonic missile systems developments are growing at an alarming rate.

Space warfare is bound to occur between any of the warring states if it becomes sufficiently essential for even one combatant state's national security or any other antagonist with the capacity to attack space-based assets. As mentioned in the above paragraphs, with the rapid emergence of spacefaring nations and their technological developments in Space, the likelihood of war has exponentially progressed. Since the United States Military is entirely dependent on its space systems and technologies, it is safe to say that this inevitability of war creates a critical interest to come to grips with considering the outer space as a conceivable theater of war.

In the book, *Space Wars: The First Six Hours of World War III*, (Coumatos, Scott, & Birnes, 2007), the authors state that there is a significant concern among the United States allies and trading partners is that history's next cataclysmic upheaval of empire is at hand, but only those who recognize the bigger picture can testify that the great clashes have already begun. Only a few of the world's intellectuals, statespeople, and military leaders comprehend the subtle implications of a few satellites and space-based assets that simply go silent in the cold negritude of space. In reality, these are the first shots already fired in space leading to a clash of civilization. Their echoes will slowly grow to tectonic proportions, with terrorism being just one of the several horrors the radicalized organizations employ to reshape the world into the model of the seventeenth-century Islamic caliphates model (Coumatos, Scott, & Birnes, 2007).

Space Warfare Theory

In *On War* (Clausewitz, 1832), Clausewitz explains that Every battle requires a strategy and a conceptual framework, and in the domain of space, a theory of space warfare must have a variety of purposes while also being formulated based on Clausewitz's principles. Firstly, the theory of space warfare must render a crystalline framework for judging the nature of bearing and an uncontested medium for battle. Secondly, it must have the strategic aptitude to determine the most effective and dynamic means for conducting combat in space.

Sequentially, it must be capable of executing predictive intelligence, pattern-based analysis, and maintain space domain awareness (SDA) of space-based systems, their optimized production levels, asset-based tactical roles, and stay reliable in the event of a conflict. Ultimately, it must preserve critical powers regardless of the adversary or the type of space-based threats.

The *Principles of War* (Clausewitz, 2003), provides a cornerstone for attention towards the formulation of the theory mentioned above. He says that the first supreme and visionary act of judgment is that the statesperson and the commander have to establish the kind of war on which they embark is neither mistaken or alien in nature. In the same way, the theory of space warfare must establish a doctrine in which the strategic aptitude must be practical and judicious. He also states that everything in war is straightforward, but sometimes achieving the simplest of things becomes extremely difficult. These difficulties are accumulated by producing friction and the inability to manage countless minor incidents that combine to the lowest level of performance that one always falls short of the intended goal. (Clausewitz, 2003).

At the time of this writing, there have been no space-based combat operations that have taken place that we are aware of; therefore, there is no straightforward technique to evaluate and validate a functional space warfare theory. However, an extensive database of literature is perpetually available on existing classic warfighting theories and strategies that could add a foundation to the development of an operational space warfare theory.

In *Pure Strategy: Power and principle in the space and information age* / Everett Carl Dolman (Dolman, E. C. 2011), the author emphasizes that just as how decisions cannot define a strategy, neither can meta decision-making. The promulgation of doctrine takes place at a higher level than on the battlefield while still concerned about the battle's outcomes. The operational level of war incorporates and classifies meta decisions from the tactical level and the application of the individual judgment. The doctrine assists tactical as well as operational decision-makers into making optimal elections based on non-exclusivity and circumstance, especially when the doctrinaire is inefficient than proving profitable. A doctrine allows a military leader to develop the best strategy, one which will ensure victory (Dolman, E. C.

2011).

Principles of Space Warfare and Space Policy Issues

There are numerous monographs published on the subject of space warfare theory and in which most of the literature epistolizes with warfighting strategists like Clausewitz and Sun Tzu. The following literature source highlights my personal experience in researching the theory of space warfare for a book I am co-authoring with a domain expert with 44 years of experience in Space Warfare.

The author's extensive experience in this exemplified space domain has allowed him to develop fundamental principles, rules, theories, strategies, and tactics by which he feels the next space war will be conducted. Most of his authored journals are available on Air University Press, and he also manages a Space Warfare think tank comprising military officials and strategic space planning leaders of many spacefaring countries. These strategies and tactics are based on unclassified analyses of past military history, and classical Military Principles of War, and Sun Tzu's Art of War, applicability to Space Warfare.

In the *Techniques for Great Power Space War* (Szymanski, 2019), the author states that Strategies and Principles are underlying determinants of ensuring victory in space warfare. Before a significant military conflict is initiated on Earth, a wise option would likely be positioning space assets at strategic locations in space that give one the maximum advantage. The goal is to enable surprise attacks while minimizing fuel requirements. Investing in Space Situational Awareness (SSA) networks, such as radar, optical, intelligence, reconnaissance, and surveillance can maximize tracking impending space attacks and minimize threats from the enemy.

He also provides 40 rules for conducting space warfare, and they are:

1. Dominating and survivable pre-conflict satellite positioning and onboard maneuvering fuel is of prime importance.
2. Perceptive SSA and predictive battlespace awareness will dominate any offensive space weapon capabilities.

3. A practical doctrine and a decisive political will are the most necessary to counter the antagonist's military actions in space.
4. The frequent and continuous movement of satellites closer and away from the opponent's space assets would create confusion, concealing your intentions and planning.
5. Unusual orbits increase the difficulty of the opponent's tracking capabilities since many of them lack worldwide space surveillance sensor coverage.
6. Pre-conflict positioning of space base assets is of most importance in strategizing space warfare.
7. Opponent's lack of the actual value of space due to awareness may allow the prioritization of targets and plans without wasting precious fuel.
8. Limited engagement with space weapons in small bursts, ceding time, and tempo will provide maximized advantages.
9. To win on the battlefield, one must fully understand the geopolitical, diplomatic, economic, and international implications of employing space weapon systems.
10. The newness of space warfare requires that a considerable amount of time be invested in the development of Space Warfare doctrine.
11. Developing pre-conflict plans and possessing varied phenomenology of space weapons to minimize casualties since the casualty rates are always high during the pre-conflict stage.
12. Establish the concept of "winning" to ensure an accurate conclusion of post-conflict reaction. By misunderstanding the notion of "winning" in space warfare, a country's military, political, diplomatic, commercial, procurement policies and the relevant thought processes could affect long term strategies and create a misconceived post-conflict reaction.

13. Avoidance and creation of space debris during the conflict to ensure minimal to no impact on space-based assets.
14. Prepare for political and international ramifications post-conflict.
15. Post-conflict reactions will allow adversaries to develop space weapon capabilities.
16. The Space Escalation Ladder will conceal the details of the conflict in space from the world populace allowing nations to use a conflict escalation to resolve issues and privately send determined political messages.
17. The offense is better than defense due to the closing speeds of hypervelocity of ASAT missiles and the radius of impact from space mines on space-assets that cost billions of dollars in development.
18. Without adequate Space Situational Awareness (SSA), sensor tracking controls, and political will, an adversary can get within the Observe, Orient, Decide, Act (OODA) command and control loops to consequentially shock and confuse you.
19. Small scale attacks can go unknown for some time, but Large scale attacks are initiated, executed, and completed within 24-48 hours.
20. Space surveillance assets cannot determine the true nature of space attacks because attacks can originate, implemented, and concluded within 48 hours, so it is best to attack first since it ensures maximum damage and assures the potential for victory.
21. Avoid integrating military and civilian capabilities on the same satellites to circumvent disruption of services to the populace and disclosure of space conflict that could create pressure on political leadership to take precipitous actions. The subtleties of poised and reasoned escalation control are lost.
22. Denial and disruption of satellite services to military forces or a civilian population is the goal of space conflict, but not merely the elimination of elite systems for the sake of scorekeeping or destruction.

23. A superior number of space forces does not guarantee a win under all circumstances. An adversary with a better doctrine, political will, positioning, and smaller forces can dominate the battlefield.
24. Equivocation and ambiguity can rapidly lead to failure in outer space warfare.
25. Possessing many believable satellite decoys, evading the enemy's space weapons and sensor systems, and constant maneuvering to avoid detection will secure dominance in the battlefield.
26. Public opinion limits military options.
27. Due to the limited spacefaring nations in possession of space weapons systems, allies will not significantly help in space conflicts.
28. In the first few hours of space conflict, many space treaties will be violated.
29. Satellites that relay data and commands to other satellites in remote orbits make them critical chokepoints and prime targets.
30. Nations that have more space systems used by the military have more systems to defend, and such countries must emphasize defense over offense in military planning. Technology developments must consider defensive over offensive controls and tactics. Target and neutralize the adversary's offensive space systems before they are implemented.
31. The inherent instability of offensive versus defensive measures in space warfare requires senior military and space leadership to enhance space surveillance and classification sensors with analogous automated assessment algorithms, particularly those that provide Predictive Battlespace Awareness (PBA).
32. Space weapons systems are untested in actual sustained combat and consist of real vulnerabilities and failure points.

33. Different cultures and military traditions of the adversary enable them to have a higher probability of detecting vulnerabilities and failure points in your space weapons systems.
34. You are always vulnerable, especially under stressful combat conditions.
35. Countries with the least meddling of politicians in military matters might be the decisive factor in winning the war but losing the peace afterward.
36. Space commanders are decisive and cold-hearted in their planning and execution because space warfare involves little to no human casualties.
37. An inexpensive space mine can inadvertently destroy a billion-dollar spacecraft because of its lightweight, inadequate armor protection and orbital hypervelocities.
38. The "fog of war" is a type of confusion well documented in traditional battlefields, but in space warfare, it is worse due to the tremendous distances and global nature of space.
39. The military cannot protect commercial satellite operators.
40. Operators trained to react to an emergency by a checklist of procedures can easily be spoofed and manipulated by a cunning adversary, especially in a disputed environment with denied or degraded communications to their headquarters.

Despite technology's pivotal role, nothing in the space environment itself invalidates the applicability of any of these principles of war to space doctrine. A synthesized space doctrine must acknowledge and accommodate the principles of space warfare.

Substituting Wargaming and Modeling for Experience

In *Space control and the role of antisatellite weapons* (Petersen, S. R. 1991), the author states that Wargaming can identify some likely characteristics of space warfare; however, these routines do not guarantee solutions to the practical problems of war, rather they illustrate the impact of various hypotheses and conclusions in space warfare. They highlight the topics and challenges that space warfare may pose. However, by using these methods, the United

States space commanders and strategic space planners can learn firsthand the benefits of managing and operating space-based assets while denying a similar capability to the adversary (Petersen, S. R. 1991).

Conclusion

The challenges to dissuade war in space are copious, and several perspectives of space warfare are no different from traditional wars. Space Situational Awareness (SSA) is essential for the United States in establishing dominance over its adversaries. China has conducted eight satellite destruction tests so far, and an antisatellite missile test in 2007 that created 3000 dangerous pieces of debris. Russia has also carried similar experiments with antisatellite missiles and the most recent one being in 2020. Russia continues to violate the Open Skies Treaty of January 2002. These are excellent case studies for orbital dangers and space debris traveling at more than 17,000 mph. Due to the emergence of such offensive and disruptive activities from Russia and China, the United States must continue developing its space strategy and doctrine, understand the competition, establish space security, expand scientific discovery and continue investing in space technologies to capitalize its approaches in preventing attacks on its space-based assets.

References

- Blount, P. (2018). Space Security Law. *Oxford Research Encyclopedia of Planetary Science*.
doi:10.1093/acrefore/9780190647926.013.73
- Chapman, B. (2008). *Space warfare and defense: A historical encyclopedia and research guide*.
Santa Barbara: ABC-CLIO.
- Chisholm, R. H. (1984). On Space Warfare: Military Strategy for Space Operations.
doi:10.21236/ada215911
- Coumatos, M. J., Scott, W. B., & Birnes, W. J. (2007, May). Space Wars: The First Six Hours
of World War III, a War ... Retrieved June 14, 2020, from
[https://www.airuniversity.af.edu/ASPJ/Book-Reviews/Article/1668156/space-wars-the-
first-six-hours-of-world-war-iii-a-war-game-scenario/](https://www.airuniversity.af.edu/ASPJ/Book-Reviews/Article/1668156/space-wars-the-first-six-hours-of-world-war-iii-a-war-game-scenario/)
- Creswell, J. W. (2016). *The Sage handbook of qualitative research*. Thousand Oaks, CA: Sage.
- Dolman, E. C. (2011). *Pure strategy: Power and principle in the space and information age /
Everett Carl Dolman*. London: Routledge, Taylor & Francis Group.
- The evolution of air and space power. (n.d.). *Understanding Modern Warfare*, 250-272.
doi:10.1017/cbo9781316460276.013
- Johnson-Freese, J. (2016). Space Warfare in the 21st Century. doi:10.4324/9781315529172
- Klein, J. J. (2004). Space Warfare: A Maritime-Inspired Space Strategy. *Astropolitics*, 2(1), 33-
61. doi:10.1080/14777620490444740
- Klein, J. J. (2014). *Space warfare: Strategy, principles and polity*. London: Routledge, Taylor &
Francis Group.
- Klein, J. J. (2019). Technology and space warfare. *Understanding Space Strategy*, 48-68.
doi:10.4324/9780429424724-3
- Loescher, M. S. (1992). Space and Electronic Warfare, A Navy Policy Paper on a New Warfare
Area. doi:10.21236/ada338983
- Logsdon, J. (2016). *John f. kennedy and the race to the moon*. Place of publication not

identified: Palgrave Macmillan.

- Lupton, & E, D. (n.d.). On Space Warfare: A Space Power Doctrine. Retrieved from <https://apps.dtic.mil/docs/citations/ADA421942>
- Lupton, D. E. (1988). *On space warfare: A space power doctrine*. Maxwell Air Force Base, Ala.: Air University Press.
- Macvey, J. W. (1985). *Space weapons, space war*. New York: Stein and Day.
- Mowthorpe, M. (2004). *The militarization and weaponization of space*. Lanham, MD: Lexington Books.
- Newberry, R. D. (1997, March). SPACE DOCTRINE FOR THE 21ST CENTURY - fas.org. Retrieved June 14, 2020, from <https://fas.org/spp/eprint/97-0427.pdf>
- Petersen, S. R. (1991, May). Space control and the role of antisatellite weapons ... Retrieved June 15, 2020, from <https://www.worldcat.org/title/space-control-and-the-role-of-antisatellite-weapons/oclc/39884919>
- Pickering, J. (1989). "Fighting talk!" Ilkeston: Moorley.
- Pike, J. (n.d.). Space. Retrieved from <https://www.globalsecurity.org/space/agency/swc.htm>
- Preston, B. (2002). *Space weapons: Earth wars*. Santa Monica, CA: Rand.
- Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. (2013). Erscheinungsort nicht ermittelbar: SAGE Publications.
- Sadeh, E. (2013). *Space strategy in the 21st century: Theory and policy*. London: Routledge.
- Sciutto, J. (2019). *The shadow war: Inside Russias and Chinas secret operations to defeat America*. New York, NY: Harper, An Imprint of HarperCollins.
- Seedhouse, E. (2010). Space warfare doctrine. *The New Space Race*, 51-77. doi:10.1007/978-1-4419-0880-3_3
- Space Warfare - YouTube. (n.d.). Retrieved from https://www.youtube.com/watch?v=xvs_f5MwT04
- SPACE WARFARE STRATEGY AND TACTICS. (n.d.). Retrieved from http://www.projectrho.com/public_html/rocket/spacewartactic.php
- Space Warfare. (n.d.). Retrieved from <https://www.rand.org/topics/space-warfare.html>

Space. (n.d.). *The SAGE Dictionary of Qualitative Management Research*.

doi:10.4135/9780857020109.n98

Sunzi, Tucker-Jones, A., & Giles, L. (2019). Sun Tzu's The art of war. London: Bloomsbury China.

Szymanski, P. (2019, Winter). Techniques for Great Power Space War. Retrieved June 14, 2020, from https://www.airuniversity.af.edu/Portals/10/SSQ/documents/Volume-13_Issue-4/Szymanski.pdf

Team, N. W. (n.d.). Space and Naval Warfare Systems Command. Retrieved from <https://www.navy.mil/local/spawar/>

Triezenberg, B. (2017). Deterring Space War: An Exploratory Analysis Incorporating Prospect Theory into a Game Theoretic Model of Space Warfare. doi:10.7249/rgsd400

Wheelon, A. D. (1986). Antisatellite Weapons and Space Warfare. *Annals of the New York Academy of Sciences*, 489(1 The High tech), 38-47. doi:10.1111/j.1749-6632.1986.tb52600.x

Wright, J. C. (2020). *Deep space warfare: Military strategy beyond orbit*. Jefferson, NC: McFarland & Company,.