How to Win the Next Space War – An Assessment

Paul S. Szymanski

***Abstract*—**The importance of outer space satellites and their supporting systems cannot be overstated. Their use in the civil and commercial world to provide communications, weather, navigation, timing and Earth resources monitoring provides major advantages to those who employ the information generated by these systems. However, due to the global reach of these space systems, advantages are provided to both friendly and adversary militaries. Beginning with the use of space systems to support military operations during the Arab-Israeli conflicts, and in Desert Storm, both major and minor players are considering how denial of space capabilities to their adversaries will be a force multiplier on terrestrial battlefields.

Based on the author's extensive experience in this theoretical area, he has developed essential "Rules" by which he feels the next space war will be conducted. These are based on his unclassified analyses of past military history, and of classical Military Principles of War [2] and Sun Tzu's Art of War [1] applicability to Space Warfare (see author's additional papers). Since a full-up space war has not yet occurred, all of these concepts are notional and unproven, much like air warfare doctrine was only theoretically understood prior to World War Two. Nonetheless, it is very important to better understand how a future space war might be conducted to ensure favorable outcomes for the more prepared country, and for better outcomes for the world, in general, post space conflict.

***Keywords*—**Outer space military warfare theory, outer space military doctrine, space policy, military space warfare, how to fight and win the next space war.

I. Introduction

The future of outer space warfare is rapidly approaching. There is significant buildup of space warfare capabilities by some major countries who rely on space systems for their defense or perceive that their potential adversaries depend too much on space capabilities to conduct terrestrial warfare. Because of the lack of significant experience by countries in this new military domain, it is difficult to fully understand what the best doctrine, strategies and tactics are to win the next space war. Based on the author's study of military history for the past 50 years, and his direct involvement with space warfare programs for the past 41 years, he has developed general rules by which the next space war will be conducted. These "Top 40 Rules" are an extrapolation of well-established Principles of War for terrestrial conflicts applied to the unique outer space environment where orbital dynamics restrict what is possible for Anti-Satellite (ASAT) weapon systems attack profiles.

Due to the large distances (tens of thousands of kilometers) between the Earth and military satellites, it is difficult to track and fully image these systems to assess their abilities as potential threats to national security. In addition, very few countries possess the world-wide space surveillance assets to track movements of suspicious space objects that may be maneuvering towards critical national assets. Even for those few countries that possess significant space sensor systems, it is very difficult to continuously track satellites that initiate their maneuvers in areas with no sensor coverage (such as Antarctica). A recent computer simulation by the author showed that 95% of possible space attacks could be completed within 24 hours, which is before any reactions on the ground can be contemplated, approved or completed. Thus, one of the conclusions of this "Top 40 Rules" study is that space warfare favors the offense. Another conclusion of this paper is that, due to the remoteness of space, countries that take actions against an adversary's satellites can do so under a cloud of secrecy, without the general population of the World becoming aware of these aggressive actions. Thus, space warfare adds new, and subtler rungs on the conflict escalation ladder, where countries can express intent and resolve to their adversaries without necessarily inducing terrestrial conflict.

II. Top 40 Rules to Fight and Win the Next Space War

1. ***First Top Principle of Space Warfare****:*
Dominating and Survivable Pre-Conflict Satellite Positioning and Extensive Satellite On-Board Maneuvering Fuel is of most importance.

2. ***Second Top Principle of Space Warfare:***
Perceptive Space Situational Awareness (SSA) and Predictive Battlespace Awareness (PBA) will dominate any offensive weapons capabilities.

3. ***Third Top Principle of Space Warfare:***
Effective Doctrine and Decisive Political Will is most necessary to counter adversary military actions in the space environment.

Top Rules for Outer Space Warfare:

4. *Maneuver:*
A satellite's ability to frequently conduct large, small or continuous maneuvers, especially just before and during a space conflict, might be the best capability to keep your adversaries guessing as to your space control intentions and planning, besides complicating his targeting solutions, especially when they may lack world-wide space surveillance sensor coverage.

5. *Unusual Orbits:*
Unusual orbits increase the difficulty of your adversaries to determine your intentions or target you quickly.

6. *Pre-Conflict Positioning:*
Since it is very difficult to change orbits at the last minute (especially changing orbital inclination), immediate space combat can only be fought with the current resources on hand in the local area. There will be no trans-conflict redistribution of space forces to help those forces under immediate attack. Thus, pre-conflict positioning of space assets is possibly the most important aspect of space strategies. This principle is related to the other fundamental

principle of maximizing high maneuvering abilities of space assets.

7. Value of Space:
Due to the newness of space warfare, your adversary probably does not fully understand the value of space both to himself, and to his adversaries. This complicates his ability to prioritize his targeting plans, and may contribute to him wasting precious maneuvering fuel and limited "shots" from space weapons, along with ceding time and tempo advantages to the other side.

8. Political Consequences:
Due to the newness of space warfare, our adversary and probably ourselves do not fully understand the political, diplomatic, economic and international ramifications of employing space weapon systems, especially post-conflict.

9. Effective Doctrine:
Due to the newness of space warfare, our adversary and probably ourselves do not fully understand the best theory, doctrine, strategies, tactics and techniques for conducting optimized space warfare. Big mistakes will be made by both sides.

10. Mistakes Will be Made:
Due to the newness of space warfare, most carefully laid plans, doctrines, strategies, tactics, techniques, political, technological and correlation of forces assumptions will prove false and be immediately thrown out (or worse, be so dearly held, they lead to immediate defeat). This rule equally applies to both sides of the conflict, unless one side is lucky enough to have gotten space doctrine slightly more correct than the opposing side.

11. Vary Space Weapon Types:
Due to the newness of space warfare, it might be best to possess different phenomenology space weapon systems with varied basing options to increase the chance you developed your pre-planning and space doctrine right for a type of conflict that has never occurred before. Remember, in all previous wars the first casualties are most, if not all, of the pre-conflict plans.

12. Define Winning:
The concept of "winning" in space warfare is not clearly defined. Its definition may be made by political leadership with limited technological, or military knowledge, and may be based on purely political, propagandistic or failed doctrinal principles. Your adversary will certainly have a very different definition of winning, which means both sides may perceive they have "won" the space conflict, and derive quite different conclusions that will dominate their military, political, diplomatic and economic (commercial and procurement strategies) thinking for decades to come. One's space strategies employed during the conflict should take this into consideration to place your nation into a favorable position, post-conflict.

13. Space Debris:
Creation of too much space debris during space conflicts may make losers out of all sides after the conflict, in the long term.

14. Future Political Impacts:
You may be assured that after the conduct of a major space war, national and international protocols, treaties, rules of conduct, and alliances will be radically changed for space. One's space strategies employed during the conflict should take these into consideration to place your nation into a favorable position, post-conflict.

15. Adversary Post-Conflict Reactions:
You may be assured that after the conduct of a major space war, your adversaries, and other nations, will learn from this war, and probably buildup their own space weapon capabilities, even if necessarily covertly. One's space strategies employed during the conflict should take these into consideration to place your nation into a favorable position, post-conflict.

16. Space Escalation Ladder:
Due to the remote nature of space systems, the world's populace may be kept in the dark (especially for low-level space conflicts) of what is truly happening, which provides addition, more subtle rungs, on the conflict escalation ladder, allowing nations to privately exhibit resolve and to send determined political messages.

17. Space Warfare Inherently Conflict Destabilizing:
Because a small, relatively inexpensive space mine can take out a large billion-dollar satellite critical to the conduct of your military operations, and actual satellite point defense is problematic due to probable ASAT hypervelocity closing speeds, then offense is better than defense in space warfare, making it inherently unstable for conflict escalation.

18. Quick Space Attacks Possible:
Due to the remote nature of satellites in space, small-scale space attacks may be initiated, executed and completed before the recipient even knows he is under attack, who is attacking, what are their attack strategies and goals (end states), and when can an uncomprehending senior political leadership validate the attack and respond in a military, political, diplomatic or economic manner. Large-scale space attacks may be initiated, executed and completed within 24-48 hours. Without adequate and timely Space Situational Awareness (SSA) and determined political will, an adversary can easily get within your Observe, Orient, Decide, Act (OODA) command and control loops for space, and shock and confuse them.

19. Space Exhibits Escalation Imbalances:
Due to the remote nature of satellites in space, and the difficulty for space surveillance assets to determine the true nature of space attacks, and because space attacks may be initiated, executed and completed within 24-48 hours, there

is a good chance that the side who initiates space attacks first will be the side that wins the space war.

20. Covertness and Surprise of Prime Importance:
Due to the remote nature of satellites in space, and the difficulty for space surveillance assets to determine the true nature of space attacks, and because space attacks may be initiated, executed and completed within 24-48 hours, covertness and surprise will significantly contribute to winning the space war.

21. Joint Military and Commercial Space Use:
Mixing military and commercial systems on the same satellites increases the chances of space conflict escalation due to the general populace immediately becoming aware of the effects of satellite loss, and placing pressure on political leadership to take precipitous actions. Thus, the nuances of steady and reasoned escalation control are lost.

22. Space Only Benefits Terrestrial Systems:
Space conflict is all about denying satellite support to military forces or civilian populations on Earth; not simply the elimination of satellite systems for destruction sake or as a space "score keeper."

23. Small Space Forces Can Beat Larger
As in many other conflicts past and present, having space forces that appear superior in numbers and technological quality on paper does not guarantee a "win" under all circumstances. There are many examples throughout thousands of years of military history of numerically inferior forces beating their "betters." Many times, it is the forces with better doctrine, planning, morale (political will) or positioning that win. This can only be truer for a new area of conflict in space that has little, if any, past military examples and experiences.

24. Decisive Political Will:
Having space forces that are superior in numbers and technological quality are useless if there is not the political will to fully and quickly use them. This principle may imply dictatorships are more at an advantage than democracies. Hesitation and uncertainty can rapidly lead to failure in outer space warfare.

25. Space Situational Awareness and Weapons Range:
It does not matter how plentiful or how brilliant your adversary space weapon systems are if they cannot find or reach your critical space systems. If you are constantly maneuvering so that he cannot find you, or your satellites are in hard to reach orbits, or have low observables, or you possess many believable satellite decoys, then he can never dominate you.

26. Public Opinion Will Limit Military Options:
Even though space wars entail very few, if any, human casualties, international public opinion values space wars as more politically unacceptable compared to terrestrial destruction and loss of human life from traditional warfare on Earth. In addition, space wars will fire the imaginations, good or bad, of your citizens, along with much of the rest of the World that is not actively participating in the conflict.

27. Allies Count Little Militarily for Space Wars:
Due to the limited number of countries with future space weapons systems and their attendant need for covertness along with international political sensitivities, each adversary will probably have to go it alone, and his allies cannot or will not significantly help him openly in the coming space conflict.

28. Space Treaties Will be Violated:
Most space treaties will be violated in the first few hours of the coming space war. International treaties have usually been violated in most previous major terrestrial conflicts, and due to the remoteness of space, treaties concerning the military use of space are easier to ignore, especially when the World populace may not even be aware of this ongoing space conflict.

29. Data Relay Satellites Are Prime Targets:
Possibly the most important space targets will be those satellites that relay data and commands directly to other satellites in remote orbits, making them choke points for critical space systems. This is particularly true for those countries without extensive world-wide satellite ground control stations.

30. Defense vs. Offense:
Those Nations that have more space systems being used by their military also have more space systems to defend, and probably must emphasize defense over offense in their technology developments and in their military planning. If your adversary has few space systems, then there are fewer targets for your offensive space weapons, and you must emphasize defense, unless you believe that you have perfect Space Situational Awareness, and you know all of your adversaries' and their allies' offensive space weapons and believe you can target and neutralize these early in the space conflict before he can fully implement his offensive space warfare plans.

31. Space Situational Awareness Is Prime:
Because of the inherent instability of offense vs. defense in space warfare, the most important tool for senior military and political space leaders is space surveillance and identification sensors with corresponding automated assessment algorithms, particularly those that provide Predictive Battlespace Awareness (PBA).

32. Space Warfare Systems Are Untested:
If your adversaries' space warfare systems are untested in real, sustained combat, then their true abilities against you are uncertain, and probably possess "cracks in their armor." Unfortunately, the same is probably true of your space warfare systems (whether you believe this or not), but the true vulnerabilities and failure points of both sides may not be obvious or believable. However, be assured, due to the new nature of space warfare, they do exist in plenitude.

33. Differing Cultures and Military Traditions:
Because your adversaries probably come from different cultures and military traditions than your own, then they

have a higher probability of detecting your space warfare systems non-obvious "cracks in their armor" than you do, and vice versa.

34. You Are Always Vulnerable:
As in all military matters since time immemorial, due to the cleverness of human beings, especially under stressful combat conditions, your adversaries will ultimately find your vulnerabilities and get through any defenses you may fool yourself into thinking are "invulnerable."

35. Decisive Commander:
For those countries at war with roughly equal space warfare forces, the main decisive factor would be which country may be lucky enough to discover and believe in the one decisive commander who is a genius in space warfare organization, doctrine, strategies and tactics. This is especially true for the non-traditional nature of space warfare. In addition, those countries with the least meddling in military matters by their politicians might be the decisive factor in winning the war (though possibly "loosing" the peace afterwards).

36. Little to No Human Casualties:
Because space warfare involves little to no human casualties, commanders can be particularly decisive and cold hearted in their planning and execution compared to terrestrial warfare. As Maj Gen Roger G. DeKok (deceased) has previously stated: "Satellites have no mothers." In addition, morale and courage on the battlefield is of less importance, though command decisiveness remains a critical factor.

37. Low-Cost Offensive Weapons:
Due to the hyper velocities of space orbits, one cannot adequately armor your spacecraft, and a small, relatively inexpensive space mine can take out a large billion-dollar satellite critical to the conduct of your military operations.

38. Space "Fog of War":
The potential for confusion known as the "Fog of War" is well documented for terrestrial battlefields - it will be even worse for space warfare due to the newness of this theater for conflict, the tremendous distances involved and the global nature of space.

39. Commercial Satellites Are on Their Own:
Commercial satellite operators whose expectations are that the military will protect their space systems during conflicts will have a rude awakening.

40. Checklist Vulnerability:
Operators who are trained to respond to unusual situations by "checklist" actions can be easily spoofed and manipulated by a clever adversary, especially in a contested environment with denied or degraded communications to higher headquarters (rule suggested by Paul Day).

III. Conclusion

The future of outer space warfare is upon us, but the theory, doctrine, strategies and tactics are uncertain. A quote from Leon Trotsky is appropriate here: "*You may not be interested in war … but war is interested in you.*" Whether you believe in outer space warfare, or are desperately trying to prevent it, conflicts in space will happen nevertheless, as space is way too important to remain a sanctuary while major military conflicts are raging on Earth. Space remains way too important to the ultimate outcome of the terrestrial battlefield and may indeed cause fewer casualties than extended conflicts on the ground.

Most importantly, before any major military conflict is initiated on the Earth, a smart adversary would position his space assets at key jumping-off points in space to better enable surprise attacks. If countries invest in Space Situational Awareness (SSA) sensor networks (RADAR and optical) on the ground and in space, then they can be pre-warned of impending space attacks, and then are presented with the opportunity to confront the adversary at the United Nations, and possibly prevent the ensuing terrestrial conflict.

I will leave you now with two more quotes:

1. General George S. Patton: "*If everyone is thinking alike, then somebody isn't thinking*;"
2. General Hugh Trenchard: "*The great captains are those who think out new methods and then put them into execution. Anybody can always use the old method*."

Acknowledgment

I would like to acknowledge the great military thinkers of the last few thousand years, from ancient Greek and Roman generals, to ancient Chinese military philosophers such as Sun Tzu [1], [2], for their continuing philosophies that inspired me to translate these concepts into theories and doctrine impacting present and future outer space warfare.

References

[1] Sun Tzu, "The Art of War," Holden-Crowther Organisation for Asian Studies, Filiquariam Publishing LLC, 2006, ISBN-13: 978-1599869773.
[2] Carl von Clausewitz, "Principles of War," New York: Dover Publications Inc., 2003, ISBN-13: 978-0486427997.

Paul S. Szymanski (B.S. Physics, Mathematics & Logic '73 – M.S. Experimental Physics, '74) has been conducting military operations research analyses for 45 years for the United States Air Force, Navy, Army and Marines. The last 42 years have been exclusively in outer space program analysis, management and development of space warfare theory, policy, doctrine, strategies, tactics and techniques. He has worked with the Air Staff at the Pentagon (Secretary of the Air Force), the Space and Missiles Systems Center (SMC) in Los Angeles, and the Air Force Research Labs (AFRL) in Albuquerque, New Mexico, along with experience in operational field testing of missile systems at China Lake, California.
He currently manages a private discussion group consisting of 10,956 hand-picked members of LinkedIn interested in outer space warfare whose members consist of: 744 General officers and Admirals, 51 current and former Under/Assistant Secretaries of Defense (including one former Secretary of Defense), 164 from the Joint Chiefs of Staff (including the current and one former Chairman of the Joint Chiefs of Staff) past and current Commanders of the 4th, 6th, Pacific, and Korea Naval fleets, 357 Congressional House & Senate staffers, 70 diplomats, 156 from the White House and National Security Council staffs, and 25 astronauts, among others.