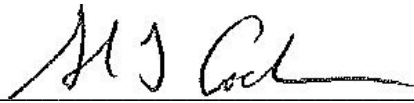


SAASS 665 - Space Power

Syllabus
2019



Course Director: Dr. Derrick Frazier

Syllabus Approved: 
Col Shawn T. Cochran, USAF
Commandant and Dean
School of Advanced Air and Space Studies

Date: 12 FEB 19

SAASS 665 - Space Power

Course Objectives: In this course we examine the history of the space domain and the use of space in the context of the national interest, national security, and the conduct of warfare. Integral to this process is the development of critical thinking on the utility of the space domain to further overall US strategic goals. By the end of this course, students should be able to effectively assess the opportunities and challenges for the US and international community presented by the overall growth in the space domain. Such opportunities and challenges include discussions regarding effective space strategies and policies, the development of theories of space power, the role of commercial interests, the importance of space situational awareness, and the securitization/weaponization of space assets to optimize states' power.

Overview: SAASS 665 is a graduate-level course on strategy, with space power as the context. A contextual overview of the Space Race during the Cold War provides the background for understanding the beginnings of the US entry into the space domain. From there we examine theoretical perspectives on space power, ranging from international cooperation to geopolitical realism. The course continues with an examination of commercial space and the interplay between the commercial and military space sectors. During this period, we will conduct a field study that provides direct engagement with commercial and military space actors. Upon our return, we continue the course with a discussion of US space policy and strategy, taking what we have learned to effectively critique current approaches by identifying strengths and weaknesses and their implications for the future of US space. Finally, we also evaluate current concerns about the nature of war in or through the space domain and whether or not such concerns require changes in the way we craft strategy.

A broad topical and political perspective is necessary as there is little consensus on the future direction of US efforts in military space operations. Going beyond an assessment of the premises and assumptions inherent in the current debate—the degree to which space dominance is critical to the nation's military future—we will engage with the primary viewpoints associated with space strategy, policy, and organization. Accordingly, readings illuminate contemporary issues, and seminar discussions will focus on the broader questions of space security and application. As you undertake the readings and engage in discussions, try to evaluate how the various thematic strands of the course fit into the broader conceptual frameworks for analyzing air, space, and cyber power that have emerged from your previous SAASS courses.

Today's complex international political and military environment, combined with extraordinary technological advances converge to make the air and space dimensions two of the dominant means of achieving US strategic and military goals. As the Air Force continues to press forward in the development of technologies necessary to control and project power in, through, and from space, it is more important than ever for strategists to gain an appreciation for the complexity of space operations and the interplay between space and the broader commercial, international, and political context.

Grading – Your final grade will be based on seminar participation and two short essay assignments. Seminar participation is weighted at 40% of your final grade. The two essays each account for 30% of your final grade.

Participation - Our assessment of your performance in seminar is rated heavily toward quality over quantity. If you are in doubt as to how you measure up in seminar participation, speak with your professor.

Essays – You will be required to write two response essays that address various problems and issues in the exploitation of the space domain. Each essay should be no more than three pages, written in Times New Roman, 12-point font, with one inch margins on all sides. Either footnotes or endnotes are allowed and do not count against the page limit, but they should consist primarily of references and not include substantial explanatory text. **Each essay is due to your professor by 1600L on the specified due date.**

Essay 1 - Due 1 March; Prompt released on 25 February

Essay 2 - Due 12 March; Prompt released on 8 March

Faculty – There are three instructors for this course. If you need anything, feel free to reach out to any of us for assistance.

Dr. Derrick Frazier, Course Director.
Col Kristi Lowenthal
Col Stephanie Kelley

Readings – The following list of books are used for the course. In addition, articles are assigned on select days. The articles are listed in full citation form on the day they are assigned. They can be located on the SAASS O: drive in the Class XXVIII file folder (under “SAASS Students”) or downloaded from the MSFRIC databases.

Brzezinski, Matthew. *Red Moon Rising: Sputnik and the Hidden Rivalries that Ignited the Space Age*. New York: Holt, 2008.

Davenport, Christopher. *The Space Barons: Elon Musk, Jeff Bezos and the Quest to Colonize the Cosmos*. New York: Public Affairs, 2018.

Dolman, Everett C. 2002. *Astropolitik. Classical Geopolitics in the Space Age*. London: Frank Cass, 2002.

Easton, Richard D. and Eric F. Frazier. *GPS Declassified*. Lincoln: University of Nebraska Press, 2013.

Johnson-Freese, Joan. *Space Warfare in the 21st Century. Arming the Heavens*. New York: Routledge, 2017.

Klein, John J. *Space Warfare. Strategy, Principles and Policy*. New York: Routledge, 2006.

Solomone, Stacey. *China's Strategy in Space*. New York: Springer, 2013.

Reference Readings

Reference materials are also included on the O: drive for additional background. They include primary documents and other literature such as the physics of space and current US space operations doctrine. You may find them useful to have handy or to refer to as you are reading the other course materials.

Field Study – This year's course includes a field study to the Space Coast area of Florida (Cape Canaveral, Merritt Island and Patrick AFB) from 3-6 March. During this trip we will visit the Air Force Technical Applications Center (AFTAC), the 45th Space Wing, United Launch Alliance (ULA), Blue Origin, SpaceX, OneWeb, and the Kennedy Space Center, plus a tour of Cape Canaveral historic space sites. The purpose of the visit is to familiarize you with the various facets of the space domain that feed into the development of strategy and policy. Additionally, the trip will provide a good perspective on the historical development of space while offering a glimpse into what the future holds. During the trip we will cover the 4/5 March readings below.



Course Calendar

<u>Date</u>	<u>Lesson Title</u>
25 Feb	Space Rivalry I: US vs USSR
26 Feb	Importance of the Space Domain
28 Feb	Space Theory I: Cooperation and Sanctuary
1 Mar	Space Theory II: High Ground and Dominance
3 Mar	Travel Day for Field Study
4 Mar	Commercial Space I: The Private Race to Space
5 Mar	Commercial Space II: State vs Private Enterprise
6 Mar	Travel Day Return from Field Study
7 Mar	Space Theory III: Domain Analogies
8 Mar	US Strategy and Policy
11 Mar	Space Rivalry II: US vs China
12 Mar	Space Warfare

Seminar Schedule

1. Getting into Space: Space Rivalry I

25 February



Readings (2)

Matthew Brzezinski, *Red Moon Rising*

United Nations, *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies* (aka The Outer Space Treaty)

The impact of the Cold War legacy on space cannot be understated. Brzezinski's book offers a perspective on the historical development of the space domain that centers on Soviet struggles to seek security from the US immediately after WWII. While other works cover the importance of the USSR/US rivalry on space, the American story tends to receive more attention; Brzezinski's work provides a refreshing approach in this regard. Additionally, the author demonstrates how both nation-state rivalry and rivalries within each state drive behavior. As it relates to your development as a strategist, the insight gained from this different vantage point should pay dividends as we later speculate about other nations' capabilities, intentions, as well as the influence of individuals.

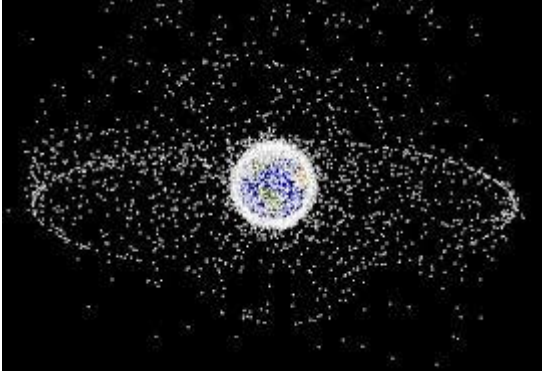
In reading *Red Moon Rising*, consider the following questions. What methods did the Soviets employ to overcome technical difficulties? How did those methods differ from those in the US? How did the Soviet Union's centrally planned economy hinder or aid development of advanced technology? How did the space race evolve from the more important issue of ICBM development? What can or should we learn from this evolution? Why was the interpretation of the utility of space so different across individuals within the US government? Why did the AF downplay the importance of missiles over manned bombing? What were the implications of this position for the development of US capabilities at the outset of the Cold War? What ethical dilemmas or cultural barriers constrained von Braun and his team of scientists? Do you see any of this story in the current environment as it pertains to the US and China? If so, what are the lessons to be learned?

Finally, out of the Cold War space race comes efforts to provide a framework for international cooperation in space. The Outer Space Treaty is often viewed as the foundational element of these efforts. Consider the treaty as a document and guide

for behavior. What is prohibited? What is not? How much ambiguity exists in the Treaty? What are the implications of this ambiguity for future cooperation on space issues?

2. The Importance of the Space Domain

26 February



Readings (2)

Richard D. Easton and Eric F. Frazier, *GPS Declassified*

National Air and Space Intelligence Center, *Competing in Space*

The ubiquitous nature of the Global Positioning System (GPS) often leads most people to take the concept of positioning, navigation and timing (PNT) for granted. Most people do not know how this system works and why it is integral to everything from “smartphones to smart bombs” as Easton and Frazier put forth. The case of GPS is interesting for lots of reasons and understanding its development will allow us to discuss some of them. Consider the global utility of GPS for commerce. How has this system revolutionized the way people do business? What does the history and development of GPS tell us about the relationship between the military and public sectors? Why would other states be interested in developing their own PNT systems if GPS is free and accessible to all? What would happen if we lost our ability to rely on GPS? Easton and Frazier set the stage for thinking about the importance of space through the utility of PNT. While in and of itself PNT makes space very important for everyone, consider how the advent of GPS has enabled a new generation of thinkers and innovators to utilize space in ways that are both positive and negative for security and prosperity.

The NASIC piece provides insight into the different ways space is being utilized today. As a brief primer on space capabilities and uses, NASIC’s information should offer a sense of what the current space domain looks like and even a little insight into what all the fuss is about with respect to space as “congested, contested and competitive.” How does the NASIC assessment comport with your current understanding of what’s taking place? This piece will help reconcile the differences.

3. Space Theory I: Cooperation and Sanctuary

28 February



Readings (5)

Steer, Cassandra. "Global Commons, Cosmic Commons. Implications of Military and Security Uses of Outer Space." *Georgetown Journal of International Affairs* 18, no. 1(2017): 1-9.

Van Ness, Peter. "The Time has Come for a Treaty to Ban Weapons in Space." *Asian Perspective* 34, no. 3 (2010): 215-225.

Herbert, Karl D. "Regulation of Space Weapons: Ensuring Stability and Continued Use of Outer Space." *Astropolitics* 12, no. 1 (2014): 1-26.

Grego, Laura. "Security in Space: What is at Stake and How do We Move Forward?" *Asian Perspective* 35 (2011): 503-520.

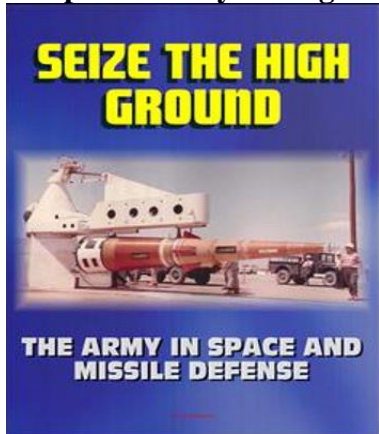
European Union. International Code of Conduct for Outer Space Activities (Draft), 2014.

In this class, we return to the consideration of space in terms of cooperation and the concept of sanctuary. Steer's piece points to the need for a return to space as a global commons. What argument does she put forth as to why this is important? How does militarization affect the idea of space as a sanctuary? Van Ness and Herbert argue that arms regulation or bans are essential to keeping space free for use. In what context are their arguments likely to have merit? Why might it be too late to prevent arms races and more overt militarization in space?

Grego points to significant implications for all spacefaring nations if there are not more robust legal and normative regimes to keep up with space activity. Is there enough room for militarization, commercialization and exploration without a stronger regulatory presence in the space domain? How so? What should nations prioritize if not? To what sorts of behaviors do states need to adhere in order to maintain stability in space? How does the proposed draft code of conduct by the European Union bring us closer to stability and sanctuary in space? What will it take to get larger spacefaring nations to buy in to such a code?

4. Space Theory II: High Ground and Dominance

1 March



Essay 1 Due

Readings (2)

Everett Dolman, *Astropolitik*

Harter, Mark E. "Ten Propositions Regarding Space Power: The Dawn of a Space Force." *Air Power and Space Journal* 20, no. 2 (2006): 64-78.

Dolman's argument follows a geopolitical realist logic that implies a rather particular approach for the US in its space behavior. Does Dolman describe a world that is consistent with your own evaluation? Is Dolman's basic argument valid across domains? Given what you know about the weaknesses of realism, what concerns should one have about pursuing a more offensively oriented approach in space? Is that a fair categorization? Finally, while Dolman's argument has gathered much attention from space professionals, is such an approach even possible at this point with respect to engaging other space powers? If not, what intellectual mileage do we get out of thinking about space as the "high ground" when it comes to peer competitors?

Competition for the high ground often serves as the basis of the argument for developing a space force. Harter's piece points to the fact that this discussion is far from new. What does he have to offer as it relates to understanding what space power brings to a nation's overall capabilities? How do his "propositions" get us to a conclusion that a separate space force is inevitable? Think through Harter's arguments here as we will return to the notion of a space force later in the course in terms of implications. For now, think about the potential relationship between the idea of a "space force" and the importance for many regarding the notion of seizing the high ground. How does Harter bring these ideas together?

Space Field Study 3 – 6 March

5. Commercial Space

4 March



Reading (1)

Christopher Davenport, *The Space Barons*

It is unlikely the government ever will be in the business of launching Teslas into space but such actions represent the type of thinking and creativity that Elon Musk and Jeff Bezos believe are essential for the US to be a successful space power. This success, however, goes beyond thinking of objects orbiting the earth. As Davenport articulates, the goal is to build a space enterprise capable of moving humans beyond the confines of earth. Quite a few questions immediately come to mind when considering these space pioneers. What types of character traits are necessary for enterprising individuals or organizations to break barriers in the space domain? Consider not only the billionaires but early space pioneers like von Braun and Korolev. From the perspective of military space, can the DoD develop such individuals from within or will the future of US military space require the private sector to be successful? If yes, how does the US compare with other states in this regard? Is it better to create an environment for these types of entrepreneurs to succeed and take risks compared to a more structured governmental approach? What does such an answer suggest regarding how the US navigates the relationship between commercial and military space compared to other states? How might this relationship provide some comfort with respect to the US maintaining its advantage in space? Finally, what about conflicts of interest between military space and commercialization? What might they look like and how might we effectively address them?

6. Commercial Space II

5 March



Readings (2)

FAA 2018 Annual Compendium of Commercial Space Transportation, pp. 1-49

Newlove-Eriksson, Lindy and Johan Eriksson. "Governance Beyond the Global: Who Controls the Extraterrestrial?" *Globalizations* 10 no. 2 (2013): 277-292.

Touring commercial space entities leads us to the issues of launch capabilities and the future of governance in space. The FAA compendium provides a nice overview of the current state of global launch capabilities and the types of equipment used. This document should prove useful in putting into context the rockets you will observe on the space launch complexes (SLCs) during our field study to the Space Coast. You may see SpaceX's Falcon-9 on the pad, in addition to ULA's Atlas V. Consider the different platforms available and how together they could bring down the cost of launch. Add to this the use of mass-produced small satellites, like those we will discuss at OneWeb, and you begin to get a sense of a new chapter beginning in the space domain. What does this chapter look like? How does the addition of new actors complicate the future of space?

Newlove-Eriksson and Eriksson begin to address this question, pushing us to consider how the governance of space will likely change over the next generation of space launch and satellite capabilities. What implications might this have for thinking about strategy? Again, the issue of private versus public roles returns. How does a strategist consider the role of private industry when thinking about security matters in the space domain? Are the types of questions and answers similar to other domains or are they remarkably different? What about accountability and responsibilities? How are these identified and enforced?

7. Space Theory III: Domain Analogies

7 March



Readings (2)

John Klein, *Space Warfare*

Mendenhall, Elizabeth. "Treating Outer Space Like a Place: A Case for Rejecting Other Domain Analogies." *Astropolitics* 16, no. 2 (2018): 97-118.

One aspect of space power theorizing includes how we think about the abstract domain of space. One common approach is comparing space to other domains. Klein's book represents one of the most developed efforts, making the analogy between sea and space. In reading this, consider the logic of his argument in a general sense but also with respect to how the analogy then lends itself to various policy prescriptions. What do we miss by treating space in this way? What benefits do we get by borrowing from thoughts employed in other domains? How weary should we be regarding analogies?

Mendenhall suggests such approaches are fraught with problems. Why is space different than the other domains? Without analogy, how does one develop a theory of space power, along with a subsequent way of preparing to fight in the domain? How do these opposing viewpoints inform the apparent difficulty the space community is having with respect to thinking about the domain from a warfighting perspective?

9. US Space Strategy and Policy

8 March



Readings (5)

US National Space Policy (2010) (NSP)

US National Security Space Strategy (2018) (NSSS) Fact Sheet

Loverro, Douglas. “Why the United States needs a Space Force.” Space News, June 25, 2018. <https://spacenews.com/why-the-united-states-needs-a-space-force/>

Colby, Elbridge. *From Sanctuary to Battlefield: A Framework for a U.S. Defense and Deterrence Strategy for Space*. Washington, DC: Center for a New American Security, 2016, pp. 1-39.

Hitchens, Theresa and Joan Johnson-Freese. *Toward a New National Security Space Strategy. Time for a Strategic Rebalancing*. Washington, DC: Atlantic Council Strategy 5 (2016).

As we head toward the end of the course, we finally turn our attention directly toward US space strategy and policy. We saved this discussion until now to allow you to bring into the debate the various aspects of space that we have previously covered. In essence, knowing current US space strategy and policy is one thing, being able to critique it is, however, another. This latter goal is what we are seeking to attain in this seminar.

The 2010 NSP from the Obama Administration is still in effect despite a new NSSS released in 2018 by the Trump Administration. While the Space Strategy in its entirety is classified, there are insights we can gain by looking at the fact sheet in comparison to current policy. How do they mesh together? Given what the strategy suggests, how might a new space policy be affected? What seems to be the relationship between space strategy and space policy at the national level? Given what you observed on the field study, is there anything missing? One possibility, at least for the Trump Administration, is a Space Force. Loverro’s article puts forth some of the reasons mentioned by many with regard to why a Space Force makes sense. Do you agree with his logic? What assumptions have been omitted? How does this compare to Herbert’s earlier claims?

With the evolution of the space domain and the changing nature of challenges, Colby’s article has us consider approaches for dealing with challenges and threats

to US space architecture. What is his basic argument? What assumptions does he make? How feasible are his recommendations? How does the code of conduct he puts forth compare to the EU proposal? What are the strategic implications of following his recommendations from the standpoint of other actors?

Finally, Hitchens and Johnson-Freese offer an argument that the US needs to change policy and strategic direction to better maintain advantages in the space domain. How does their “proactive prevention” differ from current US approaches to space? In what ways does this strategy utilize a more “whole of government” approach to succeeding in space? What limitations exist with this approach?

10. Space Rivalry II – China

11 March



Readings (3)

Stacey Solomone, *China's Strategy in Space*

Zhang, Baohui. “The Security Dilemma in the U.S.-China Military Space Relationship.” *Asian Survey* 51, no. 2 (2011): 311-332.

Reddy, Vidya. “U.S.-China Space Cooperation: Balancing Act between the U.S. Congress and President.” *Astropolitics* 15, no. 3 (2017): 235-250.

Competition in the space domain begins with Russia but ends with China. For some, China's activities in space represent unique threats to US security. Others view China's behavior as one part of a larger competition for global influence. In any case, it is difficult to argue that the US and China are not at a crossroads with respect to determining the future of space for the global community. As a strategist, part of understanding what the US faces in space vis-à-vis China requires an assessment of what China's activities mean in the context of the larger relationship with the US. Also, it means trying to determine just how to manage expectations and intentions when it comes to both the American and Chinese use of space for military purposes. Solomone's book brings us insight into the Chinese strategy for space and resonates with Hitchens and Johnson-Freese's appeal to understand a competitor's goal in space as a part of one's own strategy

building. This approach is in lieu of simply planning based on capabilities. What sorts of insights does Solomone bring to our attention that you think are missing from current US perspectives of China? What dissonance, if any, exists that may require Americans to reconsider what we think we know of China's intentions in the space domain? How might we be projecting a bit of our own biases and way of thinking as it relates to understanding China's space strategy?

How does Zhang's article fit into this discussion? How would you describe the security dilemma that exists between the US and China in space? What factors are most important in trying to alleviate the security dilemma? Which power is more at a disadvantage as it relates to the perceived dilemma? If viewed from the Chinese perspective, could the US take actions to help address China's security concerns while still maintaining its own security? What are the prospects for arms control?

Finally, one way of alleviating the security dilemma is for nations to cooperate. Reddy's article illustrates the difficulty of doing so with China and how from a policy making perspective, the sharing of powers between Congress and the Executive are likely to make cooperation difficult in the short term. From the perspective of the US Air Force or even a new Space Force, would there be any benefits of fostering cooperation with China in space? In what areas might that work? Reflecting back on the discussion of commercial space, might this be a possible area of cooperation that could alleviate the security dilemma? How so or why not? In thinking through such problems, do not focus solely on what China "needs" to do but also what the US can do to facilitate better relations in space interactions.

11. Space Warfare

12 March



Essay 2 Due

Readings (2):

Handberg, Roger. "Is Space War Imminent? Exploring the Possibility." *Comparative Strategy* 36, no. 5 (2017): 413-425.

Joan Johnson-Freese, *Space Warfare in the 21st Century*

Despite the knowledge that conflict in space would be very damaging for all parties, states with important capabilities on orbit are forced to think about how to defend them and in turn how to negate those of potential adversaries. Handberg explores the likelihood of space war in the current era, arguing that a lot has changed since the early pursuits of the US and USSR in “arming the heavens.” Today, there are multiple players in the space domain, making the ability to effectively strategize military space operations very difficult. With increasing technological capabilities, the current environment offers unprecedented challenges in anticipating the behaviors of any one actor seeking to counter the actions of others. How do these factors create conditions for conflict? How might multiple actors alleviate the possibility for conflict? What does Handberg offer to our understanding of what conflict in space might involve and why it might start?

We end with Johnson-Freese’s book that articulates a very clear perspective on what US policy has been building toward and the theoretical foundations upon which it is built. As you will note, she considers the current approaches to strategy and policy rather flawed, particularly as they relate to easing the possibility of conflict. How does her argument hold up under the evidence she provides? How would you compare and contrast her perspective with others we have read thus far, like Dolman? Considering her discussion of the historical development of US space strategy and policy, if she is right, when could the US have altered its path? Is it too late to significantly change direction? Where should the US go from here in the development of its next Space Strategy and Space Policy? While this will likely lead to echoes of our discussion of policy and strategy from an earlier seminar, consider US policy in the broader arc of theory, strategy and policy. How does everything tie together? What are the prospects for US security in the future of the space domain? How much do strategists gain in discussing space warfare without the larger context of what is happening back on earth? What might this mean for you?



The End