ATTACHMENT I

PROPOSED ACADEMIC EDUCATION AND TRAINING TOPICS
FOR USSPACECOM

Below is a list of proposed research topics collected from USSPACECOM JDIRs. These topics require original, specialized, and deep academic research relevant to unclassified and potential other real-world considerations outside the purview of the student author, faculty, and PME institution submitting the research. Each topic relates to one or more of the following USSPACECOM Commander's key tasks: understanding our competition, building the command to compete and win, maintaining key relationships, maintaining digital superiority, and integrating commercial and interagency organizations.

The USSPACECOM JDIRs and senior leadership provided the following list of academic research topics. Research topics with multiple JDIR interested are indicated with an asterisk (*). Students may contact the SIG Director for information regarding the interested JDIR to gamer an understanding of available lenses; however, research also may indicate competing, paradoxical, or unrelated interests based on the context and characterization of each JDIR's needs and interests. In randomized order, the research topics for this project are:

1. Emergent Space Conflict Theory and Policy.* How should USSPACECOM prepare to fight a future space war? What changes are needed in existing Department of Defense policy, strategy, doctrine, theories, and organizational form/function?

2. The Trinity of Multi-Domain Conflict.* Explore the idea that future conflict may center on space, cyberspace, and special operations forces. How would this function? What changes are needed for U.S. and allied security organizations to shift to this context?

3. Space in the Age of Digital Superiority. USSCYBERCOM was the first Combatant Command that is entirely digital. Is USSPACECOM the first geographic-oriented Combatant Command that also must fight exclusively in a digital context? If so, are there unique considerations and functions for USSPACECOM that USSCYBERCOM does not require?

4. Command and Control (C2).* Historically, the AF Air Operations Center has been the primary program of record for AF C2 systems development and fielding. Working with JADOC, JTT, and other joint C2 software, these software packages have responded to the traditional requirements process. The Joint Force has pursued the same requirements to fielding approach and results have not resulted in improved multi-domain C2.

5. Strategic Design of USSPACECOM.* While well on its way to being stood up, the fluidity of organizational design of USSPACECOM offers a once-in-a-century opportunity. This study would examine if the U.S. is making the most of this unique era and would propose organizational changes both subtle and radical to improve effectiveness of space warfighting.

6. Adapting to Advanced Missile Warning Threats.* Because the changes and adaptability of new adversary threats, our detection, tracking and display systems/capabilities (satellites, radars, and common operating picture [COP]) must be able to address our adversaries' abilities.

7. First Strike Instability in Space and Escalation Control.* Because of First Strike instability, there is a pressure to escalate to kinetic activity in the space domain during the competition-conflict transition. Current escalation frameworks do not account for the space domain instability in the broader geopolitical context.

8. The Role of Novel Orbits in Generation-after-Next Generation Warfighting.* U.S. military systems have been largely confined to operating in Low Earth and Geosynchronous Orbits. This study would examine how a range of alternative orbits (including Cislunar and heliocentric) might influence the provision of space services and space control both positively and negatively.

9. Hostile Intent and Hostile Act.* How lessons from other domains can inform determining hostile intent and hostile act for space engagements. Examine how hostile intent is determined for other domains and what systems and processes might be changed to improve the accuracy and timeliness of determining hostile intent for space operations.

10. Mega-Constellations.* The use of mega-constellations comprised of small satellites is on the rise, both commercially and internationally. These constellations impact the space area of operations and challenge our ability to maintain space domain awareness.

11. Proliferation of Commercial, Civil, and Military Space Systems.* Understand what it would mean to have 10,000, 100,000, or 1,000,000 satellites in orbit from a military perspective. Adch-ess considerations, including fog ofwar (e.g., how does Space Domain Awareness change), C2, autonomy, and impact to terrestrial services.

12. Responsive Space Architectural Changes to Improve Cost-Benefit. Examine how responsive space elements of an architecture might favorably compare with other resiliency options, particularly for augmentation and reconstitution. This study would compare responsive augmentation and reconstitution options to the baseline and more traditional alternatives.

13. The Road to Norms of Behavior for Space. How is space the same/different and can we get to stability faster than other domains? Examine how norms of behavior developed in other domains and how this information might aid in developing norms for space.

14. Alternative Futures for the Extraterrestrial Battlespace. Examine the future of space warfare through a lens of technology, policy, and evolving space applications. Alternative futures (e.g., mining the asteroids/moon, a competitor passes us, avenues of technological surprise, etc.) would be examined to see where the U.S. would find the most military advantages and disadvantages.

15. The Role of Space in Strategic Deterrence. The role of space in deterrence is emerging as a critical topic in the future development of a deterrence strategy for the United States. Examine the past, present, and future role of space in strategic deterrence and whether space can play a greater or unique role in strategic deterrence, increasing stability and security for the U.S. and the world.

16. Terrestrial Response Options for Space Aggressions.* Determine how to deter space aggressions using terrestrial actions. It is typically difficult to apply Diplomatic, Information, Military, and Economic (DIME) deterrence actions to transgressions in the space domain.

17. Space Deterrence Theory. Examine the similarities and differences for how aggression is deterred in other domains as compared with space. Key differences might be that there is rarely a direct loss oflife and greater difficulty collecting international interest in deterring space aggress10n.

18. The Global Proliferation of Position, Navigation, and Timing (PNT). Alternatives to GPS are proliferating, offering the U.S. and its adversaries new opportunities and challenges in the PNT battlespace of the future. This study would plumb the depths of how this proliferation of PNT affects the future of warfare.

19. Replacing GPS for U.S. PNT Requirements. Study alternatives to replacing GPS both technologically, sociologically, commercially, and militarily. Even if technology does not exist, extrapolate how "if' statements might impact dimensions of the PNT user community, particularly the military community.

20. Informational Silos from Classified Programs.* The rate of technological convergence and information availability has transformed the commercial industry. U.S. reliance on classification to provide strategic advantage has always been seen as a strength, but with rate of change increasing, it is possible that the silo-ing of information may prove a strategic disadvantage. This study will seek to expose disadvantages to slowing information flow caused by classification or other barriers.

21. Information Opportunities and Vulnerabilities for the Space Enterprise.* How the U.S. Space Enterprise (terrestrial and in-space) is vulnerable to open source, crowd-sourced, and easily observable information.

22. Critical Asset Analysis Tool.* Build a module for the USSPACECOM Critical Infrastructure Decision Support System (UCIDS) for unclassified and classified information using standard Microsoft Office Programs to enable USSPACECOM personnel to load, view, edit, print reports, etc. to manage all USSPACECOM critical assets. Tool needs to be able to identify/show shortfalls and deficiencies for Critical Mission Assets.

23. Chess in Space. Application and Evolution of Military Strategies to the Space and Joint Fight: Develop an appendix to the "Art of War" for space. Student may consider earlier published military research on 'Chess versus Go: American and Chinese Defense Philosophical Differences' and other metaphoric, game theory, cultural, and institutional differences as well.

24. Operationalizing Space Deterrence. What is an effective strategy for deterrence? How should the U.S. enable integrated deterrence in the space domain? How should space deterrence properly nest within national objectives, policy, and deterrence as a whole? What considerations are senior leaders not considering that would complement current trajectories?

25. Enabling Commercial Integration. How should the DoD adapt its business model to the rapid life cycle of innovation and emerging technology? Balancing capability, time, and control, how can the DoD mitigate bureaucratic impediments that delay modernization plans? How is space different from the terrestrial domains regarding commercial integration? How does the DoD go beyond material solutions in partnerships with the private sector to effectively leverage and strengthen the National Security Innovation Base?

26. Civil Enterprise Assumption of Space Situational Awareness. The transition for Space Situational Awareness to be monitored by civil entities is taking too long. What impact does that have on DoD members in cost and manpower? What are the major hurdles institutionally, .organizationally, legally, and internationally? What are the consequences if this takes too long
·· f& USSPACECOM, the DoD, and other stakeholders? How might this problem be resolved or a
· faster solution implemented outside of existing or traditional approaches?

27. The Future of Space Medicine in the DoD. With the stand-up ofUSSF and with USSPACECOM as the DoD Manager for Human Space Flight Support, the future of Space Medicine will significantly impact the DoD. How might the DoD further establish medical education and training to ensure medical professionals are prepared to support these missions? If the future includes DoD astronauts, should training and medical review be the responsibility of NASA or the DoD?