On Implementing a Space War-Fighting Construct

A Treatise on Applied Frameworks from Other Domains

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Space is a warfighting domain."[1] This statement, made by the president and the new commander of US Space Command (USSPACECOM) Gen John W. Raymond, is now unequivocally the position of the United States. This "war-fighting domain" implication drastically changes how the US military views and plans for conflict in space. At the national-strategic level, the US should recognize it is the nation with the most to lose in a space war. Perhaps more importantly: war in space is tied to war on Earth.[2] In a peer conflict, the US must always cast a wary eye toward escalation when warring with nuclear-armed states. As such, the US policy toward space conflict should be one of limited aims and defensively postured. The US should not seek war in space, but our adversaries should know that if pressed into battle, we intend to win. As the war-fighting major command responsible for the organization, training, and equipping of USAF Space Forces, Air Force Space Command (AFSPC) must build a war-fighting culture to employ space forces in pursuit of national objectives. To do so, AFSPC must craft new *strategy*, *doctrine*, and *tactics* that allow space operators to apply fundamental war-fighting concepts to the space domain while achieving US policy goals of winning a limited war in space.

On Space Strategy

For AFSPC, as a service component to USSPACECOM and the USAF's core functional lead for space, strategy can run the gambit from grand strategy to inform national policy, acquisitions strategies, talent management strategies, and finally operational strategies in support of war plans.[3] AFSPC needs strategies for

* Editor's note: This article was written before the signing of the FY2020 National Defense Authorization Act establishing the US Space Force (USSF) as the sixth branch of the Armed Forces. As such, references to Air Force Space Command and its associated major command functions will now need to be applied to the future USSF organizational structure currently being established.

each of these in turn. However, we shall focus on strategy linked to command of the domain. Within that context, a study of other domains' theorists can help shape our views.

At the core of a potential space strategy are the applicable truths identified by historical theorists. These truths stretch into recorded history, and on to the standard-bearers for any discussion on military strategy: Thucydides and Clausewitz. As the first history text states, nations act out of fear, honor, and interest and often react to a perceived security dilemma.[4] These actions can lead to open war to achieve geopolitical objectives.[5] Importantly, actions in space for the foreseeable future will be undertaken by Earth-bound nations with terrestrial concerns. These nations will be required to act in a physical "space," as Colin S. Gray and John B. Sheldon point out.[6] This space would be one that is unforgiving, difficult to reach, tough to refit/service, and minimally populated as of this writing. The physical properties of operating in the space domain result in national assets of fair cost, exquisite engineering, and high military value. What these points tell us is that conflict will likely follow humanity into orbit. Here nations will use counterspace capabilities to dissuade, coerce, or compel others to bend to their political will.[7] Conflict on-orbit will most often be done by remote, and under the ultimate Clausewitzian "fog of war," the vastness of dark space. Clausewitz also highlighted that while the *nature* of war never varies, its *character* often changes its tune. This adage holds true for orbital warfare too, where space forces will march to the melody of Kepler, as well as Clausewitz.

What piece does AFSPC play here? Firstly, it must set out the objectives it wishes to achieve to meet US policy goals, then craft a strategy that accomplishes those objectives. I propose a space strategy that, at its core, is purposely restricted in scope, or as Clausewitz would say—a limited war strategy. The main objective should be to protect and defend US and Allied interests in space. Secondary objectives should include (1) the ability to negate especially critical adversary space systems that place joint and coalition forces at extreme risk during terrestrial operations; (2) the ability to reconstitute or build resiliency into space architecture; and (3) to continue supporting the joint terrestrial force with war-winning, space-based enabling capabilities such as the Global Positioning System, missile warning, and satellite communications.

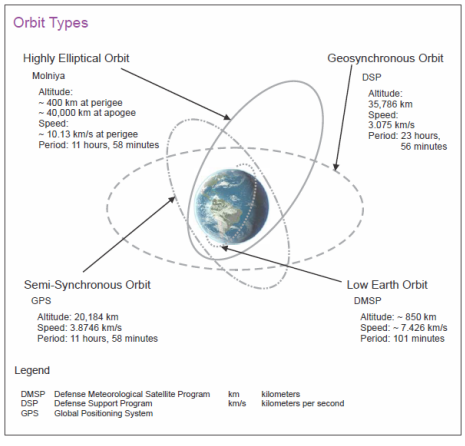
The US is the space-dependent nation when it comes to military operations. This imbalance in the need for space capabilities will likely not shift much in the next few decades, primarily because the US is the expeditionary power, not our rivals. AFSPC should protect and defend US, Allied, and where appropriate, commercial, and civil space systems that allow expeditionary forces to operate far from home. AFSPC's strategy should focus on deterrence by the denial of adversary

objectives, both in space and terrestrially. This deterrence can be enabled by both offensive and defensive capabilities, but their openly stated purpose should be to negate adversary counterspace systems. The Space Mitchells and Douhets—who clamor for offensive space supremacy—do so without the context of today's reality.

Two significant points undercut the rationality of the large-scale destruction of adversary space capabilities. First, in all likelihood, any large-scale space conflict the US would find itself embroiled in with space systems under dire threat would be set with nuclear-armed opponents. Thus, both sides are incentivized to limit escalation and miscalculation as outlined by earlier nuclear-war theorists like Bernard Brodie.[8] The wholesale destruction of space early-warning systems, dual-use nuclear command and control (C2), or the fielding of persistent on-orbit precision strike capabilities could run the risk of tripping nuclear red lines. Second, likely hotspots such as the Baltic States, the South and East China Seas, Straits of Malacca, and North Korea are all within our adversary's regional spheres of influence. Therefore, they can augment most space-based capabilities with local terrestrial equivalents like high-altitude long-endurance drones, pseudolites for position, navigation, and timing (PNT), terrestrial radios, fiber lines, or commercial intelligence, surveillance, and reconnaissance (ISR) capabilities. Today's advocates for offensive space supremacy are likely guilty of mirroring US requirements for space capabilities to our potential adversaries. We ought not to fall victim to the oft-warned trap. A strategy of the limited objective to protect and defend our valuable space assets will focus attention on enabling a true deterrence-by-denial strategy. This strategy may convince a would-be space aggressor that the attack would likely not succeed and consequently choose not to execute it. With a limited war objective established, where then to place assets or invest in capabilities?

Here, AFSPC should strive to embody the teachings of Corbett and, with a caveat, the contemporary writings of Dr. Everett C. Dolman.[9] Strategic lines of communication (LOC), specific orbital regimes, and LaGrange points will become the equivalent of the Straits of Malacca or Gibraltar. Albeit, these nodes and LOCs are spread over an incredibly vast region of space. Thus, Corbett's idea of fast, relatively cheap, and plentiful cruisers to defend critical assets and space LOCs holds more weight than historical maritime strategist Adm Alfred Thayer Mahan's quest for heavy battleships engaged in decisive battle.[10] As John Klein points out in his work *Corbett in Orbit*, "cruisers" in a space context may be an even more fiscally conservative than Corbett's initial work. Here, "cruisers" are best characterized as small, maneuverable satellites able to escort high-value systems cheaply and in-depth.[11] Additionally, these conceptual systems could defend vital orbital regimes or points in space, such as Molynia orbits, certain sections of the geosynchronous belt, cislunar and lunar orbits, and earth-moon LaGrange points.

Of note, the low-Earth orbit (LEO) belt is excluded from this list. This primarily deals with the orbital mechanics in play. LEO orbits are too numerous and inclinations too varied to actively defend with "cruisers," except for perhaps some sun-synchronous orbits. Within the rest of LEO, defenses on-board the high-value asset seem best suited to that orbital regime. Representative orbits are shown in figure 1 below, and the complexity of the LEO regime is shown in figure 2.



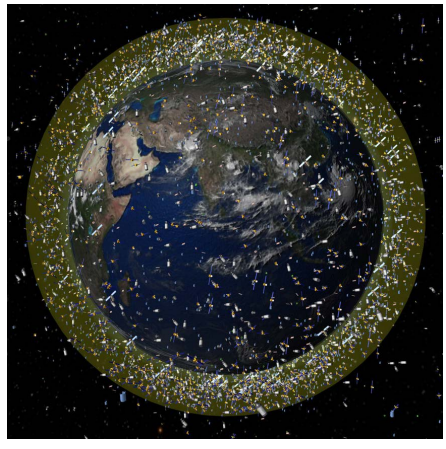


Figure 1. Representative orbit examples. Source: Joint Staff, JP 3-14, *Space Operations*, DOD, 29 May 2013

Figure 2. ESA view of orbit. Source: "Space Junk Explainer," *National Geographic*, 25 April 2019

A vitally important piece of a "protect and defend" strategy is openness, detectability, and strategic messaging. One nation's defensive weapon is another nation's security dilemma. These systems and their underlying technology are clearly dual use between offensive and defensive postures. To attempt to limit an arms race in space, the US should publicly and verifiably place these systems defensively next to high-value systems and work to minimize any overtly provocative actions that could be perceived as offensively oriented. To this point, systems placed in key orbital points may need only to be armed with reversible effects like blocking, jamming, or dazzling. Additionally, the US would need to submit to inspection by adversary craft to build trust and confidence that the systems are what they portend to be. These defensive systems should be only one line of effort within the AFSPC deterrence strategy.

The second line of effort aligns to proliferate and disaggregate. The defense of expensive, exquisite systems always runs the risk of an adversary cost/benefit calculation that tilts toward launching an attack. Additional deterrence measures are warranted to flip the cost/benefit equation against an attacker. Here, Mahan's point regarding a nation's power comes into play. He measured national power by

its ability to produce ships, its standing navy, its commercial shipping capabilities, and its network of strategic bases.[12] Today, contemporary space theorists call for the US to invest in the commercial industry as a means to stake out economic ecosystems in a new space-based mercantilist model.[13] These themes fit nicely with Mahan and can be applied to AFSPC acquisitions strategies to make use of a commercial space renaissance to broaden the industrial base as a means to further US national power within the space domain. Using this expansion in national capability, AFSPC should proliferate its space-enabling capabilities into smaller, cheaper, less-capable satellites that would be less worthy of an attack. Additionally, it should leverage a responsive space launch architecture to reconstitute degraded systems after attack. Lastly, by proliferating launch sites, ground architecture, and running common software, AFSPC can blunt the impact of physical or cyber-attacks against any one node on the ground. Altogether, US resiliency in space will rely on a broad capability base and the resultant proliferation of ground and space architecture in multiple orbital regimes. Some of this is already in motion, as shown by today's Space Defense Agency (SDA) notional architecture, as depicted in figure 3.

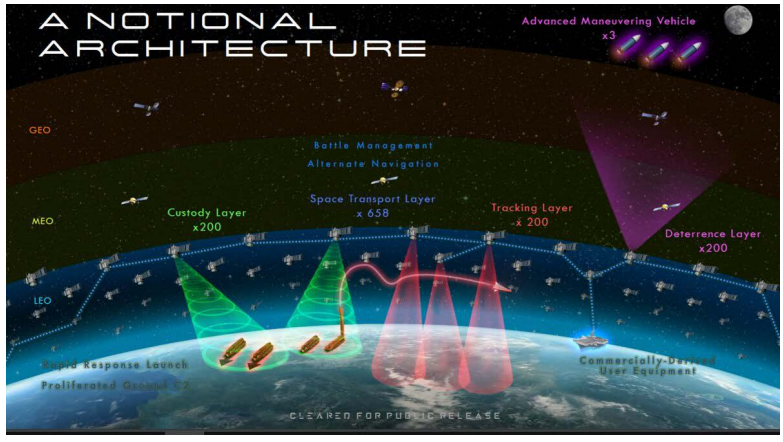


Figure 3. US DOD Notional Future Architecture. Source: Aaron Mehta, "4 Questions with the Space Development Agency's Acting Director," *Defense News*, 26 September 2019, https://www.defensenews.com/.

In summary, US policy and subordinate AFSPC strategy should have a core objective to dissuade an attack against US and allied interests, and if necessary, ensure the US can fight and win on-orbit. Winning means protecting and defending our space assets during conflict so that our terrestrial forces are provided space-based enabling capabilities. A secondary objective could include the offensive negation of select "red" satellites or systems, but only if warranted, within the bounds of acceptable escalation risk, and if meaningfully impactful on adversary

terrestrial operations. A strategy of *offensive space supremacy* sweeping the skies of adversary systems should be rejected. To execute a "protect and defend" strategy, AFSPC should acquire space-based defenders to blunt or deny adversary counterspace systems from achieving objectives. To further deter adversary aggression in space, AFSPC should set an acquisitions strategy that broadens our industrial base and builds layers of resiliency into our space architecture, to the point that the cost/risk/reward equation tilts toward not bothering to attack at all. With the strategy in place, one must now formulate an operational framework for forces to operate. In other words, we need doctrine.

On Space Doctrine

Implementing a deterrence-by-denial strategy will require heavy modification to existing doctrine. USAF Space Doctrine, captured in Annex 3-14 *Counterspace Operations*, does an adequate job describing the terms around space operations, as well as key effects provided by space forces. Joint Publication (JP) 3-14 similarly describes systems, how space supports joint functions, and high-level C2 and planning considerations. Compared to equivalent air, maritime, and land domain doctrine, space doctrine is severely lacking in the specifics on how to fight in the domain. After the establishment of USSPACECOM and its associated area of responsibility (AOR), the other combatant commands (CCMD) and associated services will need to work out details on a joint operating concept for space. Within the AOR, USSPACECOM will need associated Joint Doctrine to execute space domain control. JP 3-14 touches on the topic, defining the terms associated with space control, but what is needed is an operational framework akin to what is housed in JP 3-30, *C2 of Joint Air Operations.* AFSPC should work with partners, including the Curtis E. LeMay Center for Doctrine Development and Education and the Joint Staff, to update this cohort of documents.

The best corollary appears to be a space version of the Theater Air Control System (TACS). A Space TACS, or Space Defense Control System (SDCS), would incorporate applicable constructs such as an area air defense commander, repurposed as the area space defense commander (ASDC). This role would be given to the commander of USSPACECOM's Joint Task Force Space Defense (JTF-SD). Additionally, CDR JTF-SD would be given space control authority (SCA) to establish a space control plan and establish sector battle management areas akin to what TACS has. SCA here is different than today's space coordinating authority in JP 3-14 and Annex 3-14. SCA would be the capability to *direct* forces akin to the Airspace Control Authority. See figure 4 below for notional TACS sectors, and figure 5 for recommended SDCS sectors. See table 1 for the overall correlation between roles and authorities.

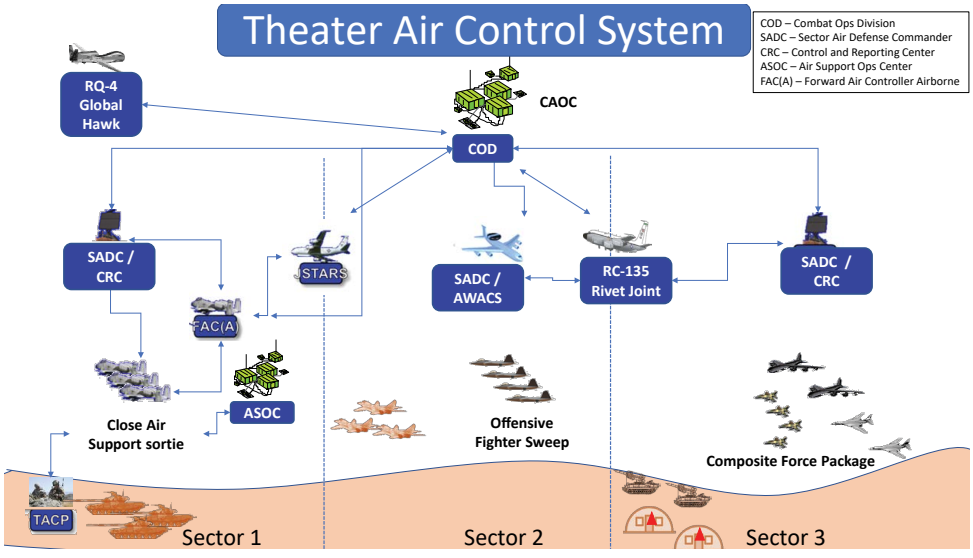


Figure 4. Notional Theater Air Control System. Source: Brandon Davenport, *Beyond the Air Domain: Battle Management in Space Operations* (Maxwell AFB, AL: School of Advanced Air and Space Studies, June 2018), 33

The creation of the SDCS would allow for clear authorities, purposeful planning, and the doctrinal underpinnings to allow JTF-SD to refine space warfighting concepts. Overall, this framework implements an executable C2 structure to credibly defend US and allied interests, thereby increasing the likelihood of deterring aggression in space.[14]

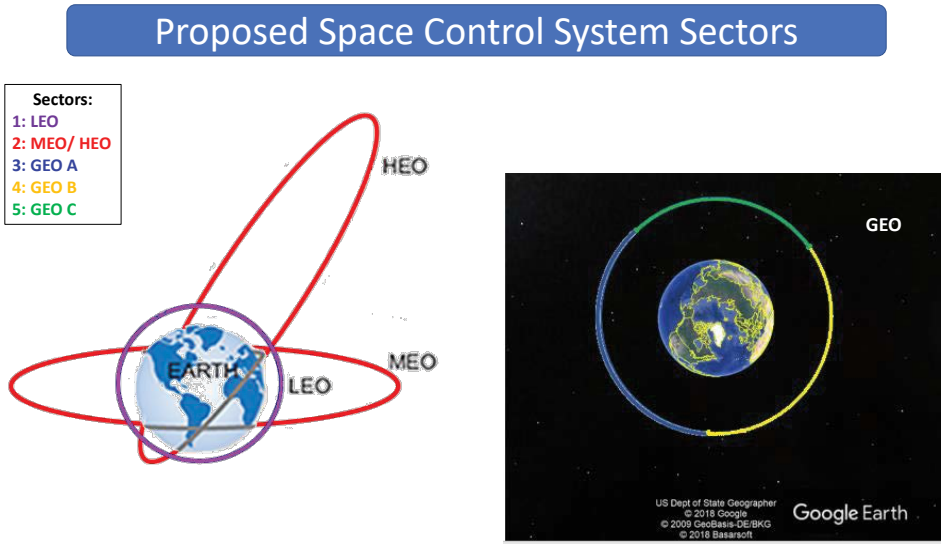


Figure 5. Proposed Space Control Sectors. Source: Davenport, *Beyond the Air Domain*, 70

Table 1. Comparison of Air and Proposed Space Doctrine

Commander	Joint Functional Air Component Commander	Commander Joint Task Force–Space Defense
Role	**Area Air Defense Commander**	**Area Space Defense Commander**
Product	Area Air Defense Plan —Defense CONOPS —Critical Asset List/Defended Asset List —Special Instructions —Rules of Engagement —Combat ID —Threat matrix —Air Defense Warning (Red, Yellow, White)	Space Defense Plan —Defense CONOPS —On-Orbit Critical Asset List/ Defended Asset List —Special Instructions —Rules of Engagement —Combat ID —Threat matrix —Space Defense Warning (Red, Yellow, White)
Role	**Airspace Control Authority**	**Space Control Authority**
Product	Airspace Control Plan —Air Control Order —Airspace Deconfliction —Airspace Control Measures —Airspace Coordinating Measures	Space Control Plan —Space Control Order —Orbital Deconfliction —Space Control Measures —Space Coordinating Measures (on-orbit)
Control System	**Theater Air Control System (TACS)**	**Space Defense Control System (SDCS)**
C2 Structure	Air Ops Center (AOC) —Sector Controllers —Tactical Engagement Controllers/ Battle Managers	National Space Defense Center (NSDC) —Sector Controllers —Space Battle Managers

Doctrine must also be modified to accommodate the creation of USSPACECOM and its subordinate commands. Current Air Force Doctrine Document 3-14 *Counterspace Operations* outlines SCA, as does JP 3-14. SCA, in its current form, is no longer efficient within the new structure. A new term, *theater space support coordinating authority* (TSSCA), should take its place. This authority should continue to be housed at the combatant commander level and then delegated to the joint force air component commander (JFACC) in theater, if warranted. The TSSCA would no longer facilitate terrestrial or on-orbit counterspace targeting into the joint targeting process, nor would they be responsible for facilitating space-language into CCMD operational plans. Targeting will now fall upon the USSPACECOM staff, coordinated through its integrated planning elements (IPE) embedded into geographic CCMD staffs. These same IPEs, modeled after US Cyber Command's similarly named teams, will ensure space planning integration across the CCMDs.[15]

Within USSPACECOM, the global space support coordinating authority (GSSCA) should be delegated to the combined force space component com-

mander (CFSCC). The CFSCC's role is currently assigned to the commander of the 14th Air Force at Vandenberg AFB, California. The CFSCC, with the GSSCA, will primarily be responsible for "planning and conducting global space operations and [to] deliver space capabilities to combatant commanders and allies."[16] The CFSCC will continue to liaise directly with theater JFACCs and is responsible for ensuring PNT, satellite communications, missile warning, space situational awareness, space-weather, ground-based electronic warfare, and title-10 space-based ISR is appropriately supporting the geographic CCMDs.

A realignment and growth within space doctrine, both within USAF AFDD series, as well as JP 3-14, will better posture both AFSPC and USSPACECOM to field forces both to protect and defend on-orbit. The doctrine will also enable both commands to continue the track record of almost 30 years of excellence in providing space-based enabling capabilities to US and allied war fighters worldwide.[17] The establishment of C2 and space control doctrine will clearly align authorities under one commander—CDR JTF-SD—and allow for the creation of a SDCS analogous to the TACS utilized by JFACCs around the world. Redefining SCA will help doctrine incorporate the reestablishment of USSPACECOM. Clear doctrine will pay dividends as the USAF looks to new tactics, techniques and procedures (TTP) to fight and win a war in space as doctrine often forms the basis for tactics development.

On Space Tactics, Techniques, and Procedures

New space TTPs are difficult to discuss in an unclassified setting. As such, this last section will be purposely vague and short on details. Nonetheless, the creation of a SDCS will open up a new world for synergistic creation of new TTPs for space operations crews. Using air battle management (ABM) as a model, TTPs will build from battle management core competencies. See table 2 for distinctive ABM competencies that a space battle manager (SBM) would want to emulate. Beyond the SBM, satellite operations center commanders at locations like the 2nd Space Operations Squadron, 2nd Space Warning Squadron, 4th Satellite Operations Squadron, among others, would want to interface with SBMs, filling the role of the mission commander shown in table 2 below.

Table 2. ABM distinctive core competencies

Defensive counterair

Function	*ABM*	*Mission commander*	*Package CC*	*Flight lead*
Command and control	X	X	X	X
Force management	X	–	X	–
Integrated surveillance and identification	X	–	–	–
Continuum of control	X	–	–	–
Information management	X	X	X	X

Source: Maj Jonathan Watson and Maj Kendrick Carroll, *Air Battle Management: Establishing A Common Thread for Integrating Cross-Domain Operations in the 21st Century* (Air University Press: Maxwell AFB, AL, 2014), 33.

Each core competency, or function, requires TTPs to implement. For example, an ABM will execute surveillance and identification for assigned assets with a clear call-out on the radio, such as "Eagle 21, Barnyard, track 2322 hostile, Bullseye 194 for 42, angels 32." In that radio call, the ABM (barnyard) is telling a flight of F-15s that Link-16 track number 2322 is cleared to engage, and that it is 194 degrees from a pre-established point (bullseye) and 42 nautical miles away, at 32,000 feet. Space tacticians are working to formalize a similar set of procedures for space. C2 direction would follow, where ABMs would attempt to place the F-15 in a position of advantage to take a shot. This would rely on both the SBM and Eagle flight to have common understandings of tactics available to the fighters.

ABMs have a core competency requirement to execute force management of assigned assets. They must resource actions based on factors such as the location of forces, fuel, weapons, sensors, and the tactical capabilities of the systems under their control.[18] Additionally, they must be steeped in JFACC objectives and tasks to make tactical decisions. SBMs will need to build comparative skills within their domain. With SBMs tasked to manage forces, tactics will undoubtedly follow as the teams look to collectively solve problems via mission planning and debrief. One key technique provided by ABMs is the threat callout and subsequent direction to "slide" to modify the route or "scram" to clear the area for high-value air assets. Here again, SBMs will likely provide clarity to space forces who currently have little situational awareness of the environment around their satellites. With the authority of the ASDC and the associated Space Defense Plan, SBMs can help develop and execute techniques to maneuver high-value satellites out of harm's way, if possible.

Further TTPs will be required to normalize space operators' responses for combat identification, orbital deconfliction, and reaction to Space Defense Warning declarations. Each, ensconced in doctrine, will require iterative steps at establishing acceptable TTPs to meet the needs of the new SDCS framework. Each operational-level TTP will better help the National Space Defense Center, SBMs, and satellite operators collectively operate at the same level as a war-fighting CAOC and its associated TACS.

At the unit-level, whether a high-value asset like the Space-Based IR System or an as of yet-notional "cruiser" defender system, operators will begin to work out package-level TTPs, contracts, and common language to allow interoperability up and down the command chain, as well as among the orbital regimes AFSPC operates in. The doctrinal framework of the SDCS will enable clarity of purpose, authorities, and terms among the collective crews. The empowered SBMs and crews will furnish the horsepower, in venues such as Space Flag, to further advance TTP development.

Conclusion

AFSPC will need to work with USSPACECOM, the Joint Chiefs of Staff, Office of the Secretary of Defense, and other key space enterprise stakeholders such as the intelligence community to establish a national policy for a potential war in space. That policy, grounded in the same peer-conflict reality our other war-fighting major commands like US Air Forces in Europe, and Pacific Air Forces operate under, will drive a national objective of winning a limited space war centered around protecting and defending US and allied interests. The resultant AFSPC strategy will be one of dissuading adversaries from attacking on-orbit assets due to a combination of "cruisers" deployed as escorts or along strategic LOCs in the domain, as well as a proliferated space and ground architecture that limits the value of any one node in the system. Updated doctrine will evolve to include the establishment of USSPACECOM, as well as create a C2 framework, known as the Space Defense Control System, that is defensively postured akin to the roles and responsibilities an area air defense commander executes in theater. TTP development will build upon that doctrinal framework to enable young space battle managers, high-value satellite, and defender satellite operators to work collectively within that system to come up with innovative non-material solutions to thwart adversary counterspace systems. As a result, AFSPC will be better postured to instill a space war-fighting construct implementing a new evolution of strategy, doctrine, and tactics. ✪

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Notes

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