Recent U.S. Government and Military Space Strategy and Doctrine

Bert T. Chapman

Purdue University Libraries

chapmanb@purdue.edu

Abstract

Recent years have seen the U.S. Government and U.S. military branches produce national space strategy and military doctrinal documents for conducting military operations in or from space. This literature is produced by the White House and individual armed service branches and is often required by congressionally mandated legislation. This work will examine such literature produced during the Trump and Biden Administrations, emphasize the public availability of significant portions of this literature, assess that China and Russia are key rivals of the U.S. in the military space sphere, and will assess congressional reaction to these documents.

Keywords: space policy, intelligence, military space, space legislation, China

Estrategia y doctrina espacial reciente del gobierno y el ejército de los EE. UU.

Resumen

En los últimos años, el gobierno y las ramas militares de los EE. UU. han producido estrategias espaciales nacionales y documentos doctrinales militares para llevar a cabo operaciones militares en o desde el espacio. Esta literatura es producida por la Casa Blanca y las ramas individuales de las fuerzas armadas y, a menudo, es requerida por legislación ordenada por el Congreso. Este trabajo examinará dicha literatura producida durante las administraciones de Trump y Biden, enfatizará la disponibilidad pública de partes significativas de esta literatura, evaluará que China y Rusia son rivales clave de los EE. UU. en la esfera espacial militar y evaluará la reacción del Congreso a estos documentos.

Palabras clave: política espacial, inteligencia, espacio militar, legislación espacial, China

 doi: 10.18278/sesa.4.4.4

美国政府和军方近期的太空战略和理论

摘要

近年来，美国政府和美国各军种制定了国家太空战略和军事理论文件，用于在太空中或从太空中开展军事操作。这些文献由白宫和各军种制定，并且通常是国会授权立法所要求的。本文将分析特朗普和拜登政府期间制作的此类文献，强调这些文献中很大一部分的公开可用性，评估中国和俄罗斯是美国在军事太空领域的主要竞争对手这一情况，并将评估国会对这些文件的反应。

关键词：太空政策，情报，军事太空，太空立法，中国

Introduction

U.S. Government and military space strategy and doctrinal documents are produced as a resulting of congressional statutory reporting requirements to enhance public knowledge of governmental policymaking activity in these arenas. While some of these reports are classified, a significant portion of them are freely available to assist interested individuals in enhancing their knowledge of U.S. governmental civilian and military space policymaking. This article seeks to examine recent examples of this literature from multiple federal agencies. Literature describing such policy and doctrinal documents is widespread. A key statue detailing government agency congressional reporting requirements is the Government Performance and Results (GPRA) Modernization Act of 2010 (Clerk, U.S. House of Representatives, 2023; Marchsteiner, K.E., 2021, Chapman, B., 2009, Public Law 111-352).

Access to this literature comes through resources such as government agency websites and various sections of the U.S. Government Publishing Office's https://govinfo.gov/ portal. Improved access to many of these reports will come from the 2022 *Access to Congressionally Mandated Reports Act* requiring much broader availability of these reports via https://govinfo.gov/ (Public Law 117-263, 2022; U.S. Government Publishing Office, 2023).

National Space Policy of the United States of America 2020

Issued in December 2020, this Trump Administration document stressed the right of nations to explore and use space, stressed that the U.S. would continue using space for national and allied security, and maintained that the U.S. would use all national power elements to deter and prevail over hostile activities in, from, and through space. It declared that U.S. space policy involved

all nations acting responsibly in space to ensure safety, security, and long-term space activity sustainability and that responsible space actors must operate with openness, transparency, and predictability to maintain space's benefits for all humanity. It also stressed that the U.S. was committed to enhancing the commercial growth of the U.S.' space sector; desired to collaborate with nations sharing democratic values, human rights, and economic freedom in explorations of the Moon and Mars; would extract and use space resources in compliance with relevant law recognizing those resources as essential for sustainable exploration, scientific discovery, and commercial operations (President Donald Trump, 2020).

United States Space Priorities Framework 2021

This December 2021 Biden Administration release stressed that space activities power our economy and way of life in areas such as enabling global navigation, crop yield prediction, water management, power grid monitoring; and facilitating global telecommunications in areas including banking, education, and telemedicine. It noted space goods and services create new industries and jobs in areas such as energy technology and broadband access; protect lives from extreme weather events and encourage STEM careers. It stressed the U.S. commitment to maintaining leadership in space exploration and science, foster a beneficial policy and regulatory environment for the domestic commercial space sector; ensure space systems protect critical infrastructures, and enhance the U.S. ability to deter aggression and develop a more resilient military space architecture (President Joe Biden, 2021).

National Security Strategy 2022

This congressionally mandated report saw the Biden Administration stress that space was a geographic entity governed by the United Nations Charter; stressed that space was an area where the U.S. must invest in advanced technologies to defend its national security interests; contended that space must be integrated into other military deterrence domains including air, cyber, land, and sea; argued that Russia's aerospace sector must be restrained; stressed the U.S.' need to update outer space governance by establishing a space traffic coordination system; enhance U.S. space system resilience; and responsibly steward the space environment (*National Security Strategy of the United States*, 2022).

National Defense Strategy of the United States of America Including the 2022 Nuclear Posture Review and the 2022 Missile Defense Review

On October 27, 2022, Department of Defense (DOD) combined series of reports noting that China will be the U.S.' most consequential strategic competitor for multiple decades. Emphases include China expanding its space and counterspace capabilities, the existence of Russian counterspace capabilities targeting the Global Positioning System and other space capabilities supporting U.S. military power and daily civilian life, space-based coercion by

both of these powers against U.S. and allied countries, the need for coordinating with allies to enhance space warfighting capabilities, enhancing market production of space defense capabilities, strengthening space-based nuclear command and control, the need to expand the network of space-based and terrestrial ballistic missile defense architecture, and recognizing the critical importance of developing space-based of developing resilient space-based infrared radar and associated data transport systems to enhance awareness of ballistic missile threats (Department of Defense, 2022.)

Space Policy Review and Strategy on Protection of Satellites 2023

A September 2023 DOD report explains DOD's space policy and it strives to protect and defend space systems and the military from hostile space usage. Noting that it was authorized by Section 1611 of the Fiscal Year (FY) 2022 National Defense Authorization Act (NDAA) and Section 1602 of the FY 2023 NDAA, this treatise stresses China's emerging military space developments. Beijing established the People's Liberation Army (PLA) Strategic Support Force to enhance its effectiveness in making space a warfighting domain. It noted that China owns and operates approximately half of the world's space-based intelligence, surveillance, and reconnaissance (ISR) satellites. Recent Chinese ISR fleet enhancements have increased its ability to monitor global forces including U.S. expeditionary forces, increasing China's ability to conduct long-range strikes against U.S. and allied forces (Department of Defense, 2023).

This assessment also noted the Russian Federation creation of a separate space force in 2015; notes that Russia has some of the most capable ISR satellites for optical and radar imagery, signals intelligence, and missile warning; and that it is developing, testing, and fielding reversible and irreversible counterspace systems to degrade or deny U.S. space-based services in order to offset a perceived U.S. military advantage and deter the U.S. from entering a regional conflict (Department of Defense, 2023).

U.S. responses to these developments will include accelerating the transition to more resilient architectures by protecting and defending critical systems against counterspace threats; strengthening the ability to detect and attribute hostile acts in, from and to space; and protect the Joint Force from hostile uses of space. Accomplishing these steps is proposed by requesting FY 2024 congressional funding of $33.3 billion representing a 13% space funding increase from FY 2023. Specific funding requests include $5.0 billion to develop new proliferated resilient missile warning and tracking capabilities; $481 million in ground and space-based sensors, deep space radar, and ground-based optical projects to improve DOD Space Development Agency capability and resilience; and $131 million to produce highly accurate, rapidly available detection, tracking, and space object characterization, regardless of origin (Department of Defense, 2023).

DOD Directive 3100.10 Space Policy 2022

Issued by the Office of the Undersecretary of Defense for Policy on August 30, 2022, this document is applicable to the Office of the Secretary of Defense, Military Departments, Chairman of the Joint Chiefs of Staff (CJCS) and Joint Staff, geographic military combatant commands, the Defense Department Office of Inspector General, defense agencies, and other DOD components. Its multiple provisions include recognizing that DOD policy for this military domain includes:

- Recognizing space as a national military power priority domain foundational to advancing national security military operations.
- Strengthening the safety, security, stability, sustainability, and accessibility of the space domain.
- Preserving access to and freedom to operate in the space domain.
- Protecting and defending space's use for U.S. national security purposes, the U.S. economy, and U.S. allies and partners.
- Conducting operations in, from, and to space and delivering advanced space capabilities to deter conflict and counter and defeat aggression if deterrence fails.
- Promoting long-term space environmental sustainability.
- Enhancing DOD and intelligence community partnership to increase unity of effort and effectiveness of space operations and space-related activities.
- Strengthening space-related alliances and building new partnerships providing a durable strategic advantage for the U.S. and its allies.
- Leveraging and promoting the U.S. civil and commercial space industry by expanding and increasing emphasis on innovative and emerging commercial space capabilities.
- Transforming DOD's space enterprise to adapt to rapid strategic environment changes (Department of Defense 2022(b).

U.S. Military Branch Documents

Air Force

Air Force Counterspace Operations 2018

Issued August 27, 2018, *Air Force Doctrine Publication (AFDP) 3-14* seeks to document the Air Force's objectives in achieving space capabilities allowing operations to be conducted in space without prohibitive interference by opposing forces while enabling the U.S. and its allies to gain space superiority. This resource has subsequently been updated and is divided into categories such as threats to space operations, space superiority/supremacy, space situational awareness, counterspace operations, space support to operations, space service support, organization and command and control, command

relationships, command and control resources and requirements, planning considerations, execution considerations, and assessment considerations. (U.S. Air Force, 2018).

Examples of specific operational scenarios documented in these categories include the following under threats to space operations:

Terrestrial Attack	Kinetic attack of sabotage against terrestrial nodes and supporting infrastructure. E.g., operations centers, command and control nodes, communication relays.
Electromagnetic Attack	Electromagnetic energy attacking a link segment including uplink, downlink, and crosslink signals.
Directed Energy	Laser, radio frequency, and particle beam weapons which may be used to temporarily disrupt or deny capabilities or permanently degrade or destroy satellite systems.
High Altitude Nuclear Detonation	Capable of impacting multiple space segments simultaneously including via electromagnetic pulse.
Anti-Satellite (ASAT) Weapons	Can destroy or degrade spacecraft components by denying or disrupting their capabilities.
Offensive Cyberspace Operations	Attacks disrupting or denying space-based or terrestrial-based computing functions.
Environment	Weather, space debris, and unintentional electromagnetic interference.
Weather	Solar storms can impact satellite functioning and survivability while thunderstorms and cloud cover can impact ground and link segment functionality.
Debris	Increasing space congestion increases satellite collision probability which could damage satellites and produce additional debris.
Electromagnetic Interference	Demand placed on electromagnetic continues increasing as the numbers of satellites, satellite services, and users increases limiting spectrum availability and increasing possibility of unintentional interference on friendly signals (U.S. Air Force, 2018).

Offensive characteristics of counterspace operations include:

Deceive	Seek to mislead adversaries by manipulation, distortion, or falsifying evidence or information to cause an adversary to act detrimentally to their interests.
Disrupt	Designed to temporarily impair adversary use or access to a system for a period of time.
Deny	Designed to temporarily eliminate adversary use, access, or operation of a system without physical damage to the affected system.
Degrade	Designed to permanently impair adversary use of a system with some physical damage to this system.
Destroy	Permanently eliminating adversary use of a system with physical damage to this system. (U.S. Air Force, 2018).

Army

Department of the Army Space Policy Army Regulation 900-1 2017

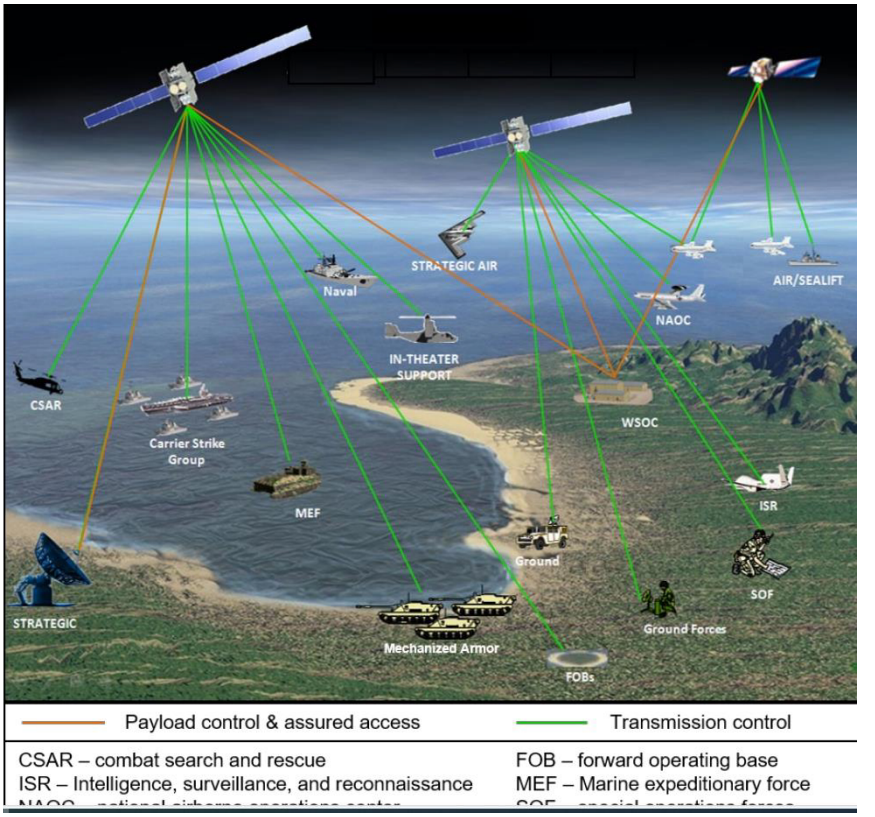
This April 21, 2017 document established Army policy, responsibilities, and authorities for developing Army space capabilities and operations. It notes Army space policy objectives include:

- Providing space-related and enabled capabilities supporting validated Army requirements.
- Providing qualified space cadre for participating in Combined, Joint, and Army space-related training, education, exercises, experiments, wargames, and operations.
- Integrating space capabilities and training across the force.
- Increasing understanding, use, training, and application of cyber-space capabilities for data analysis of space-related information and protecting interconnected space and ground systems exchanging this information.
- Developing proper doctrine, tactics, techniques, and procedures to maximize space enabled combat capabilities.
- Researching, developing, acquiring, and operating Army space-related capabilities responsive to land force requirements.
- Developing concepts and influencing development, funding, acquiring, and operating future DOD space systems to enable and enhance land force operations.
- Developing and sustaining a cadre of skilled military and civilian space personnel through effective space-related training and education.(U.S. Army, 2017).

Army Space Operations **FM 3-14 2019**

This October 2019 document notes that nearly all Army operations rely on space capabilities and effects to enhance military effectiveness. Space capabilities enable enhanced situational understanding; provide global communications; enable precise and accurate fires; support conducting joint expeditionary entry, maneuver, and movement operations; and provide a conduit for cyber electromagnetic operations supporting Unified Land Operations. Such capabilities directly support large combat operations by enhancing command and control and providing secure communication over extended geographic distances and across areas without modern infrastructure.

Army units relying on space assets to execute operational activity will include lethal and non-lethal targeting workgroups; intelligence cell; movement and maneuver cell; fires cell; air and missile defense section; signal and network operations; cyberspace electromagnetic activities workgroup; information operations workgroup; special operations workgroup; electronic warfare cell; and staff weather officer (U.S. Army, 2019).



NAOC-National Airborne Operations Center SOF -Special Operations Forces
WSOC-Wideband satellite communications operations center

Figure 3-4. Wideband satellite communications operations centers mission overview (U.S. Army, 2019).

Coast Guard

U.S. Coast Guard Space Launch and Reentry Activities Affecting the Marine Transportation System, 2023

This September 2023 document lists policy and reporting requirements for Coast Guard units responsible for assessing and mitigating space launch and reentry risks occurring in or adjacent to the U.S.' marine environment. This policy notes that space activities create a unique risk profile for the marine transport system and marine environment, recognizes that governmental and commercial space operators have become maritime stakeholders and that Coast Guard space launch activities are also influenced by DOD, the Federal Aviation Administration (FAA), National Aeronautics and Space Administration (NASA), U.S. Air Force, and U.S. Space Force.

Such risk impacts may include:

> (1) Direct strike from jettisoned objects with persons, marine wildlife, vessels or other watercraft, or offshore installations and infrastructure;
>
> (2) Marine pollutants from jettisoned objects;
>
> (3) Floating debris impacting shipping and safe navigation;
>
> (4) Changes to seabed topography reducing vessel under keel clearance; and
>
> (5) Re-routing of vessel traffic to avoid a space launch or reentry hazard area.

Coast Guard space activities may involve search and rescue and space launch and reentry activities while also publishing information about maritime safety from space launches that may also include amateur rocket launch operators, and the requirement to maintain a central digital library of relevant Coast Guard policy materials including navigation risk safety assessments and agreements with U.S. Government and commercial space launch and recovery activities (U.S. Coast Guard, 2023).

Joint Chiefs of Staff

Joint Chiefs of Staff Joint Publication 3-14: Space Operations 2020

The U.S. Joint Chiefs of Staff (JCS) consists of a Chair, Joint Chair, Chiefs of the Air Force, Army, Naval Operations, Marine Corps, and Space Operations, and serves as the principal military advisor to the President, Secretary of Defense, and National Security Council (The Joint Staff, 2023). Military doctrinal literature and instructions applying to all branches of the U.S. military are produced by JCS. *Joint Publication 3-14* covering space operations was initially released in April 10, 2018, and updated October 26, 2020. It defines space domain as an area above 100 kilometers (54 nautical miles) where atmospheric effects on airborne objects become negligible and that this is where United States Space Command's area of responsibility begins. It proceeds to define space operations as impacting or directly utilizing space and ground-based capabilities to enhance the potential of the U.S. and its multination-

al partners. Consequently, joint space forces are space and terrestrial systems, equipment, facilities, organizations, and personnel necessary for conducting space operations. Space systems consist of space, link, and ground as related segments (*Joint Publication 3-14: Space Operations* (2020).

Additional components of this document include definitions of terms such as space situational awareness, space control, positioning, navigation, and timing, intelligence, surveillance, and reconnaissance, satellite communications, and missile warning. These definitions include:

Space situational awareness	Requisite foundational, current, and predictive knowledge and characterization of space objects and the operational environment (OE) upon which space operations depend—including physical, virtual, information, and human dimensions—as well as all factors, activities, and events of all entities conducting, or preparing to conduct space operations.
Space control	Offensive space control and defensive space control operations to ensure freedom of action in space and, when directed, defeat efforts to interfere with or attack U.S. or allied space systems.
Positioning, Navigation, and Timing	Military users depend on assured positioning, navigation, and timing (PNT) systems for precise and accurate geo-location, navigation, and time reference services. PNT information, whether from space-based global navigation satellite systems (GNSS), such as Global Positioning System, or non-GNSS sources, is considered mission-essential for virtually every modern weapons system.
Intelligence, Surveillance and Reconnaissance	Space-based intelligence collection synchronizes and integrates sensors, assets, and systems for gathering data and information on an object or in an area of interest on a persistent, event-driven, or scheduled basis. Space-based intelligence, surveillance, and reconnaissance, which includes overhead persistent infrared (OPIR), is conducted by an organization's intelligence collection manager to ensure integrated, synchronized, and deconflicted operations of high-demand assets.

Satellite Communications	Satellite communications (SATCOM) systems inherently facilitate beyond line-of-sight connectivity. Depending on its configuration, a robust SATCOM architecture provides either equatorial coverage (non-polar) or high-latitude coverage (includes poles). This provides national and strategic leadership with a means to maintain situational awareness and convey their intent to the operational commanders responsible for conducting joint operations.
Missile Warning	The missile warning mission uses a mix of OPIR and ground-based radars. Missile warning supports the warning mission executed by North American Aerospace Defense Command (NORAD) notify national leaders of a missile attack against North America, as well as attacks against multinational partners … *Joint Publication 3-14 Space Operations 2020*.

Joint Chiefs of Staff Instruction CJSCI 3225.01B 2023

This March 29, 2023 instruction establishes procedures for management illumination of space objects. It stresses that all DOD-owned, operated, or leased laser activities in space or intending to provide direct energy over the horizon must be conducted safely and responsibly, in consistency with national security requirements, manage associated risks to space systems, and enable mission effectiveness of those systems and humans in space. An additional provision of this instruction is ensuring DOD resident space object research, development, acquisition, and operations activities minimize damage risk from intentional and unintentional laser illumination from any source while considering the proliferation of domestic and foreign commercial and government laser systems (Joint Chiefs of Staff Instruction CJCSI 3225.01G, 2023).

Marine Corps

Marine Corps Space Policy Order 5400.53 2009

This September 28, 2009 order defines the process by which the Marine Corps will participate in Navy Department and national security space activities. The Corps traditional emphasis on maneuver warfare is accelerated by an increased reliance on space-based capabilities including satellite communications; space-based ISR; missile warning; space control and space-based position, navigation, and timing. Such assets increase the combat effectiveness of Marine Air Ground Task Forces (MAGTF) and are critical in employing a synchronized combined arms force. Consequently, this requires the Corps to maintain and enhance its ability to

exploit space capabilities and interoperability requirements, develop a cadre of professionally educated Marines in space operations, and actively participate in space activities.

Documents such as these can also be used to enhance Corps ability to employ precision fires in future operations using space-based assets and utilizing such assets to support military commander estimates of operational battlefield situations, develop the situation by providing continuing knowledge of unfolding events to enhance commander estimates of emerging hostile situations, providing indications and warnings for the space warfighting domain, providing enhanced support to targeting capabilities; and supporting combat assessment by using existing satellite capabilities and augmenting them with the significant increase in commercial and coalition remote sensing satellites (U.S. Marine Corps, 2009; Carlson, K.E., 2018; McDonald, 2019).

Navy

Education for Sea Power: Final Report 2018

This December 2018 report covers the history of naval professional military education and includes content and recommendations on future directions the Navy should take in this arena including space power. These recommendations include space conflict becoming a part of complex war-game exercises, including space warfare specialists within a single Naval Education Board, emulating China's professional military educational system by having recruits study in specific educational sectors such as space, striving to bring space and electromagnetic warfare into the ability of naval graduates to apply critical thinking to a wider spectrum of conflict scenarios, and recognizing that space's overwhelming importance involves transmitting information to earth, that space-based assets will threaten space-based support system, and that hostile countries will seek to target U.S. space-based assets (U.S. Navy, 2018).

Navy Advantage at Sea: Prevailing with Integrated All-Domain Naval Power 2020

This 2020 report stresses that China is centralizing its robust strategic, space, cyber, electronic, and psychological warfare capabilities; stresses the maritime domain's vulnerability as a warfighting domain; the need for the U.S. military to expand its ability to deliver results across the competition domain from the sea floor to space; that U.S. partner and allied forces augment capabilities in space and other arenas; that the Navy fights with the Space Force and other U.S. and allied forces to deny enemy objectives, destroy enemy forces; and compel war termination; that unmanned ISR forces enhance the ability to monitor, record, and report instances of coercive behavior to facilitate diplomatic engagement and enhance public awareness; and that naval power synchronizes all military capabilities to enhance U.S. and allied military lethality (U.S. Navy, 2020).

Naval Doctrine Publication 1 Naval Warfare 2020

This April 2020 analysis notes the maritime doctrinal domain encompassing oceans, seas, bays, estuaries, islands, coastal areas, the airspace above including littorals, and space. It notes that space is one of the fleet's multiple operational echelons; that the U.S. faces challenges from competitors from space and other maritime domains with the contemporary maritime environment growing more challenging as adversaries continue innovating and adapting concepts and technologies to counter long-standing U.S. military superiority, that space is a prime area of U.S. maritime combat operational activity, and space being an area of information warfare useful for denying an enemy's information environment and enhancing the effectiveness of friendly force operations (Center for International Maritime Security, 2020).

Space Force

U.S. Space Force Space Capstone Publication: Spacepower: Doctrine for Space Forces 2020

U.S. Space Force (USSF) is a prime producer of military space doctrinal information. This 2020 publication begins with this evaluative assessment:

> Once the great powers of the world competed for technological supremacy in outer space to demonstrate the superiority of their societies. To win was to be fastest, highest, farthest, or first. The United States and its Allies firmly won that early space race. Today, however, the competition has evolved and with heavy consequences. Since this initial competition, the domain of space itself has not changed. The harshness of its environment, its physics, and the vastness of its expanse challenge us today just as it challenged the earliest explorers. Humankind has changed, and our potential adversaries' actions have significantly increased the likelihood of warfare in the space domain. Our destiny as a free country to strive even higher in space remains the same, but the need for security and defense-as only military force can provide-is the stark reality of our new mission. (U.S. Space Force, 2020)

Guiding military space power principles include the U.S. desiring a peaceful, secure, stable and accessible space domain to facilitate freedom of action in other warfighting domains while contributing to international stability and security; space domain value deriving from conducting activities with unrivaled reach, persistence, endurance, and responsiveness allowing legal overflight of all earthy locations; military space forces are warfighters protecting, defending, and projecting space power in, from, and to the space domain in cooperation with the U.S. Government, allies, partners, and adhering to domestic, and international law; space operations are multi-domain with space attacks against one or more segments or links capable of neutralizing space capabilities; and USSF must

be a lean, mission-focused digital service valuing organizational agility, innovation, and boldness (U.S. Space Force, 2020).

Space Doctrine Publication 1-0 Personnel: Doctrine for Space Forces 2022

This document stresses personnel doctrine adhered to by USSF members who are known as Guardians. USSF structure consists of three field commands, space operations command, Space Systems Command (SSC), and Space Training and Readiness Command (STARCOM) supporting the Office of the Chief of Space Operations (OSCO). Forces assigned to OSCO include space-based deltas, the field commands, and their subordinate units (deltas and directorates) delivering space capabilities to warfighters. Three top guardians the Chief of Space Operations (CSO), Vice-Chief of Space Operations (VCSO), and Chief Master Sargeant of the Space Force (CMSSF) lead USSF.

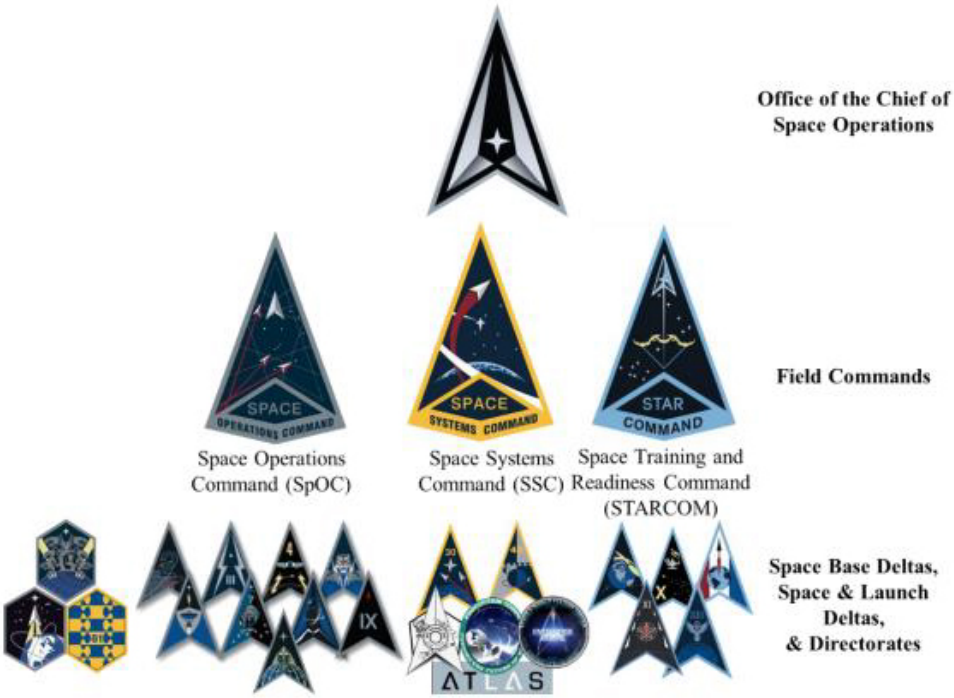


Figure 1. USSF structure

(U.S. Space Force 2022(a)

Attributes of SPOC, STARCOM, and SSC include:

- SPOC generates, presents, and sustains combat-ready Guardians for space operations, intelligence, cyberspace, and combat support missions.
- STARCOM is responsible for preparing every Guardian to prevail in competition and conflict by

developing and conducting education, training, doctrine, wargaming, lessons learned, test, and evaluation.

- SSC is responsible for delivering new space capabilities at operationally relevant speeds, to include developing, acquiring, equipping, fielding, and sustaining those capabilities. SSC builds, launches, and sustains space capabilities for military and civilian users worldwide (U.S. Space Force, 2022).

Additional career specialty and other courses in Guardian training include astronaut, operational tactics, techniques, and procedures (TTP) encompassing weapon system mastery, intelligence, cyberspace operations, deployment preparation, acquisitions management, digital fluency and supra coders, and other courses involving planning and targeting (U.S. Space Force, 2022).

Space Doctrine Publication 2-0 Intelligence Doctrine for Space Forces 2023

This document establishes USSF intelligence operations supporting the freedom to operate in, from, and to space. It defines three levels of intelligence meeting commanders needs at each level by informing allocation decisions concerning resources required to collect, analyze, and disseminate intelligence.

Strategic Intelligence	Shapes military strategy, policy, plans, and operations at the national and theater levels. Primary consumers include combatant commands, the IC, Department of the Air Force, other parts of the Department of Defense (DoD), and national level leadership.
Operational Intelligence	Operational intelligence informs the planning and conduct of campaigns and major operations to accomplish strategic objectives within the theater and areas of operations.
Tactical Intelligence	Tactical intelligence drives the planning and execution of tactical operations. This type of intelligence activity occurs at the unit level and at organizations that maintain tactical control of forces. Guardians provide commanders the intelligence to identify, assess, and defeat threats, and protect assets in support of achieving mission objectives (U.S. Space Force, 2023)(a).

Additional components of USSF intelligence doctrines include the following six disciplines and their attributes:

Orbital Warfare	Uses orbital maneuver and offensive and defensive fires to preserve freedom of access to the domain and allows the United States and its allies and partners to deny the adversary the same advantage. Guardians must analyze foreign threat capabilities, vulnerabilities, adversary intent, and the adversary's respective levels of readiness to inform commander decisions on the employment of forces.
Space Electromagnetic Warfare	Guardians should understand the operations within and affected by the electromagnetic spectrum, including how to maneuver within the spectrum, and support targeting to conduct effective non-kinetic fires within the spectrum to deny access to communication pathways.
Space Battle Management	Knowledge of how to orient friendly capabilities and deny adversary access to the space domain, and skill in making decisions to preserve and ultimately ensure mission accomplishment. It also includes the ability to identify hostile actions and entities, conduct combat identification, target, and direct action in response to an evolving threat environment.
Space Access and Sustainment	Includes all the processes necessary to field, maintain, and prolong operations in the space domain. Threat-informed sustainment planning allows for proactive operations that mitigate the effects of enemy actions and maintain friendly force freedom of action.
Engineering and Acquisition	Guardians depend on knowledge of adversary capabilities throughout the acquisition process and in the planning and execution of test and evaluation for new capabilities. Guardians continually assess the potential effectiveness of a program in a contested environment and against current and future adversary capabilities.
Cyber Operations	Guardians employ intelligence-driven cyber operations to defend the global networks that are critical to space operations. Guardians also maintain awareness of cyber threats and operations to derive intelligence relevant to military space operations in all domains and environments (U.S. Space Force, 2023(a).

Space Doctrine Publication 3-0 Operations Doctrine for Space Forces 2023

This work serves as the keystone doctrine publication for USSF while describing official advice and best practices for supporting the Joint Force Commander (JFC) in gaining and exploiting an advantageous position in the space domain. Eleven principals of joint operation and the space domain include objective which is defined as directing military action toward a clearly defined and achievable goal; offensive action to seize, retain, and exploit the initiative; mass involving concentrating the effects of combat power at the most advantageous time to provide decisive results in any domain; using maneuver to place hostile forces in disadvantageous positions; using economy of force to expend minimal essential combat power [lethal and nonlethal] on secondary efforts to allocate maximum possible combat power on primary efforts; achieving command unity to ensure unity of effort under one responsible commander for every objective; preventing an enemy from acquiring an unexpected advantage through security; surprising an enemy by striking anytime or anywhere the enemy is unprepared; using simplicity by preparing clear, uncomplicated plans, and precise orders to increase probability of successful execution; preventing excessive use of force by restraint; using perseverance to ensure the commitment necessary for achieving strategic objectives; and maintain legitimacy through legal and moral authority by adhering to binding treaties, domestic and international law, and cooperation with allies and partners (U.S. Space Force, 2023(b).

Specific orbital regimes relevant to USSF doctrine include:

Geocentric Regime	Where Earth's gravity dominates, and objects follow orbital trajectories relative to the Earth.
Cislunar Regime	Characterized by the combined gravitational effects of the Earth and Moon, includes translunar space between these bodies, the Earth-Moon Lagrange points, and orbits around the moon (selenocentric).
Solar Regime	The Sun's massive gravitational field defines the solar regime, where planets and other objects in the solar system orbit around the Sun. The solar regime also includes Lagrange points characterized by the combined gravitational effects of the Sun and the planets (U.S. Space Force, 2023(b).

Orbital regimes relevant to USSF doctrine include:

Geosynchronous Earth Orbit (GEO)	GEO spacecraft operate at approximately 35,000 kilometers, orbiting at the same rate the Earth rotates on its axis. Spacecraft in GEO appear to trace a figure-eight path over the ground. The more highly inclined (tilted off the equator) the orbit, the larger its ground trace. A geostationary orbit is a special type of GEO positioned directly over the equator at zero degrees inclination. To observers on the Earth a geostationary spacecraft appears at a fixed point in space. GEO is ideal for worldwide communications, surveillance, reconnaissance, environmental monitoring, and missile warning.
Highly Elliptical Orbit (HEO)	HEO takes the shape of a long ellipse. At their most distant points from Earth (apogee), spacecraft in HEO may be more than 40,000 kilometers away. On the other side of the elliptical orbit, the spacecraft's closest point of approach (perigee) may be only a few hundred kilometers above the Earth's surface. HEO provides very long dwell times over an area on the Earth when the spacecraft is near apogee.
Medium Earth Orbit (MEO)	Has no formally defined altitude but includes those orbits between LEO and GEO. MEO orbits are typically between 2,000 and 35,000 kilometers from Earth … home to PNT spacecraft such as the GPS.
Low Earth Orbit (LEO)	LEO is relatively close to the Earth (approximately 160 to 2,000 kilometers), so spacecraft can use less-powerful transmitters for communications and achieve higher-resolution imagery with similar-sized apertures as compared to objects in higher orbits … ideal for ISR, environmental monitoring, and small communications spacecraft. Scientific instrument payloads and human spaceflight missions also frequently use these orbits (U.S. Space Force, 2023(b).

Space Doctrine Publication 4-0 Sustainment Doctrine for Space Forces 2022

This resource seeks to communicate best practices and lessons for sustaining space forces. Overall contents include an introduction featuring details on space's operation environment and sustainment fundamentals, sustainment's role in the competition continuum, sustainment capabilities such as on-orbit, terrestrial, and link sustainment,

challenges to space sustainment, and roles, responsibilities, and relationships encompassing the Office of the Chief of Space Operations (OSO), other DOD organizations, the intelligence community, commercial partners, and allied countries. (USSF 2022(b)).

Nine principles of sustainment are posited including:

Integration	Combining all sustainment elements within operations assuring command and unity of effort across the competition continuum representing a world characterized by enduring competition, competition below armed conflict, and armed conflict (Joint Staff, 2019).
Anticipation	Ability to foresee operational requirements and initiate necessary actions.
Responsiveness	Ability to react to changing requirements and meet needs to maintain support while providing the right support in the right place at the right time.
Simplicity	Processes, procedures, and equipment to minimize sustainment's complexity in order to prevent confusion.
Economy	Providing sustainment resources efficiently to enable commander to make optimal effective use of resources while eliminating unnecessary capability redundancy.
Survivability	Military force quality or capability to avoid or endure hostile actions or environmental conditions while still fulfilling their primary mission.
Continuity	Uninterrupted provision of sustainment across competition continuum. Assures confidence in sustainment allowing commanders freedom of action, operational reach, and endurance
Improvisation	Ability to adapt sustainment operations to unexpected situations or circumstances affecting a mission.
Interoperability	Ability to act together coherently, effectively, and efficiently to achieve tactical, operational, and strategic objectives while being interoperable with multinational partners (USSF, 2022(b)).

On-orbit sustainment components include all spacecraft orbit beyond Earth's atmosphere focusing on the following five categories:

Space Access, Mobility, and Logistics (SAML)	Movement, deployment, assembly as needed, and support of military equipment in, to, and from the space domain. SAML starts with the ability to launch military equipment into the proper orbit in a safe, secure, and reliable manner.
Coordination	Sustainment of certain on-orbit assets require extensive coordination both within the U.S. Government and externally with the international community. An example of this is the maintenance of geosynchronous slots supporting Military Satellite Communications activities.
Debris Mitigation	Need to account for environmental sustainment The exponential increase in the number of active and inactive objects in space demands that Guardians consider compliance with Orbital Debris Mitigation Standard Practices, conjunction de-confliction/maneuvers, and end-of-life disposal plans early and throughout the life of the system.
Positioning, Execution, and Reconstitution	In space operations, the assets are on orbit regardless of where the joint force is operating on the competition continuum … for the orbital system, the main difference is in the focus. During cooperation, the focus is on efficiently managing constellations and assets to minimize fuel usage and maximize operational support to the other services. During armed conflict/war, sustainment of the orbital segment would focus on reconstitution type activities such as quickly returning degraded assets to operations or maneuvering assets, as necessary, to maximize capabilities.
Rendezvous, Proximity Operations, and Docking	Rendezvous, proximity operations, and docking are prerequisite enabling capabilities for routinely accomplishing many future autonomous mobility and logistics tasks in space, including post-deployment orbit raising of spacecraft by orbital transfer vehicles. (USSF, 2022(b)).

Space Doctrine Publication 5-0 Planning Doctrine for Space Forces 2021

This resource seeks to articulate best practices and lessons for space power planning while emphasizing planning conditions unique to space operations and represents the genesis of transitioning space doctrine from *AFDP 3-14* into USSF doctrine. Eight steps are involved in initiating the space planning process including:

Planning Initiation	Begins when an appropriate authority issues planning guidance upon recognizing the potential to employ military capability in support of the Joint Force Commander's objectives or in response to a potential or actual crisis.
Mission Analysis	Study the assigned task and identify all other tasks to accomplish the mission. It focuses the commander and the staff on the problem at hand and lays a foundation for effective planning.
Course of Action (COA) Development	Potential way (solution, method) developed to accomplish the signed mission. Staffs develop … to provide commanders with options to obtain the military end state.
Course of Action Analysis and Wargaming	Process of closely examining potential COAs to reveal details to enable planners to evaluate and identify advantages and disadvantages or proposed COAs.
Course of Action Comparison	Subjective and objective process with COAs independently evaluated against staff and commander established criteria.
Course of Action Approval	Staff briefs the commander on the COA comparison and the analysis and wargaming results, including a review of important supporting information. The key output from this step is the commander's estimate, which is a concise statement describing the selected COA.
Plan or Order Development	Any communication that directs actions and focuses subordinates' tasks and activities toward accomplishing the mission. Orders promulgate from all levels of command … translates the commander's chosen COA into an appropriate level plan or order (normally a support plan or space appendix to a contingency plan).

(Cont'd.)

Transition to Execution	Ensure a successful shift from planning to execution. There are two types of transition: external and internal. External transition ensures units tasked with execution fully comprehend the order—especially the commander's intent, the CONOPS, and the leadership responsibilities of mission command. Internal transition ensures those charged with execution fully comprehend the order (USSF, 2021).

On January 4, 2024, Air University announced that it was launching a Space Force focused track at its Squadron Operation School to provide Space Force officers with specialized doctrine, education, and training to prepare them to lead at the tactical level (Blankenship, 2024).

Congressional Reaction

Congress seeks to influence and mandate the preparation of space strategy and doctrinal documents by relevant policymaking agencies through legislation, speeches, and reporting requirements. A legislative example of this was the text of the proposed National Defense Authorization Act for Fiscal Year 2023 when then House Armed Services Committee Chair Rep. Adam Smith (D-WA) introduced space strategic language in this proposed legislation during July 13, 2022 debate. Section 1604 of this proposed legislation required the Chief of Space Operations and Commander of United States Space Command to jointly develop a responsive space strategy to include policies specific to launch, buses, payloads, ground infrastructure, and networks; specifying enterprise-wide acquisitions capability policies; and roles, responsibilities, functions, and operational workflows of responsive space architecture and infrastructure personnel in the Air Force, Army, Marine Corps, Navy, Space Force, and combatant commands within 270 days of this legislation being enacted (*Congressional Record*, 2022).

A March 27, 2019 Senate Armed Services Committee Subcommittee on Strategic Forces hearing saw extensive testimony on military space operations policies, and programs. Subcommittee Chair Senator Deb Fischer (R-NE) noted that space is now a warfighting domain and that military space operations, policies, and programs must keep pace with this changing environment. Subcommittee Ranking Member Senator Martin Heinrich (D-NM) noted that a culture of innovation and rapid acquisition must be fostered within the space domain (U.S. Congress, Senate Committee on Armed Services, 2021).

Assistant Secretary of Defense for Homeland Defense and Global Security Kenneth Rapuano observed that China and Russia were already developing military capabilities and doctrine to jeopardize U.S. space systems. He maintained that DOD needed to expe-

dite its response to changing space dynamics by adopting to more effectively deter aggression, protect interests, and enhance lethality by developing requisite policies, doctrine, capabilities, and expertise to enhance U.S. space warfighting culture. These objectives could be met by including a Schriever Scholars program at Air Command and Staff College with a space concentration program encompassing space history, policy, strategy, and doctrine; developing a wargame to advance space doctrine and better align it with air, land, sea, and cyberspace doctrine, and funding a USSF Development Center at $20 million per year (U.S. Space Force, 2021).

Conclusion

Space as a warfighting domain must include continually flexible and evolving doctrine to meet and defeat emerging threats from countries such as China and Russia and potentially other entities. Numerous scholars have noted these realities over multiple decades. Colin Gray in 1996 defined space power as "the ability to use space while denying reliable use to any foe" (Gray, 1996). A recent analysis of Gray's assessment of space power noted theoretical works on this subject should examine the interconnectedness and interdependence of different geographical environments within this domain. Gray noted that space is not a sanctuary and that militarily useful geographies will eventually be exploited and contested and that space warfare is a future certainty due to the essential use of space in military conflict. At the same time, Gray urged that space power fit within a joint warfighting framework and total wartime effort and that conflict in space must have terrestrial reference since only people can live on land. Finally, Gray urged that space power augments the effectiveness of air, sea, and land power with space power deciding the outcome of some conflicts. (Gray, 2005; Klein, 2021).

Everett Dolman of the Air Command and Staff College reinforces the reality of space as a warfighting domain noting that "the purpose of military space power should be to ensure access to space for all in peace and deny that access to opposing forces in conflict and war." He proceeds to provide this more detailed explanation of how important space power contending that attacks by air, land, and sea forces increasingly require space force support to work with precision and efficiently and that since an effective space attack is unlikely to directly and immediately harm people with a response on earth getting people killed lacks proportionately and reciprocity undermining the will to respond (Dolman, 2022).

He then makes the following assertion on how essential space power has become for the U.S.:

> Today, no state relies more on space power for its national strategy for its national security and economic well-being than the United States. Space provides an asymmetric advantage for America, its Allies, and its partners. If something were to occur take space away—some

> combination of solar flares, micrometeorite showers or hostile attacks, the resulting economic crisis would be globally crippling. Transportation and electrical power infrastructure would seize, international commerce and international finance would stop cold, and food production would plummet. America's ability to project force abroad would, at least temporarily, halt. (Dolman, 2022)

Steve Lambakis also notes the U.S. heavy dependence on space, the emergence of China and Russia as space power competitors with the ability and will to hold U.S. and allied space systems at risk by developing anti-satellite missiles and directed energy weapons to target U.S. assets, documents such as *National Defense Strategy* and *Missile Defense Review* noting the imperative to develop resilient and survivable infrastructures to protect U.S. space capabilities and include layered missile defenses and disruptive theater capabilities for theater and strategic missile threats to the U.S. homeland, demonstrating to adversaries that the U.S. has the will to use its capabilities and retaliate against hostile attacks, and that this reality must be reflected in a bipartisan manner to help promote the reality of U.S. military space posture to domestic and international audiences, with transparency of such information and restricting overclassification of such information being key public policy imperatives (Lambakis, 2022).

This assessment should introduce readers to the growing variety of U.S. government civilian and military space policy and doctrinal documents. Expenditures on USSF and other space policy agencies are likely to continue increasing. An October 2023 Congressional Budget Office (CBO) report notes that annual Air Force acquisition costs (including USSF) will average $91 billion between 2024–2028 and these costs are projected to increase from $92 billion in 2028 to $96 billion by 2031. This document notes that cost estimates for future space systems and command and control systems are particularly uncertain. Unknown costs for USSF involve satellite constellations providing varying capabilities including communications, missile defense, reconnaissance, and surveillance, and tracking ground targets with such plans likely to be costly (Congressional Budget Office, 2023).

Substantive and reliable examinations of Chinese and Russian military space policy strategy and doctrine are available from sources outside these countries. The U.S. China Economic and Security Review Commission in 2020 determined that large Chinese investments in space and counterspace capabilities may prove detrimental to U.S. space assets and military usefulness. China's pursuit of military space superiority harms U.S. economic competitiveness, and asserts Chinese military writings emphasize that space warfighting missions and scenarios are national priorities on which future joint military operations will rely (Stokes, 2020).

A 2023 report from the Center for Naval Analyses (CAN) documented

Russian use of space and counterspace capabilities in its war against Ukraine. This assessment notes that Russia believes that controlling access to space-based information confers enormous advantage through increased situational awareness and warfighting capability allowing the conduct of long-range military operations and cross domain attacks to disorient and disorganize adversaries and leave them vulnerable to defeat. Russian forces have attempted to disrupt Ukrainian forces command and control by cyberattacking the Viasat-KA-SAT satellite network, may have attacked Space X Starlink constellation, and by increasing development and production of earth observation, electronic intelligence, and communication satellites while acknowledging that these efforts are dwarfed by Space X and other western companies supporting Ukraine (Connell, 2023).

Future research directions in military space strategic and doctrinal literature can include the roles of public-private partnerships involving the U.S. and other countries in developing requisite military infrastructure, the financial costs of such development, the impact of space debris, satellite communications disruption, how these countries will cope with evolving military strategic objectives and technologies, legislative oversight of such programs, what role national and international law may play in developing and implementing military space strategy and doctrine, and how countries will develop and sustain narratives to support military operations in space. Some of these topics are already addressed in existing literature (Suess, 2021; Burke, 2020; Burke 2023; Wood, 2021).

Civilian space policy and strategy literature and military space doctrinal literature will continually evolve in subsequent years. Those interested in the future directions of U.S. civil and military space policy must regularly consult these resources and communicate their views on this material to their congressional representatives to express their views on this subject which has become critically important to the U.S. economy and national security and to individual and societal communication, economic, financial, and transportation requirements.

References

Blankenship, B. (2024). "Air University launches Space Force track at SOS." Air University Public Affairs, https://www.airuniversity.af.edu/News/Display/Article/3631625/air-university-launches-space-force-track-at-sos/ (January 4): 1-2; Accessed January 10, 2024.

Burke, E.J., Gunness, K. Cooper III, C.A., & Cozad, M. (2020). *People's Liberation Army operational concepts*. Santa Monica, CA: The Rand Corporation, https://www.rand.org/pubs/research_reports/RRA394-1.html; Accessed January 9, 2024.

Burke, K. (2023). *PLA counterspace command and control*. Montgomery, AL: Air University China Aerospace Studies Institute, https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/PLASSF/2023-12-11%20Counterspace-%20web%20version.pdf; Accessed January 9, 2024.

Carlson, Katharine E. (2018). "Precision language for precision fires: An alternative to lethal and non-lethal labels." *Marine Corps Gazette* (December): 52–55.

Center for International Maritime Security. (2020). *Naval Doctrine Publication 1: Naval Warfare.* Silver Spring, MD: Center for International Maritime Security, https://cimsec.org/wp-content/uploads/2020/08/NDP1_April2020.pdf; 2, 9, 29-30, 33, 73; Accessed October 19, 2023.

Chapman, B. (2009). *Military doctrine: A reference handbook*. Santa Barbara: Praeger Security International.

Clerk, U.S. House of Representatives. (2023). *Reports to be made to Congress.* House Document 118-4, Washington, D.C.: Government Publishing Office, https://www.govinfo.gov/content/pkg/CDOC-118hdoc4/pdf/CDOC-118hdoc4.pdf; Accessed October 13, 2023.

Congressional Budget Office. (2023). *Long-yerm implications of the 2024 Future Years Defense Program*. Washington, D.C.: CBO, https://www.cbo.gov/system/files/2023-10/59511-FYDP.pdf; 17, 19, 20; Accessed October 26, 2023.

Congressional Record, (2022). July 13, H6121-6122; https://www.govinfo.gov/content/pkg/CREC-2022-07-13/pdf/CREC-2022-07-13-pt1-PgH6025-3.pdf; Accessed October 24, 2023.

Connell, M., Bemdett, S., & Lennox, B. (2023). *The role of space in Russia's operations in Ukraine*. Washington, D.C.: Center for Naval Analyses, https://www.cna.org/reports/2023/11/Role-of-Space-in-Russias-Operations-in-Ukraine.pdf; 1, 14-15, 18; Accessed January 9, 2024.

Department of Defense. (2022(a)). *2022 National Defense Strategy of the United States of America Including the 2022 Nuclear Posture Review and the 2022 Missile Defense Review.* Washington, DC: DOD, https://purl.fdlp.gov/GPO/gpo188301; 4–6, 17, 20–22, 6–9. Accessed October 16, 2023. These reports have separate paginations and the final page reference is from the *Missile Defense Review*.

Department of Defense. (2022(b)). *DOD Directive 3100.10 Space Policy*, Washington, D.C.: DOD, https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodd/310010p.PDF; 3; Accessed October 16, 2023.

Department of Defense. (2023). *Space Policy review and strategy on protection of satellites*. Washington, D.C.: DOD https://media.defense.gov/2023/Sep/14/2003301146/-1/-1/0/COMPREHENSIVE-REPORT-FOR-RELEASE.PDF; 1–3, 13; Accessed October 13, 2023.

Dolman, E.C. (2022). "Space is a warfighting domain." *Aether: A Journal of Strategic Airpower & Spacepower* (Spring 2022) *1*(1): 86, 89–90; https://www.airuniversity.af.edu/Portals/10/AEtherJournal/Journals/Volume-1_Issue-1/11-Dolman.pdf, Accessed October 30, 2021

Gray, C.S. (1996). "The Influence of Space Power Upon History." *Comparative Strategy*, *15*(4): 293, 299; https://www.tandfonline.com/doi/abs/10.1080/01495939608403082; Accessed October 26, 2023.

Gray C.S. (2005). Another Bloody Century: Future Warfare. London: Weidenfeld & Nicolson, 307.

Joint Chiefs of Staff Instruction 3225.01B Procedures for Management of Illumination of Objects in Space (2023). Washington, D.C.: Joint Chiefs of Staff, https://www.jcs.mil/Portals/36/Documents/Library/Instructions/CJCSI%203225.01B.pdf; 1-2; Accessed October 18, 2023.

Joint Publication 3-14: Space Operations. (2020). Washington, D.C.: Joint Electronic Library, https://irp.fas.org/doddir/dod/jp3_14.pdf; vii–viii, ix–xi. Accessed October 18, 2023.

Joint Staff. (2019). *Joint Doctrine Note 1-19: Competition continuum*. Washington, D.C.: Joint Staff, https://www.jcs.mil/Portals/36/Documents/Doctrine/jdn_jg/jdn1_19.pdf; v, Accessed October 24, 2023.

Joint Staff. (2023). Washington, D.C.: Joint Staff, https://www.jcs.mil/About/; 1; Accessed October 18, 2023.

Klein, J.J. (2021). "Some lessons on spacepower from Colin Gray." *Naval War College Review*, *74*(1)(Winter 2021): 45–54; https://digital-commons.usnwc.edu/cgi/viewcontent.cgi?article=8164&context=nwc-review; Accessed October 26, 2023.

Lambakis, S. (2022). "Space as a warfighting domain: Reshaping policy to execute 21st century spacepower." *Comparative Strategy*, *41*(4): 331–369, https://www.tandfonline.com/doi/full/10.1080/01495933.2022.2087419

McDonald, Mark J. (2019). "The space warfighting domain: Is Marine Corps intelligence ready?" *Marine Corps Gazette* (September): 26–29.

Marchsteiner, K.E. (2021). *Strategies for identifying reporting requirements and submitted reporting to Congress*. Washington, D.C.: Library of Congress, Congressional Research Service, https://crsreports.congress.gov/product/pdf/R/R46661; Accessed October 13, 2023.

National Security Strategy of the United States. (2022). Washington, D.C.: The White House, https://purl.fdlp.gov/GPO/gpo187710; 12, 21–22, 26, 45; Accessed October 13, 2023.

President Donald Trump. (2020). *National Space Policy of the United States of America*. Washington, D.C.: Executive Office of the President, https://purl.fdlp.gov/GPO/gpo148849; 1–3; Accessed October 13, 2023.

President Joe Biden. (2021). *United States space priorities framework*. Washington, D.C.: The White House, https://purl.fdlp.gov/GPO/gpo193490; 1–7; Accessed October 13, 2023.

Public Law 117-263. (2022). *James M. Inhofe National Defense Authorization Act for Fiscal Year 2023*. https://www.govinfo.gov/content/pkg/PLAW-117publ263/pdf/PLAW-117publ263.pdf#page=1283, 3677–3683; Accessed October 13, 2023.

Stokes, M., Alvarado, G., Weinstein, E., Easton, I. (2020). *China's space and counterspace activities*. Washington, D.C.: U.S-China Economic and Security Review Commission, 3, 13; https://purl.fdlp.gov/GPO/gpo154588; Accessed January 9, 2024.

Suess, J. (2021). "Space and the future of war according to Russia." (London: Royal United Services Institute, https://www.rusi.org/explore-our-research/publications/commentary/space-and-future-war-according-russia; Accessed January 9, 2024.

U.S. Air Force. (2018). *Counterspace operations: Air Force doctrine publication 3-14*. Maxwell Air Force Base, AL; https://www.doctrine.af.mil/Portals/61/documents/AFDP_3-14/AFDP-3-14-Counterspace-Ops.pdf; 2–3, 5–38; Accessed October 16, 2023.

U.S. Army. (2017). *Army Regulation 900-1: Department of the Army space policy*. Washington, D.C.: Headquarters, Department of the Army, 1, 5–6; https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/ARN596_AR900-1_Final.pdf; Accessed October 17, 2023.

U.S. Army. (2019). *FM 3-14 Army Space Operations*. Washington, D.C.: Headquarters, Department of the Army, v, 3–14; 4–4 to 4–5; https://armypubs.army.mil/

epubs/DR_pubs/DR_a/pdf/web/ARN19639_FM%203-14%20FINAL%20WEB.pdf; Accessed October 17, 2023.

U.S. Coast Guard. (2023). *Commandant Instruction 16601.11A: Space launch and reentry activities affecting the marine transportation system*. Washington, D.C.: U.S. Coast Guard, 1-2, 10, 15; https://media.defense.gov/2023/Sep/29/2003311184/-1/-1/0/CI_16601_11A.PDF; Accessed October 17, 2023.

U.S. Congress, Senate Committee on Armed Services. Subcommittee on Strategic Forces. (2021). *Military space operations, policies, and programs*. Washington, D.C.: GPO, 1–2, 7–8, 19–20, 62–63; https://www.govinfo.gov/content/pkg/CHRG-116shrg46157/pdf/CHRG-116shrg46157.pdf; Accessed October 24, 2023.

U.S. Government Publishing Office. (2023). *A guide for federal agencies to comply with the access to Congressionally Mandated Reports Act*. Washington, D.C.: GPO, https://www.gpo.gov/how-to-work-with-us/agency/congressionally-mandated-reports; Accessed October 13, 2023.

U.S. Marine Corps. (2009). *Marine Corps Order 5400.53: Marine Corps space policy*. Washington, D.C.: United States Marine Corps, https://www.hqmc.marines.mil/Portals/133/Docs/MCO%205400.53.pdf; 1–2; Accessed October 18, 2023.

U.S. Navy. (2018). *Education for seapower: Final report.* Washington, D.C:. Department of the Navy, https://purl.fdlp.gov/GPO/gpo133022; 7, 15, 64, 96, 97, 180, 199–200, 404; Accessed October 19, 2023.

U.S. Navy. (2020). *Advantage at sea: Prevailing with integrated all-domain naval power*, Washington, D.C.: Department of the Navy, https://purl.fdlp.gov/GPO/gpo150136; 3, 6–7, 13–14, 18, 21; Accessed October 19, 2023.

U.S. Space Force. (2020). *Spacepower: Doctrine for space forces*, Washington, D.C.: U.S. Space Force, https://purl.fdlp.gov/GPO/gpo143383; iv, vi–vii; Accessed October 20, 2023.

U.S. Space Force. (2021). *Space Doctrine Publication 5-0: Planning doctrine for space forces*, Washington, D.C.: U.S. Space Force, https://media.defense.gov/2022/Jan/19/2002924107/-1/-1/0/SDP%205-0,%20PLANNING%20(20%20DEC%202021).PDF; 1, 12–30; Accessed October 24, 2023.

U.S. Space Force. (2022(a)). *Space Doctrine Publication 1-0: Personnel doctrine for space forces*. Washington, D.C.: U.S. Space Force, https://www.starcom.spaceforce.mil/Portals/2/SDP%201-0%20Personnel%207%20September%202022.

pdf?ver=erudfM8rwArAPlxplIu47g%3d%3d; 6–7, 12–13. Accessed October20, 2023.

U.S. Space Force. (2022(b)). *Space Doctrine Publication 4-0: Sustainment doctrine for space forces*. Washington, D.C.: USSSF, https://www.starcom.spaceforce.mil/Portals/2/SDP%204-0%20Sustainment%20(Signed).pdf?ver=jFc_4BiAkDjJdc49LmESgg%3d%3d; 2, 4, 8–9, 17–20. Accessed October 24, 2023.

U.S. Space Force. (2023(a)). *Space Doctrine Publication 2-0: Intelligence doctrine for space* forces, Washington, D.C.: USSF, https://www.starcom.spaceforce.mil/Portals/2/SDP%202-0%20Intelligence%20(19%20July%202023).pdf?ver=-G44px6uvwU3vIkE4R5jWw%3d%3d0; 10–12; Accessed October 23, 2023.

United States Space Force. (2023(b)). *Space Doctrine Publication 3-0: Operations doctrine for space forces*. Washington, D.C.: USSF, https://www.starcom.spaceforce.mil/Portals/2/SDP%203-0%20Operations%20(19%20July%202023).pdf?ver=nHRhKpy49XVtcSVRaQRNNg%3d%3d; 2; 7–12, 14–15. Accessed October 23, 2023.

Wood, P., Stone, A., & Lee, T.A. (2021). *China's ground segment: Building the pillars of a great space power*. Montgomery, AL: Air University China's Aerospace Studies Institute, https://purl.fdlp.gov/GPO/gpo153785; Accessed January 9, 2024.