Joint Publication 3-14

Joint Space Operations

23 August 2023

PREFACE

1. Scope

This publication describes how to plan, execute, and assess joint space operations.

2. Purpose

This publication has been prepared under the direction of the Chairman of the Joint Chiefs of Staff (CJCS). It sets forth joint doctrine to govern the activities and performance of the Armed Forces of the United States in joint operations, and it provides considerations for military interaction with governmental and nongovernmental agencies, multinational forces, and other interorganizational partners. It provides military guidance for the exercise of authority by combatant commanders and other joint force commanders (JFCs) and prescribes joint doctrine for operations and training. It provides military guidance for use by the Armed Forces of the United States in preparing and executing their plans and orders. It is not the intent of this publication to restrict the authority of the JFC from organizing the force and executing the mission in a manner the JFC deems most appropriate to ensure unity of effort in the achievement of objectives.

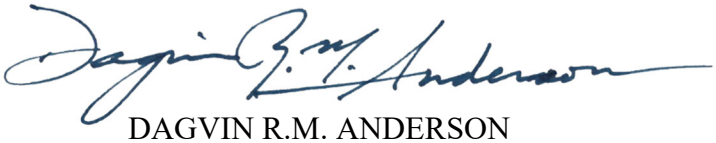
3. Application

a. Joint doctrine established in this publication applies to the Joint Staff, combatant commands, subordinate unified commands, joint task forces, subordinate components of these commands, the Services, the National Guard Bureau, and combat support agencies.

b. This doctrine constitutes official advice concerning the enclosed subject matter; however, the judgment of the commander is paramount in all situations.

c. If conflicts arise between the contents of this publication and the contents of Service publications, this publication takes precedence unless the CJCS, normally in coordination with the other members of the Joint Chiefs of Staff, has provided more current and specific guidance, or the Secretary of Defense has directed otherwise. Commanders of forces operating as part of a multinational (alliance or coalition) military command should follow multinational doctrine and procedures ratified by the United States unless they conflict with this guidance. For doctrine and procedures not ratified by the United States, commanders should evaluate and follow the multinational command's doctrine and procedures, where applicable and consistent with United States law, regulations, and doctrine.

For the Chairman of the Joint Chiefs of Staff:



DAGVIN R.M. ANDERSON
Lieutenant General, U.S. Air Force
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SUMMARY OF CHANGES
REVISION OF JOINT PUBLICATION 3-14
DATED 10 APRIL 2018

- **Expands the description of United States Space Command's (USSPACECOM's) area of responsibility characteristics, including astrographic boundaries for coordination.**

- **Reflects responsibilities for missile defense transferred from United States Strategic Command to USSPACECOM.**

- **Introduces United States Space Force component field commands as Service components to combatant commands.**

- **Introduces offensive and defensive space operations which deny enemy freedom of action by destroying, temporarily disrupting, or partially degrading enemy space forces.**

- **Removes space control, space coordinating authority, space negation, and counterspace.**

- **Updates the definition of space domain awareness and space situational awareness.**

- **Expands discussion on space mission areas to include direct and enabling capabilities.**

- **Updates each Service's contributions to joint space operations.**

- **Updates terms and definitions.**

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Overview of Joint Space Operations

General

The rapid evolution of space infrastructure, improvements in technologies, technology transfers, and globalization of services have led to the development and proliferation of advanced space systems across the commercial, civil, and national security sectors. Space is no longer used by only the most technologically advanced countries. Nation-states, non-state actors, economies, and individuals across the world are increasingly dependent on capabilities provided by space technology.

Space Operational Environment

The space domain is the area above the altitude where atmospheric effects on airborne objects become negligible. Like the air, land, and maritime domains, space is a physical domain where military, civil, and commercial activities are conducted. Space is a medium in, from, and to which activities are conducted to cause or enable actions throughout an operational environment (OE). Space activities and operations may create effects in other domains, and activities and operations in other domains may create effects in space.

Benefits of Access to Space

Space operations support and enable joint forces' regional and global operations. Space capabilities provide nearly worldwide coverage and access to otherwise inaccessible areas. Joint operations across the competition continuum are enabled by assured access to

space. Loss of space capabilities would be detrimental to the United States and its allies and adversaries alike.

Threats, Hazards, and Vulnerabilities in Space Operations

The space domain is a naturally hazardous environment and is increasingly congested, contested, and competitive. Space operations face intentional and unintentional threats and naturally occurring hazards impacting joint operations.

Segments of Space Operations

Space operations conducted across the competition continuum enable freedom of action for the joint force. Space forces consist of orbital and terrestrial systems, equipment, personnel, and support necessary to directly or indirectly impact joint operations. Space systems consist of three interdependent segments: orbital, link, and terrestrial.

Space Superiority

Space superiority is the degree of control in the space domain of one force over another that permits freedom of access and action without prohibitive interference from an adversary and, as required, simultaneously denies an adversary's freedom of access and action. Offensive space operations, which include the suppression of enemy space capabilities, contribute to the denial of an adversary's freedom of access and action in space and increase the United States' relative degree of control.

Command and Control of Joint Space Operations

General

Commander, United States Space Command (USSPACECOM), advocates, plans, and executes military space operations and prioritizes, deconflicts, integrates, and synchronizes military space operations with current and planned joint operations. A combatant commander (CCDR) may choose to designate a joint force space component commander, delegate the responsibilities to a Service component, or retain the responsibility for command and control and coordination of specific space requirements, functions, capabilities, and requests.

Command Relationships

The Secretary of Defense establishes support relationships among CCDRs for the planning and execution of joint operations. A supported CCDR requests forces, tasks supporting Department of Defense components, coordinates with the appropriate United

States Government departments and agencies, and develops a plan to achieve the objective. Supporting CCDRs provide the requested forces, as approved by the Secretary of Defense, to assist the supported CCDR to accomplish missions requiring additional resources.

USSPACECOM provides key space capabilities to other combatant commands (CCMDs), as well as receives simultaneous support and defenses for space forces. This mutual support requires a fluid use of support relationships with guidance from the Secretary of Defense.

Combatant Commanders

Commander, USSPACECOM, exercises combatant command (command authority) over assigned joint space forces to ensure availability of space capabilities to the joint force by leveraging commercial, intelligence community, and Department of Defense assets. Commander, USSPACECOM, plans, coordinates, integrates, synchronizes, assesses, and, as directed, executes global offensive and defensive space operations in coordination with or in support of other CCMDs, the Services, United States Government departments and agencies, allies and partners, and other entities. These operations can occur in any domain or through the electromagnetic spectrum.

CCDRs, in coordination with USSPACECOM, have the authority to use assigned or attached joint space forces to best accomplish their assigned mission in accordance with established orders. Space forces directly supporting a CCDR's daily operations are usually limited in number. The United States Space Force and USSPACECOM facilitate the integration of space into CCMDs.

Services

The United States Space Force organizes, trains, and equips space forces to further United States' national security objectives. Alongside the other Services, it provides the space forces needed to support CCDR- and joint force commander-level missions across the competition continuum.

The United States Army conducts and supports space operations by leveraging capabilities for joint land

operations to integrate space capabilities across all echelons and all joint functions.

The United States Marine Corps integrates space capabilities for use in decentralized combined arms operations, providing strategic agility and tactical flexibility over an adversary during operations conducted by a Marine air-ground task force.

The United States Navy supports space operations and contributes to the achievement of space superiority through Navy Space Command under Fleet Cyber Command.

When required, United States Air Force forces suppress threats against space systems operating outside the space domain and serve as critical enablers of space operations.

The Air National Guard and Army National Guard provide space electromagnetic warfare, missile warning, satellite communications, and spacecraft control squadrons to support United States Space Force, USSPACECOM, and National Reconnaissance Office activities.

Joint and Combined Operations

Space operations and resources are inherent in, and often technologically integrated with, joint and Service-specific capabilities. A common understanding of how space operations and capabilities integrate with joint operations is required to effectively utilize space capabilities and achieve joint force commander objectives.

Planning and Assessment of Joint Space Operations

Joint Space Operations Planning Overview

Space operations planning has unique factors to consider that begin with understanding the OE; the threats and hazards; and United States, adversary, and other relevant actors' goals, intents, capabilities, and limitations. Space capabilities should be thoroughly integrated into every aspect of joint planning. Early integration and planning, before operations begin, ensures the joint force is effectively postured and prepared. This includes the prioritization of security and defense critical assets. Understanding the constraints of the OE (e.g., orbital dynamics), the multiplicity of participants (Department

of Defense; intelligence community; other United States Government departments and agencies; allied, commercial, and foreign partners; competitors and adversaries), and command and control and cooperative relationships is imperative to developing space strategies and plans and conducting operations.

Joint Planning Process

Commanders direct the planning process and should continuously participate in the process to provide guidance. The planner develops possible solutions to a problem presented in strategic or commander's guidance. Commanders coordinate space operations through plans and orders at all levels of the competition continuum. Plans should address how, when, and where to effectively perform space missions, integrate space capabilities with other systems, optimize use of limited joint space forces, protect and defend joint space forces, consolidate operational requirements for joint space forces, and, as directed, counter an adversary's use of space.

Key Planning Considerations

Planning considerations for joint space operations include:

- National Space Policy.
- Department of Defense Space Policy.
- Defense Space Strategy.
- Legal Considerations.
- Agreements with Allies, Partners, and Others.

Joint Fires Planning

Joint fires applied to space operations is inherently multi-domain and global in nature, requiring cross-CCMD, interagency, allied, and partner nation coordination. To achieve objectives, planners should consider a broad range of options, to include lethal fires on terrestrial targets, the integration of information activities, and leveraging (or advocating for) United States and allied government diplomatic and economic resources.

Plans and Orders

Space operations planners issue various products during planning to feed the joint targeting cycle. For instance, the space operations directive captures Commander, USSPACECOM's, guidance and intent. The space operations directive conveys prioritization and apportionment guidance focused on the applicable

execution period. This is then used to form the master space plan. The master space plan is used to allocate resources to each desired effect and serves as the source to generate unit tasking and coordination. Similar to the air tasking order, the combined space tasking order assigns missions and resources to forces.

Joint Space Operations Assessment Process

The assessment of space operations nests within the larger operational assessment of the supported campaign or operation. When space operations constitute the main effort of an operation, the assessment provides feedback to USSPACECOM concerning the effectiveness in achieving the required objectives. Other CCMDs, partners, and allies support space operations assessments by providing any requested data to help assess mission success or failure. A collaborative effort across the joint force supporting assessment makes the process efficient with comprehensive, timely, and effective products for the commander.

Space Mission Areas

General

Due to the complexities of the OE, the required integration and synchronization between elements of the joint force, and the degree to which space capabilities enable the joint functions, a shared understanding of selected aspects of specific space capabilities and their interactions is essential to foster and enhance unified actions.

Space Domain Awareness

Space domain awareness (SDA), primarily supported by enabling capabilities, is a timely, relevant, and actionable understanding of the OE. SDA allows military forces to plan, integrate, execute, and assess space operations. SDA is achieved through the integration of intelligence, surveillance, and reconnaissance; environmental monitoring; and friendly force tracking. SDA goes beyond space surveillance (object tracking and characterization), to include understanding intent, motive, predicted actions across the terrestrial and link segments. SDA incorporates multiple intelligence and information capabilities, including terrestrial and space-based surveillance, space and terrestrial weather, and information and data-sharing capabilities. Operators, users, and decision makers obtain SDA through a timely appreciation of

factors and actors—including friendly, adversary, and third party—affecting all the joint functions.

Offensive and Defensive Space Operations

Offensive and defensive space operations, primarily supported by direct capabilities, use a broad range of measures to provide continued, sustainable use of space; deter adversaries; attribute attacks; and support the inherent right to self-defense. Offensive and defensive space operations can be active or passive, lethal or nonlethal, reversible or nonreversible, and occur in any segment of a space system. Offensive and defensive space operations, including navigation warfare, enable freedom of action in space and counter efforts to interfere with or attack space forces of the United States, allies, or commercial partners.

Positioning, Navigation, and Timing

Positioning, navigation, and timing, primarily supported by enabling capabilities, provide precise and accurate location, navigation, and time reference services. Positioning, navigation, and timing information enables most modern weapon systems and critical infrastructure. Several countries, including the United States, have developed spacecraft constellations that provide positioning, navigation, and timing services. This service can also be augmented by terrestrial assets to increase accuracy, precision, or coverage.

Intelligence, Surveillance, and Reconnaissance

Intelligence, surveillance, and reconnaissance, primarily supported by enabling capabilities, includes the collection of diverse intelligence data across political, military, economic, social, information, and infrastructure systems, providing decision makers with timely, accurate data for information that can create a decisive advantage across the competition continuum.

Satellite Communications

Satellite communications, primarily supported by enabling capabilities, provides global communications and data transmission to forces around the globe. Satellite communications provides national and strategic leadership with a means to maintain situational awareness and convey their intent to the operational commanders conducting joint operations.

Environmental Monitoring

Environmental monitoring, primarily supported by enabling capabilities, supports the joint force's understanding of the natural environment and is a key contributor to SDA. Space-based environmental

monitoring of phenomena in the space and terrestrial environment informs planning and the ability to assess the impact of natural environmental hazards and intentional threats to operations and capabilities.

Missile Warning

Missile warning, primarily supported by enabling capabilities, employs an architecture of ground-based and space-based sensors to protect joint forces and allies by providing early warning. Space-based and terrestrial space systems, correlation center command and control systems, and CCDR/national leadership decision support systems support time-critical event conferencing for decision makers.

Nuclear Detonation Detection

Nuclear detonation detection, primarily supported by enabling capabilities, consists of persistent, integrated sensors to provide global surveillance coverage.

Spacecraft Operations

Spacecraft operations, primarily supported by enabling capabilities, include telemetry, tracking, and commanding; movement and maneuver; monitoring state-of-health; and sustainment sub-functions. Spacecraft operations monitor onboard systems, transmit the status of those systems to the control segment on the ground, and receive and process instructions from the control segment.

Spacelift

Spacelift, primarily supported by enabling capabilities, delivers payloads (spacecraft or other materials) into space and, in some cases, enables the safe reentry and recovery of launch vehicles.

CONCLUSION

This publication describes how to plan, execute, and assess joint space operations.

CHAPTER I
OVERVIEW OF JOINT SPACE OPERATIONS

"Space activities are essential to our way of life. They advance our understanding of the Earth, the universe, and humanity; enable US national security; create good jobs and economic opportunity; enhance our health and well-being; and inspire us to pursue our dreams. Space capabilities provide critical data, products, and services that drive innovation in the United States and around the world. Access to and use of space is a vital national interest."

United States Space Priorities Framework, December 2021

1. General

a. In stark contrast to the modest beginnings of the Space Age, space is not only a critical domain, but it is contested, congested, and competitive. The rapid evolution of space infrastructure, improvements in technologies, technology transfers, and globalization of services have led to the development and proliferation of advanced space systems across the commercial, civil, and national security sectors. Space is no longer used by only the most technologically advanced countries. Nation-states, non-state actors, economies, and individuals across the world are increasingly dependent on capabilities provided by space technology. Space capabilities underpin infrastructures and services for activities such as environmental monitoring (EM), commerce, agriculture, transportation, humanitarian assistance, financial transactions, and national defense.

b. Adversaries continue to develop space programs or access space through public and private space organizations. These space programs continue to make significant advances in surveillance capabilities and offensive and defensive space activities that challenge the United States (US) and allied use of space. Adversaries are accessing, using, and observing space with increasingly capable and accurate space capabilities, which degrades US and allied freedom of action in space.

c. The proliferation of military, civil, academic, commercial, scientific, and multipurpose space activities presents unique and complex challenges for joint space operations. Anyone can increase their influence in regional or global events by accessing, purchasing, or leasing an expanding array of space capabilities, products, and applications at lower costs than developing their own space capabilities. While space continues to inspire innovation, the convergence of increasing reliance orbital congestion and aggressive competition for access and primacy in space highlights the value of space.

d. The *2020 National Space Policy of The United States of America* recognizes the benefits space provides for security, economics, and society: "the United States will continue to use space for national security activities, including to exercise the inherent right of self-defense. Unfettered access and freedom to operate in space is a vital national interest." The United States exercises the full range of unified action in space through all instruments of national power—diplomatic, informational, military, and economic—to

plan, direct, and execute space operations for public, commercial, and military uses. With these national instruments, the United States plans, directs, and executes space operations on behalf of public, commercial, and military needs. The joint force relies on space capabilities, and their integration and synchronization into joint operations increases the probability of success and decreases risk. Each Military Department contributes personnel to joint space forces.

e. While planning and executing operations, commanders should understand how space capabilities enhance their operations and how to integrate space forces. The joint force:

(1) Integrates space operations into other joint operations and the strategic framework for integrated defense.

(2) Defends space forces that are critical enablers of joint operations.

(3) Maintains the ability to deter, disrupt, or deny adversary use of space.

2. Space Operational Environment

a. **Space Domain.** The space domain is the area above the altitude where atmospheric effects on airborne objects become negligible. Like the air, land, and maritime domains, space is a physical domain where military, civil, and commercial activities are conducted. Space is a medium in, from, and to which activities are conducted to cause or enable actions throughout an operational environment (OE). Space activities and operations may create effects in other domains, and activities and operations in other domains may create effects in space. The characteristics and features of the space domain present unique challenges and opportunities to project power and achieve strategic objectives.

b. **United States Space Command (USSPACECOM) Area of Responsibility (AOR).** The USSPACECOM AOR is the area surrounding Earth at altitudes equal to or greater than 100 kilometers (54 nautical miles) above mean sea level, an astrographic boundary that is adjacent to every other AOR. At altitudes above 100 kilometers, it is difficult to sustain aerodynamic flight. Instead of aerodynamics, the laws of orbital physics characterize the position and movement of objects in the space AOR. The space AOR's range extends indefinitely, and the concept of key terrain within the AOR continues to change as technology and capabilities evolve.

The boundary between the United States Space Command's area of responsibility (AOR) and all other AORs is a type of astrographic boundary defined by altitudes rather than a nations' borders or latitude/longitudinal coordinates. While this example is one type of astrographic boundary using altitude only, other astrographic boundaries may define a three-dimensional area without adjacency to the Earth employing astrographic descriptors to ensure common understanding of the boundary required for coordination.

c. **Orbital Characteristics.** The laws of physics establish the orbital parameters that govern the position and movement of spacecraft. Spacecraft developers select the orbit type and parameters that provide the greatest benefit based on the purpose and capabilities of the spacecraft's mission. It is important to understand the unique characteristics of orbits to properly apply space capabilities. The four most common orbit types are discussed below (see Figure I-1).

(1) **Low Earth Orbit (LEO).** LEO is the region from the Earth's upper atmosphere to approximately 2,000 kilometers (1,080 nautical miles) above mean sea level. LEO is relatively close to the Earth, so LEO spacecraft have less latency for ground communications and achieve higher resolution terrestrial imagery with similar-sized apertures compared to spacecraft in higher orbits. LEO has the disadvantage of only being in the view of a ground user or station for a short period of time, which requires additional terrestrial or space-based relays to achieve continuous communications when the spacecraft is no longer in view. The advantages of LEO make it ideal for intelligence, surveillance, and reconnaissance (ISR); EM; and communications spacecraft. Continuous Earth coverage requires a constellation of spacecraft evenly spaced around the Earth in multiple orbital planes. The average time to orbit the Earth in LEO is approximately 90-100 minutes. Scientific instrument payloads and human space-flight missions also use LEO.

(2) **Medium Earth Orbit (MEO).** MEO has no formal altitude but is considered to include those orbits between LEO and geosynchronous earth orbit (GEO), approximately 2,000 to 35,780 kilometers (1,080 to 19,320 nautical miles) above mean sea level. A semi-synchronous orbit is a special orbit that is nearly circular in its path and repeats an identical ground trace after two revolutions in a 24-hour period. Semi-synchronous orbits are classified as MEO when they are nearly circular. MEO is ideal for global navigation satellite systems. MEO may also be used for communications.

(3) **Highly Elliptical Orbit (HEO).** HEO takes the shape of a long ellipse. At the most distant point from Earth (apogee), spacecraft in HEO are approximately 40,000 kilometers (21,600 nautical miles) above mean sea level. The satellite's closest point of approach (perigee) could be only a few hundred miles above the Earth's surface. HEO provides long dwell times near apogee. Spacecraft in HEO are typically highly inclined, with long dwell times over high latitudes. HEO dwell times in a 12-hour orbit are approximately 10 hours. Two satellites set in phased orbits can provide continuous high-latitude coverage, filling the polar coverage gaps of GEO spacecraft. HEO is ideally suited for communications, scientific, surveillance, missile warning, and EM missions over higher latitudes.

(4) **GEO.** GEO remains at a relatively fixed altitude of approximately 35,780 kilometers (19,320 nautical miles) above mean sea level, with an orbital period of approximately 24 hours, or essentially the same period as the Earth revolves around its axis. If inclined, the ground trace of a spacecraft in GEO makes a figure eight; the higher the inclination, the larger the figure eight. A geostationary orbit is a special type of GEO placed directly over the equator in a circular orbit, making a spacecraft appear to be in a

Orbital Paths

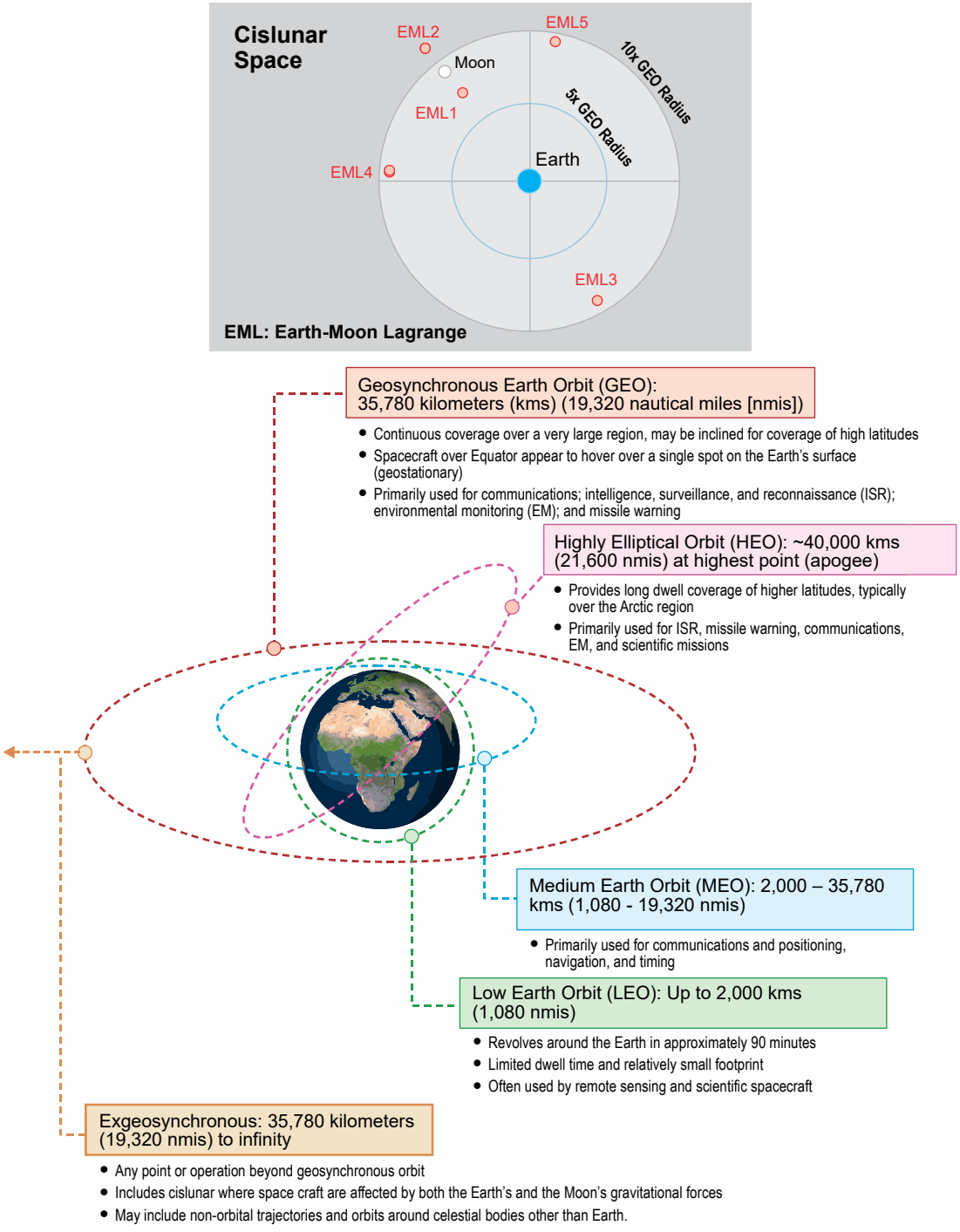

Figure I-1. Orbital Paths

fixed position in the sky to observers on the ground. GEO enables continuous line-of-sight observations within a very large footprint covering 42 percent of the Earth's surface. A

GEO footprint extends to 77-81 degrees of latitude; higher latitudes fall outside the footprint. With the exception of polar regions, GEO is ideal for worldwide communications, ISR, EM, and missile warning.

(5) **Additional Characteristics of the USSPACECOM AOR.** Nations are expanding space operations to the Moon and other celestial bodies (e.g., Mars). The United States, its allies, partners, and adversaries are identifying areas of key terrain that will become vital to space operations. Some areas of key terrain are Lagrange points, cislunar space, and exgeosynchronous orbits. Lagrange points are points where balanced gravitational forces of two large masses allow for spacecraft to hold a persistent and stable position reducing the fuel consumption needed to remain in position (e.g., Earth-Moon, Earth-Sun). Cislunar space incorporates Earth-Moon Lagrange points as well as all positions between lunar and geostationary orbits. Operations in cislunar space enable rapid expansion further into space. Lastly, exgeosynchronous is the area beyond GEO and includes non-orbital trajectories and orbits around celestial bodies other than Earth.

3. Benefits of Access to Space

a. **Operations.** Space operations support and enable joint forces' regional and global operations. Space capabilities provide nearly worldwide coverage and access to otherwise inaccessible areas. Joint operations across the competition continuum are enabled by assured access to space. Loss of space capabilities would be detrimental to the United States and its allies and adversaries alike.

b. **Freedom to Operate.** In accordance with international treaties, all nations have free access to outer space. The United States conducts joint and combined operations integrating the tenants of responsible space behavior to support establishing norms of behavior that promote unfettered access and freedom to operate in space. The development and proliferation of space technology amongst the international community and commercial entities are significant factors that shape United States Government (USG) efforts to preserve freedom to operate in space. The freedom to operate within the electromagnetic spectrum (EMS) is also required to communicate with and control spacecraft.

(1) **Global Perspective.** Space is often referred to as "the ultimate high ground" for the unparalleled vantage point it provides joint operations across the competition continuum. Since international agreements and treaties do not extend a nation's territorial boundaries into space, overflight restrictions do not apply to spacecraft in orbit around Earth. Access for military applications in space affords a global vantage point from which to assess large swaths of land, oceans, and air for strategic-, operational-, and tactical-level operations. This perspective makes space-based ISR; remote sensing; satellite communications (SATCOM); and positioning, navigation, and timing (PNT) advantageous alternatives to terrestrial-based options.

(2) **Agility.** Space operations enhance joint capabilities, such as communications or ISR, with greater speed, reach, and persistence compared to ground-based or airborne modalities. As priorities change, some space capabilities can be reallocated to the areas

where they are needed. As an example, in the event of increased operating tempo, available SATCOM bandwidth can be reallocated across a constellation to meet the highest-priority requirements.

(3) **Multi-User Capacity.** Space operations typically support multiple users simultaneously. Some systems, such as Global Positioning System (GPS), provide service to an unlimited number of users. The joint force can benefit from effects generated in space anywhere on the globe, in near real time.

4. Threats, Hazards, and Vulnerabilities in Space Operations

a. The space domain is a naturally hazardous environment and is increasingly congested, contested, and competitive. Space operations face intentional and unintentional threats and naturally occurring hazards impacting joint operations.

(1) **Congested.** A growing list of nations continue to develop space capabilities, including missile warning, geolocation and tracking, target identification, and navigation services for their citizens and armed forces. Space commercialization is also rapidly expanding as companies augment or replace government-provided activities, services, and capabilities. The resulting increase in the number of LEO spacecraft creates a congested environment and increases the probability of collisions between objects in LEO.

(2) **Contested.** Some nation-states have developed, tested, and deployed offensive and defensive space capabilities. Adversaries seek to develop and deploy space systems to improve their military effectiveness and reduce shared use of other nations' space capabilities. The prevalence of dual-use technologies (military and civilian applications) enables adversaries to contest assured access to space.

(3) **Competitive.** Adversaries are continually seeking strategic and operational advantages and to challenge the US position in the space domain. Adversaries position themselves as leading space powers, intent on creating new global space norms.

b. **Threats to Space Operations**

(1) **Threats.** Intentional threats are deliberate activities employed to disrupt, degrade, or destroy any of the three segments of space operations. Intentional attacks can be lethal or nonlethal, can originate in any domain, and can target space forces anywhere. Adversaries also seek information to exploit capabilities, limitations, and vulnerabilities.

(a) **Directed energy** threats include weapon systems operating in the EMS, such as lasers and radio frequency jammers that can temporarily disrupt, permanently degrade, or destroy space capability subsystems. Electromagnetic energy from terrestrial or space-based sources can support attacks on electronic components, as well as the link segment, including uplink, downlink, and crosslink signals.

(b) **Cyberspace attacks** may disrupt or degrade space-based or terrestrial-based command and control (C2) functions used to conduct or support spacecraft operations or to collect, process, and disseminate mission data.

(c) A **nuclear detonation (NUDET)** creates charged particles and presents an additional hazard to spacecraft not directly impacted by the initial detonation. The radiation generated by a detonation, particularly at high altitudes, could damage spacecraft components and shorten their effective operational lives from years to days. Due to the wide expansion of a NUDET's effects, specific spacecraft targeting is unnecessary, and collateral damage to other spacecraft is possible.

(d) An **electromagnetic pulse** induces damaging currents into unprotected (or insufficiently shielded) electronic components of spacecraft and equipment at terrestrial nodes. An intentional electromagnetic pulse can be generated by both nuclear and nonnuclear weapons, and its effects can range from disruption to destruction depending on the strength of the weapon and its proximity to the targeted system.

(e) **Physical attack** takes different forms, depending on the system component under attack. Antisatellite weapons are capable of destroying or degrading a spacecraft. More advanced antisatellite weapons could employ proximity operations and robotic arms to seize or damage target spacecraft. Physical attack on terrestrial nodes or links can include any destructive or disruptive attack on communications, personnel, or facilities.

(2) **Hazards**

(a) **Debris.** Increased congestion raises the possibility of collision, and the resulting debris could further congest valuable orbits for the foreseeable future. Attributing the cause of collisions and debris is problematic, introducing the potential for misinterpretation or deception.

(b) **Electromagnetic Interference.** All space operations rely on the EMS for C2, sensing, and information distribution. Electromagnetic interference and the demand placed on the EMS continue to grow as the number of spacecraft, users, and services increase. As the congestion in the space domain increases, so does the potential for signal interference.

(c) **Terrestrial Hazards and Interference.** Weather (rain, snow, clouds) can cause link segment degradation and disruption to SATCOM. Terrain features can also cause EMS interference due to hills, mountains, or buildings. Terrestrial hazards include damage caused to ground-based space forces from tornados, high winds, hurricanes, wildfires, cyclones, floods, lightning, earthquakes, tsunamis, landslides, volcanic activity, avalanches, and extreme hot or cold temperatures.

THREATS CREATED IN SPACE (INTENTIONAL AND UNINTENTIONAL)

Intentional: In January of 2007, China conducted an antisatellite (ASAT) test, which destroyed the aging Chinese weather spacecraft Feng Yun 1C.

Intentional: Russia conducted an ASAT test in November 2021, in which a Russian spacecraft was destroyed causing a debris field in which the International Space Station was forced to transit.

Unintentional: These tests created over 4,500 discrete pieces of debris that remain in low Earth orbit. The residual risks created by intentional threats in space will continue to pose a challenge to all space faring entities creating a hazard to spaceflight safety.

Various Sources

(d) **Space Hazards.** Geomagnetic storms or space weather are a phenomenon caused by events such as a sun coronal burst, solar flares, or ionospheric interference. The prolonged exposure of spacecraft to energetic charged particles from cosmic rays and radiation belts can also cause harm. Space hazards also include natural debris in the form of cosmic dust and meteoroids.

5. Segments of Space Operations

Space operations conducted across the competition continuum enable freedom of action for the joint force. Space forces consist of orbital and terrestrial systems, equipment, personnel, and support necessary to directly or indirectly impact joint operations. Space systems consist of three interdependent segments: orbital, link, and terrestrial.

a. **Orbital.** The orbital segment consists of spacecraft beyond Earth's atmosphere. Depending on the application, spacecraft can be remotely operated, crewed, or autonomous. Orbital segment operations include deploying spacecraft into a space operational area and maneuvering them into position. Maneuvers involve the use of propellant to change a spacecraft's predicted movement relative to other celestial bodies or spacecraft. Additional orbital operations may include spacecraft refueling, servicing, and repair.

b. **Link.** The link segment consists of signals connecting other segments using the EMS. The different links comprise ground-to-space (uplink), space-to-ground (downlink), and space-to-space (crosslink). This segment includes telemetry, tracking, and commanding (TT&C) signals necessary to control the spacecraft and its payload. Separate from the TT&C signals, the spacecraft payload may provide a direct downlink of data (e.g., imagery), SATCOM signals between two terminals on the ground, or a PNT signal. These activities require secure reliable access to the EMS to provide timely exchange of information to support joint operations.

c. **Terrestrial.** The terrestrial segment consists of personnel, facilities, and equipment that exist in the other physical domains (air, land, and maritime) that affect or are affected by the use of either orbital or link segments. The terrestrial segment includes personnel and equipment that utilize the link segment to control or receive information from spacecraft. Space forces use fixed or mobile platforms to conduct operations. Additionally, spacelift operations deploy spacecraft into the orbital segment to provide space-based capabilities. Range operations assure access to space during spacelift operations.

6. Space Superiority

a. **Space superiority** is the degree of control in the space domain of one force over another that permits freedom of access and action without prohibitive interference from an adversary and, as required, simultaneously denies an adversary's freedom of access and action. Offensive space operations, which include the suppression of enemy space capabilities, contribute to the denial of an adversary's freedom of access and action in space and increase the United States' relative degree of control. Space superiority enables the employment of space capabilities supporting joint operations in other domains to further the interests of the United States, allies, and partners.

b. **Space Mission Areas.** A space mission area is a category of similarly purposed operations, activities, and investments that support joint operations and global campaigns. Space mission areas (e.g., PNT) are broader than single capabilities (e.g., GPS). To gain space superiority requires the employment of resilient space forces with space or terrestrial capabilities to create effects, provide a service, or conduct missions across the space segments (orbital, link, terrestrial). Categorizing space activities into space mission areas clarifies how each activity contributes to gaining instances of space superiority or supporting the joint force.

c. **Space Capabilities.** A space capability is the ability of space forces to accomplish a mission or operation in, to, and from any space segment. **Direct capabilities** are fires which impact an adversary. **Enabling capabilities** do not inflict harm but serve as a force multiplier for friendly forces and support the potential of other instruments of national power.

For more information, see Chapter IV, "Space Mission Areas."

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CHAPTER II
COMMAND AND CONTROL OF JOINT SPACE OPERATIONS

"International partners provide systems and capabilities across the multi-domain spectrum. Space and cyberspace efforts focus on key areas, including but not limited to space domain awareness, rapid launch capabilities, improved ISR [intelligence, surveillance, and reconnaissance], enhanced environmental monitoring, and increased communications bandwidth."

General James H. Dickinson, Commander, United States Space Command, 5 November 2020

1. General

Clearly defined command relationships are crucial for ensuring timely and effective execution of space operations in support of combatant commander (CCDR) objectives. Commander, United States Space Command (CDRUSSPACECOM), advocates, plans, and executes military space operations and prioritizes, deconflicts, integrates, and synchronizes military space operations with current and planned joint operations. A CCDR may choose to designate a joint force space component commander (JFSCC), delegate the responsibilities to a Service component, or retain the responsibility for C2 and coordination of specific space requirements, functions, capabilities, and requests. It is essential that commanders and staff have a common understanding of command relationships to conduct space operations throughout the OE.

2. Command Relationships

a. The Secretary of Defense (SecDef) establishes support relationships among CCDRs for the planning and execution of joint operations. A supported CCDR requests forces, tasks supporting Department of Defense (DoD) components, coordinates with the appropriate USG departments and agencies, and develops a plan to achieve the objective. Supporting CCDRs provide the requested forces, as approved by SecDef, to assist the supported CCDR to accomplish missions requiring additional resources.

b. USSPACECOM provides key space capabilities to other combatant commands (CCMDs), as well as receives simultaneous support and defenses for space forces. This mutual support requires a fluid use of support relationships with guidance from SecDef. Due to the global nature of space operations, space forces are assigned to multiple CCDRs. SecDef approves the command relationships for each space operation through the global force management allocation process. CCDRs consider the following as potential responsibilities to supporting space operations:

(1) Establish specific joint and combined force guidance and objectives for space operations. This guidance is integrated into appropriate plans and orders.

(2) Nominate, plan, integrate, and coordinate space operations for the CCDR and between CCMDs.

(3) Protect space operations and forces.

(4) Coordinate with supporting USSPACECOM elements (e.g., joint integrated space teams [JISTs]) to provide cross-CCMD understanding and synchronize USSPACECOM's capabilities into other CCMDs' planning and operations. (See Figure II-1)

3. Combatant Commanders

a. CDRUSSPACECOM exercises combatant command (command authority) over assigned joint space forces to ensure availability of space capabilities to the joint force by leveraging commercial, intelligence community (IC), and DoD assets. CDRUSSPACECOM plans, coordinates, integrates, synchronizes, assesses, and, as directed, executes global offensive and defensive space operations in coordination with or in support of other CCMDs, the Services, USG departments and agencies, allies and partners, and other entities. These operations can occur in any domain or through the EMS. In addition to responsibilities common to all CCDRs with an assigned AOR, CDRUSSPACECOM has specific responsibilities.

(1) CDRUSSPACECOM secures and defends US and, as directed, allied, partner, and commercial critical space operational capabilities in the USSPACECOM AOR. CDRUSSPACECOM serves as the DoD manager for human space flight operations. CDRUSSPACECOM provides warning and assessment of attack on space forces, defends on-orbit space forces and associated data links, and coordinates with other CCDRs for defense of USSPACECOM forces. CDRUSSPACECOM advocates for space operations

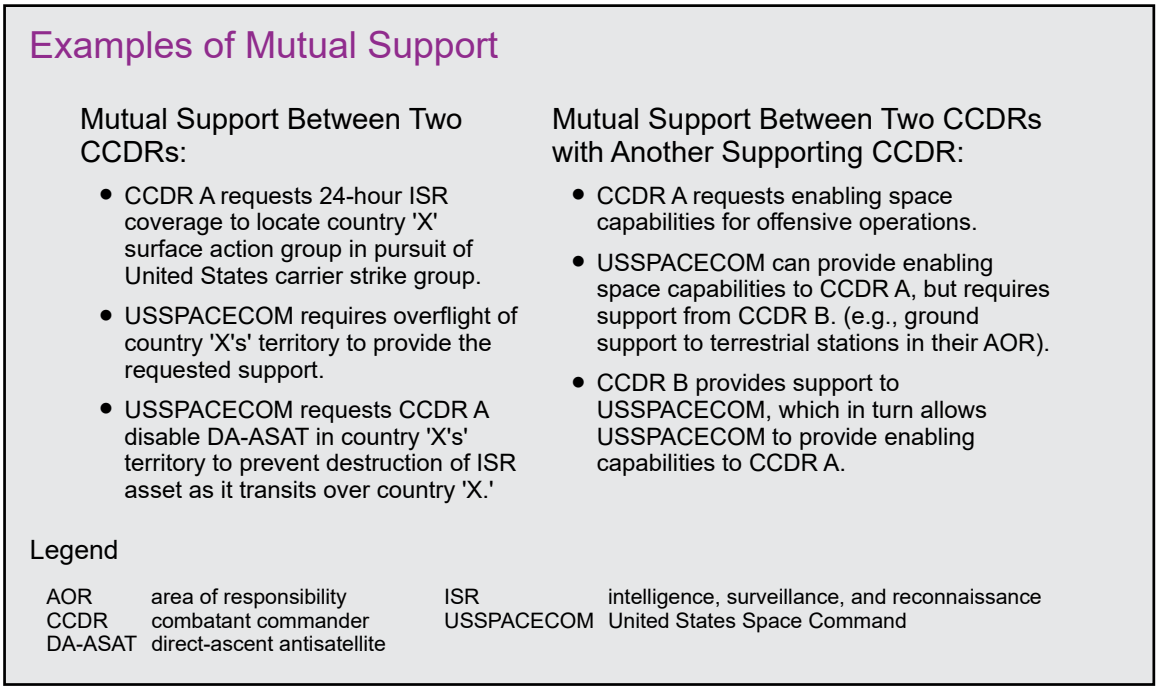

Figure II-1. Examples of Mutual Support

capabilities in coordination with other CCMDs and provides space capabilities to CCMDs, allies, partners, and other entities, as directed.

(2) Global Sensor Manager. CDRUSSPACECOM plans and manages DoD space capabilities to conduct operations that support space domain awareness (SDA), missile warning and missile defense, transregional networks, and associated C2. CDRUSSPACECOM synchronizes, integrates, and provides operational sensor information to other CCDRs, international partners, and other entities, and coordinates with CCDRs and other USG departments and agencies for support from other sensors.

(3) Global SATCOM Operations Manager. CDRUSSPACECOM plans, manages, allocates, and executes DoD SATCOM (narrowband, wideband, protected, and leased commercial) in support of other CCDRs, USG departments and agencies, international partners, and other entities.

(4) Transregional Missile Defense. CDRUSSPACECOM conducts transregional missile defense planning and operations in coordination with other CCDRs, the Services, and as directed, appropriate USG departments and agencies, allies, and partners; supports assessment of missile defense operational capabilities; and ensures continuity of operations.

(5) Space Joint Force Provider. CDRUSSPACECOM identifies and recommends joint space sourcing solutions to the Chairman of the Joint Chiefs of Staff in coordination with the Services and other CCDRs and supervises the implementation of sourcing decisions.

b. CCDRs, in coordination with USSPACECOM, have the authority to use assigned or attached joint space forces to best accomplish their assigned mission in accordance with established orders. Space forces directly supporting a CCDR's daily operations are usually limited in number. The United States Space Force (USSF) and USSPACECOM facilitate the integration of space into CCMDs via two mutually supporting constructs. The USSF organizes, trains, equips, and presents Service components to CCMDs, at their request, to support operations. USSPACECOM forms JISTs to facilitate CCMD-level planning and execution to optimize supporting and supported relationships and activities between USSPACECOM and other CCMDs. A USSPACECOM JIST, co-located within each CCMD, provides additional advice on the employment of USSPACECOM capabilities and assistance with leveraging those capabilities.

c. Subordinate joint force commanders (JFCs) and component commanders request space operations and capabilities specific to their mission during the planning process. The JFC requests space support via the request for forces and request for capability processes. Appropriate command relationships for CCDR-attached space forces are coordinated between the CCDR and CDRUSSPACECOM and are typically documented in a SecDef-approved order. USSPACECOM coordinates other CCDR support to conduct operations for mitigation or elimination of threats to space systems. In these cases, CDRUSSPACECOM is typically the supported commander for protection of friendly

space operations and capabilities (e.g., a terrestrial-based threat to space capabilities), while another CCDR is the supported commander for all other operations. Synchronizing the capabilities and mitigating limitations of the joint space force is critical to achieving unity of effort. Joint space forces need to be integrated through a whole-of-government approach to meet US national security objectives.

d. A CCDR considering options for C2 of their assigned or attached space forces and facilitating coordination with USSPACECOM may choose to designate a JFSCC, delegate the responsibilities to a Service component, or retain the responsibility. The CCDR considers the mission, capabilities, and component with the preponderance of forces needed to achieve strategic objectives when deciding C2 options. The JFSCC may come from one of the assigned component commanders, including the commander, Space Force forces (if assigned). If only one Service presents space forces to the CCMD, the CCDR may choose to conduct C2 of space operations via that Service component commander in coordination with USSPACECOM.

e. If the CCDR delegates space C2 responsibilities, the JFSCC or designated component commander is responsible for integrating, synchronizing, and coordinating effects in space with the CCMD's operations. This includes exercising C2 over assigned and attached space forces and ensuring operations in, from, or to the USSPACECOM AOR are coordinated with USSPACECOM. Additional responsibilities include prioritizing and adjudicating intra-theater support requests to USSPACECOM and the Joint Staff based on CCDR objectives. This may include advocating for request for forces, request for support, and global force management actions.

f. JISTs are integrated within other CCMDs as CDRUSSPACECOM's liaison. JISTs synchronize space-related force requirements, C2, intelligence, operations, logistics, planning, requirements, assessments, and exercises. The JIST enables synchronization on relevant timelines to facilitate effective space operations.

4. Services

a. **USSF**

(1) The USSF organizes, trains, and equips space forces to further US national security objectives. Alongside the other Services, USSF provides the space forces needed to support CCDR- and JFC-level missions across the competition continuum.

(2) The USSF employs a three-echelon structure, including field commands, space deltas (equivalent to United States Air Force [USAF] wing or United States Army [USA] brigade), and squadrons to support space operations through presented forces. The majority of USSF and USAF forces assigned or attached to the space deltas support employed-in-place operations from garrison locations to deliver space capabilities regardless of the AOR.

(3) The USSF provides warfighting forces to the CCMDs as directed by SecDef via component field commands. Each component field command exercises operational control, as delegated by the CCDR, of assigned and attached Space Force forces. A component field command executes missions and tasks, recommends effective employment, tasks assigned and attached forces, provides C2, synchronizes space effects with other CCMD components, and coordinates with USSPACECOM. Each component field command commander exercises administrative control over assigned and attached Space Force forces. Commander, Space Operations Command, is the Commander, Space Force forces, to USSPACECOM.

(a) **Space Operations Command.** Space Operations Command, as the USSF Service component to USSPACECOM, generates, presents, and sustains combat-ready forces for space operations, intelligence, cyberspace operations, and combat support missions. Delta and squadron commanders organize, train, equip, and sustain the force to support JFCs. The command structure provides the ability to coordinate and direct assigned forces. Space Operations Command operates independently as required or directed in coordination with other Services, allies, and partners.

(b) **Space Training and Readiness Command.** Space Training and Readiness Command prepares USSF personnel to operate across the competition continuum by developing or conducting education, training, doctrine, wargaming, lessons learned, exercise, test, and evaluation.

(c) **Space Systems Command.** Space Systems Command delivers new space capabilities, to include developing, acquiring, equipping, fielding, and sustaining those capabilities. Space Systems Command builds, launches, and sustains space capabilities for military and civilian users worldwide.

b. **USA.** The USA conducts and supports space operations by leveraging capabilities for joint land operations to integrate space capabilities across all echelons and all joint functions. The USA organizes, trains, and equips dedicated space professionals for operations and support. When required, USA forces suppress threats targeting space segments outside the space domain that serve as critical enablers. USA forces rely on a wide range of space capabilities, including SATCOM, PNT, missile warning, EM, navigation warfare (NAVWAR), and space-based ISR, to be combat effective. The USA integrates space effects into land operations in close coordination with the theater's JFSCC (when established) and other CCDR-designated individuals for coordination on space matters. The United States Army Space and Missile Defense Command is the USA Service component command to USSPACECOM and is designated as the USA representative to identify and advocate for PNT and NAVWAR requirements to the Joint Staff. The USA integrates SATCOM and PNT to provide continuous friendly force tracking to CCDRs, other USG departments and agencies, allies, and multinational partners. Friendly force tracking improves SDA by providing the location and movement of forces equipped with devices that transmit position location information. The friendly force tracking mission management center ensures all information delivered is accurate, timely, and actionable. The center ensures complete system operations for emergency message alerting,

notification, and execution of position location capabilities such as tagging, tracking, and locating. The USA, through its multi-domain task force formations, creates effects in space in support of the joint force.

(1) **Space Support Elements (SSEs).** SSEs provide space expertise at the army, corps, and division echelons, as well as special forces groups. SSEs are directly involved in headquarters staff planning and targeting processes and coordinate space support requests and support with the CCDR; commander, Space Force forces; or JFSCC (if established). SSEs develop courses of action and integrate space forces to meet the commander's intent. They identify the utility of employing space forces, coordinate those forces through the commander, and integrate them into current and future joint operations.

(2) **Army Space Support Teams.** Army Reserve and Army National Guard units support SSEs, normally at the army and corps levels, when additional staff capacity or particular mission area expertise is required. They assist units without organic SSEs such as theater sustainment commands, joint task forces, and Marine expeditionary forces. An Army space support team may be tailored to meet the mission requirements and incorporate joint forces.

(3) **Space Control Planning Teams.** Space control planning teams deploy globally to support commanders and staffs in planning of space operations into current and future operations. This includes planning offensive and defensive space capabilities into schemes of operations, fires, and maneuver for joint operations, which ensures freedom of action in space for the United States and its allies. Space control platoons provide SDA, transmission control, and NAVWAR operations to support joint operations across the competition continuum. Platoons deploy globally to provide CCDRs with defensive space capabilities through ground mobile surveillance and assessment of space systems in support of military and civil operations.

c. **The United States Marine Corps.** The United States Marine Corps integrates space capabilities for use in decentralized combined arms operations, providing strategic agility and tactical flexibility over an adversary during operations conducted by a Marine air-ground task force. Marine Corps Forces Space Command is the Service component to USSPACECOM. The Marine Corps has a limited number of dedicated space officers serving in various joint and Service billets, to include the operations directorate of the staff and the Marine expeditionary force information group. These officers integrate space-based capabilities and effects via coordination with the senior officer designated with the responsibility for coordinating space requirement and may task-organize as a Marine space support team. The Marine Corps often receives additional space support from Army space support teams, space control planning teams, and SSE forces when assigned to a joint force land component and from the maritime operations center, space working groups, and/or Naval Network Warfare Command space directorate when assigned to a joint force maritime component.

d. **The United States Navy (USN)**

(1) The USN supports space operations and contributes to the achievement of space superiority through Navy Space Command under Fleet Cyber Command. Navy Space Command, as the USN's Service component to USSPACECOM, provides recommendations to the JFC. Navy Space Command is an echelon II Service component headquarters. Commander, Navy Space Command, is also the Commander of Fleet Cyber Command/United States Tenth Fleet and a joint force headquarters-cyberspace. Fleet Cyber Command serves as the USN's central operational authority for USN networks, cryptology, signals intelligence, operations in the information environment, cyberspace operations, electromagnetic warfare, and space operations.

(2) The USN integrates space capabilities through the Navy component commanders' and fleet commanders' maritime operations centers. Maritime operations centers support all assigned operational missions and provide C2 of assigned forces and employment recommendations to the respective CCDR. Within the maritime operations center, the space working group provides support to all warfare areas, planning teams, and decision forums, where space systems and services impact operations. The space working group coordinates with the senior officer designated the responsibility for coordinating space requirements (or designated representative), as required, and ensures space operations and vulnerabilities are included in all planning.

e. **USAF.** When required, USAF forces suppress threats against space systems operating outside the space domain and serve as critical enablers of space operations. USAF relies on a wide range of space capabilities to be combat effective. USAF integrates space effects into air operations through the air operations center in close coordination with the CCDR; commander, Space Force forces; or JFSCC, if established.

f. **National Guard.** The Air National Guard and Army National Guard provide space electromagnetic warfare, missile warning, SATCOM, and spacecraft control squadrons to support USSF, USSPACECOM, and National Reconnaissance Office (NRO) activities. The Air National Guard provides mobile, survivable missile warning ground systems supporting the President and national security efforts. Additionally, the Army National Guard provides ballistic missile defense personnel to the United States Northern Command to protect the United States from intercontinental ballistic missiles.

5. Joint and Combined Operations

a. Space operations and resources are inherent in, and often technologically integrated with, joint and Service-specific capabilities. A common understanding of how space operations and capabilities integrate with joint operations is required to effectively utilize space capabilities and achieve JFC objectives. When properly planned and coordinated, space operations enable and support unified action through each of the seven joint functions throughout the OE. Depending on the complexity and scale of an operation or mission, and/or the capacity of a particular DoD space system, military planners may need to coordinate additional support with non-DoD civil, commercial, interagency, and foreign organizations.

b. The joint force leverages commercial space systems to provide SATCOM; geolocation; tagging, tracking, and locating; launch; and other support when needed. Examples include global integration of commercial personal locator beacons in military common operational pictures to support multinational partners, leasing SATCOM bandwidth, and contracting for commercial imagery. Even when military space systems are utilized, the launch vehicles, spacecraft, and other equipment are normally supplied by contractors, and continued space operations depend on fulfilment of those contracts. Although there may be additional risks associated with using commercial services, these should be balanced against the potential benefits, including support to multinational partners and the effectiveness of maintaining a surge capacity without procuring larger and more expensive DoD spacecraft constellations.

c. Leveraging capabilities of allies and partners is essential to space operations, providing greater capacity, resilience, and flexibility while complicating an adversary's decision making. Joint, interagency, and multinational space operations build a partner community capacity with responsible nations, international organizations, nongovernmental organizations, and commercial owner/operators. These partnerships provide a common understanding of space operations and identify the importance of capable space partners for current and future multinational operations. Strengthening our alliances and attracting new partners while working together to enhance interoperability is essential to success in space. US and allied militaries use space systems to connect, warn, guide, and inform decisions across the competition continuum. For example, USSPACECOM continues to expand space situational awareness data-sharing agreements with partner nations, as well as with commercial and academic entities, exchanging space-related activity information with an emphasis on safety and sustainability in the space domain.

(1) Partnerships provide data exchange, vital locations for space capabilities, SDA, increased space capacity, and redundancies. Partnerships support the OE and provide key advantages to foster coalition success. Success in space depends on having the right partners for an operation.

(2) A positive international perception of the United States and its partnerships is vital for continued access and success in space. The United States and its allies share a common goal of freedom to operate and because of these partnerships will not have to fight alone in the event of a conflict.

(3) The joint force should communicate space-related information at the lowest appropriate security classification level and with the broadest releasability to our allies and international partners. The goal is to minimize barriers to information sharing, using established procedures for disclosure of intelligence and other relevant classified or export-restricted information on US space systems and operations.

CHAPTER III
PLANNING AND ASSESSMENT OF JOINT SPACE OPERATIONS

"No combatant commander can do it all. It requires us all to work together, as part of our whole-of-government effort, so that we can provide the nation with the requisite capability for our national security."

Admiral Cecil D. Haney, Commander, United States Strategic Command, March 24, 2015

SECTION A. PLANNING

1. Joint Space Operations Planning Overview

a. Space operations planning has unique factors to consider that begin with understanding the OE; the threats and hazards; and US, adversary, and other relevant actors' goals, intents, capabilities, and limitations. Space capabilities should be thoroughly integrated into every aspect of joint planning. Early integration and planning, before operations begin, ensures the joint force is effectively postured and prepared. This includes the prioritization of security and defense critical assets. Understanding the constraints of the OE (e.g., orbital dynamics), the multiplicity of participants (DoD; IC; other USG departments and agencies; allied, commercial, and foreign partners; competitors and adversaries), and C2 and cooperative relationships is imperative to developing space strategies, plans, and conducting operations.

b. Joint space forces typically support multiple CCDRs, joint functions, and OEs simultaneously to create effects during all military operations (strategic, operational, and tactical). Joint planners continually coordinate across internal and external equity holders to integrate intelligence and information for commander guidance and decisions on the development and refinement of space strategies, plans, and objectives. The timely assessment of space operations is critical for the iterative joint planning process, especially in a contested environment. Feedback from operational users ensures space operations are timely and accurate.

c. Even when executing tactical actions, space operations can generate strategic effects. Joint planners should understand and incorporate space capabilities from CCMDs, other USG organizations, allies and partners, academia, and the commercial sector. Joint planners coordinate and cooperate to ensure planning for space operations is consistent with, and supports the requirements of, these organizations as they conduct their respective national security tasks. Joint planners integrate intelligence and information about the future strategic environment and OE to anticipate changes and advocate for operational requirements and capabilities. CDRUSSPACECOM and USG interagency partners synchronize, coordinate, and integrate military space plans and operations with the activities of interorganizational participants to achieve unity of effort toward US objectives. The JFC should clearly articulate military space capabilities, requirements, operational limitations, liaison requirements, and legal considerations to interagency partners. Joint planners require an understanding of the relationships, the types of support

they can provide space partners, and where and how to integrate planning across organizations. Strategic-level joint planners also support CCDRs and the Joint Staff through the global force management assignment and allocation processes to advise SecDef of the global availability of space forces.

d. In recognition of the need for balance, and of the growing threat to space operations, commanders and staffs should plan for degraded space operations. Operational-level planning considerations translate JFC objectives into supporting actions and effects. Throughout this process, space operations planners balance operational-level requirements to support current and future operations with strategic-level requirements to conduct current space operations and preserve space capabilities for other times and places. Operational space activities incorporate a sustained cycle of situational awareness, planning, execution, and assessment occurring continuously to support leader decision-making cycles at all levels of command.

2. Joint Planning Process

a. Commanders direct the planning process and should continuously participate in the process to provide guidance. The planner develops possible solutions to a problem presented in strategic or commander's guidance. Commanders coordinate space operations through plans and orders at all levels of the competition continuum. Plans should address how, when, and where to effectively perform space missions, integrate space capabilities with other systems, optimize use of limited joint space forces, protect and defend joint space forces, consolidate operational requirements for joint space forces, and, as directed, counter an adversary's use of space.

b. During mission analysis, planners identify specified, implied, and essential tasks for space forces. Additionally, planners should consider adversary's capabilities to impact space forces and capabilities throughout the orbital, link, and terrestrial segments. Military planners should work with intelligence analysts to identify adversary space forces and capabilities that threaten friendly centers of gravity.

(1) **CDRUSSPACECOM.** CDRUSSPACECOM plans, executes, and assesses space operations and missions in coordination with, or in support of, other CCMDs, Services, DoD agencies, allies, and partners, and, as directed, other entities. These operations can occur in any or all of the space segments simultaneously.

(2) **CCDRs.** CCDRs synchronize joint planning and incorporate space forces and considerations into campaign and contingency plans. Space operations planners coordinate with other space experts (e.g., commercial partners, liaison officers) to develop objectives for space operations to integrate and synchronize effects.

For further guidance on joint planning, refer to Joint Publication (JP) 5-0, Joint Planning.

(3) **Integration of Non-DoD Capabilities.** Non-DoD space capabilities provide a significant contribution to joint operations. Organizations providing such capabilities interact with forces operating in all domains at the tactical-through-strategic levels via established procedures but usually do not subscribe to DoD planning constructs. Joint planners should consider and document non-DoD capabilities in operation plans through interorganizational cooperation.

c. Space operations planners also consider the following when planning space operations:

(1) **Capabilities.** Joint space forces provide high-demand, low-density capabilities that may be required to support CCDRs in multiple AORs simultaneously. In addition, joint space forces may also provide global support to national priorities, shaping operations, and peacetime users.

(2) **Multi-Mission Capabilities.** Planners consider the multi-mission nature of many space systems. For example, some missile warning assets provide a secondary capability of space surveillance. Finding creative methods to utilize existing systems for potential secondary uses may alleviate gaps in resources. However, prioritization of missions may be necessary for assets that cannot execute these missions at the same time.

(3) **Global Force Management.** Joint space forces are assigned and allocated by SecDef through the global force management process based on validated priorities. This enables SecDef to make prioritized, risk informed, and globally integrated decisions on how to most effectively and efficiently allocate the joint force.

(4) **SATCOM.** DoD primarily uses military and commercial SATCOM to establish or augment telecommunications in areas lacking suitable terrestrial infrastructure, for users requiring beyond line-of-sight connectivity, or users requiring connectivity while conducting movement and maneuver.

(5) **Reconstitution.** Reconstitution consists of actions taken to restore capabilities to an acceptable level for a particular mission, operation, or contingency after degradation. There are several methods of reconstitution, to include launching new spacecraft, on-orbit spares, backup ground sites, frequency reallocation, allied and partner capabilities, and solutions from other domains. Design intricacies and constrained launch schedules result in long lead times to replenish or replace spacecraft if destroyed or rendered inoperable. Planners should consider options early on and emphasize mitigation of lost capability vice assets.

(6) **Global Reach.** The orbital motion and high altitude of spacecraft offer an outstanding vantage point to serve CCDRs in multiple AORs. Spacecraft constellations employing communication relays and cross-links provide near-instantaneous connectivity around the world. Large constellations of spacecraft in LEO can provide global access.

(7) **Persistence.** Persistent access provides predictable coverage of an AOR. HEO and GEO systems provide significant dwell time for spacecraft; constellations of a relatively small number of spacecraft in these orbits can provide global persistent access. However, because coverage patterns of such systems can be easily determined, any gaps may provide an adversary with a predictable window of opportunity to perform unobserved activity. Most intelligence collected from space consists of multiple spacecraft operating in concert, or supplemented by other sensors, when continuous surveillance of an area is desired.

(8) **Space and Terrestrial Weather.** Planners should consider the impact of space and terrestrial weather on space systems and identify the environmental limitations of those space systems. These impacts may include temporary disruption or denial of signals, anomalous or spurious information, or even permanent degradation of spacecraft capability. Terrestrial weather can degrade the effectiveness of space-based electro-optical sensors; interfere with ground-based, electro-optical system ability to conduct SDA; and impede higher-frequency SATCOM uplink and downlink signals during moisture producing storms. Planners consider space and terrestrial weather effects when developing collection and contingency plans.

(9) **Integration of Space Operations with Other Operations.** Rarely are space operations conducted independently of other operations. Planners should remain cognizant of the ways operations in space provide mutual support to concurrent joint operations throughout the OE. Likewise, planners should recognize and understand joint force reliance on space operations to enable mission success. Space operations often set conditions for operations in other domains across the competition continuum.

(10) **Resilience.** Resilience is the ability of an architecture to support the functions necessary for mission success with higher probability; shorter periods of reduced capability; and across a wider range of scenarios, conditions, and threats, despite hostile action or adverse conditions. Capability resiliency is achieved through one or a combination of the following methodologies:

(a) Disaggregation is the separation of dissimilar capabilities into separate spacecraft or payloads. An example of this would be separating tactical and strategic protected SATCOM.

(b) Distribution is utilizing a number of nodes, working together, to perform the same mission or functions as a single node.

(c) Diversification is contributing to the same mission in multiple ways, using different orbits or systems, or using capabilities of commercial, civil, or international partners.

(d) Protection comprises active and passive measures to ensure space systems provide the required quantity and quality of mission support in any OE or condition.

(e) Proliferation is deploying larger numbers of the same payloads or systems of the same types to perform the same mission.

3. Key Planning Considerations

a. Planners consider higher headquarters planning directives and strategic guidance and the commander's initial planning guidance, which may include a description of the OE, a definition of the problem, the operational approach, initial intent, and the joint intelligence preparation of the OE. Command relationships and authorities for joint space forces and units require special consideration, as they may vary from traditional relationships and authorities, as detailed in Chapter II, "Command and Control of Joint Space Operations."

b. Planning considerations for joint space operations include:

(1) **National Space Policy.** This policy provides governing principles for the US approach to operations in space. In some cases, national policy dictates provision of military space capabilities for use by civilian users. For example, the USG is committed to minimizing impact to peaceful civil use of GPS outside of operational areas.

(2) **DoD Space Policy.** DoD space-related activities deter aggression, promote stability and responsible use of space, integrate space capabilities, and improve mission assurance.

(3) **Defense Space Strategy.** This strategy provides guidance for achieving a secure, stable, and accessible space domain, whose use by the United States and our allies and partners is underpinned by comprehensive and sustained military strength.

See Department of Defense Directive (DoDD) 3100.10, Space Policy, *for more information.*

c. **Legal Considerations**

(1) Space activities and operations are required to comply with the law of war; the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies; applicable treaties or international agreements to which the United States is a party; applicable domestic law and policy; and applicable host-nation laws. Legal counsel participates during all stages of space operations planning and execution, assessing compliance with applicable legal requirements, and providing guidance, as required.

(2) Some contracts and consortium agreements prohibit certain space assets from being used for military purposes, such as corporate agreements prohibiting use of commercial SATCOM for military operations. Planners should be aware of emerging and changing laws and agreements to ensure all operations remain legally compliant.

(3) **Agreements with Allies, Partners, and Others.** Planners also consider a growing number of bilateral and multilateral treaties, agreements, and other instruments of coordination between the United States and other nations, DoD and interagency partners, nongovernmental organizations, commercial companies, and academia.

4. Joint Fires Planning

a. Joint fires applied to space operations is inherently multi-domain and global in nature, requiring cross-CCMD, interagency, allied, and partner nation coordination. To achieve objectives, planners should consider a broad range of options, to include lethal fires on terrestrial targets, the integration of information activities, and leveraging (or advocating for) US and allied government diplomatic and economic resources. These considerations apply throughout the competition continuum.

b. Space operations provide distinct advantages to the joint warfighter. Because of this, they are often viewed as a supporting function. However, the space domain is no longer a permissive environment that can be freely exploited to US military advantage. This shift to a contested domain requires joint fires planning in both supporting and supported roles. This requires the balancing of mutually dependent objectives to achieve space superiority. When applied to space operations, fires can be executed to achieve both offensive and defensive objectives.

c. These factors, combined with the interrelationship between other joint operations and space operations, places USSPACECOM simultaneously in a supported and supporting role. To achieve these objectives, joint fires should consider effects against adversary orbital, link, and terrestrial segments, as well as supporting and supported requirements, and determine appropriate phasing of operations to achieve both USSPACECOM and supported CCMD objectives.

d. Execution of joint fires for space typically requires cross-CCMD coordination of on-orbit capability. For example, targeting terrestrial facilities enabling spacecraft operations may be necessary to achieve the commander's objectives. This coordination requires commands (both the supporting and supported) joint fires elements to coordinate these fires and ensure all requirements to prosecute a target are met (e.g., target development, target list placement, automated processes). Additionally, planners and targeteers should account for the often extraordinary amount of system dependencies that reside in multiple domains, seek opportunities to exploit/interdict these dependencies, and ultimately present the commander with options to create effects.

e. For offensive and defensive space operations, planners should vet and manage fires and protection activities involving or affecting space operations, including effects from and in all segments, via the fires process, thereby maximizing integration and synchronization. Any CCMD can nominate targets through their respective target nomination processes. The USSPACECOM joint fires element synchronizes target validation (in any space operations segment) with other CCMDs and interagency partners through a joint targeting coordination board. Validated target nominations meet the objectives and criteria outlined

by the commander's guidance and comply with the law of war and rules of engagement. Target sets typically have linkages and overlap throughout the OE.

For more information, see JP 3-60, Joint Targeting.

5. Plans and Orders

a. Space operations planners issue various products during planning to feed the joint targeting cycle. For instance, the space operations directive captures CDRUSSPACECOM's guidance and intent. The space operations directive conveys prioritization and apportionment guidance focused on the applicable execution period. This is then used to form the master space plan. The master space plan is used to allocate resources to each desired effect and serves as the source to generate unit tasking and coordination. Similar to the air tasking order, the combined space tasking order (CSTO) assigns missions and resources to forces.

b. **CSTO.** USSPACECOM produces plans/orders for the management of assigned joint space forces and disseminates them through the CSTO. Additional coordinating information not included in the CSTO can be promulgated in special instructions. The CSTO and special instructions direct space forces, assign tasks to meet joint force operational objectives, and synchronize space operations with other CCMD operations.

(1) The planning process may significantly compress during a crisis or to support combat operations. The CSTO is a weekly product to synchronize with the supported CCDR's battle rhythm.

(2) The CSTO transmits guidance and priorities for a short-duration timeframe, assigns tasks to meet operational objectives, and, when required, synchronizes and integrates activities with other CCMD operations.

(3) Planners should consider the effects that their actions may have on establishing normative behavior in space and the interpretation of relevant provisions of international treaties and agreements. As the United States remains committed to updating outer space governance and charting a path for responsible behavior in space, planners should consider whether their actions are consistent with these endeavors.

SECTION B. ASSESSMENT

6. Joint Space Operations Assessment Process

a. Assessment is a continuous process conducted throughout the joint planning process. It is essential to developing specific and measurable task-based objectives and effects. Assessment activities begin with planning initiation. Integration with the planning process from the beginning ensures a plan is feasible and compatible with higher-level policy, guidance, and orders. To accurately inform the JFC's understanding of the OE, assessment must keep pace with evolving conditions and considerations. As part of the planning process and assessment approach, planners need to define the information and

intelligence requirements necessary to assess operations and the means to collect that data. This can be challenging in the space domain where operators often cannot directly observe the effects of an operation and resulting adversary behavior. Planners should consider this and identify alternative information sources and secondary effects that may reveal results of an operation or other changes in the OE.

b. To maintain the advantage, the joint force should constantly assess the impacts and effectiveness of its operations to improve alignment between actions, objectives, and changes in the OE. Planners should be mindful of strategic, operational, and tactical seams and gaps between CCMDs' responsibilities as potential adversary activities are increasingly global in nature. Potential adversary space activities can simultaneously cross multiple AORs. This should include measuring progress toward creating desired effects and identifying where those actions begin to negatively affect the OE. Planners should coordinate with intelligence and other joint functions to identify indicators for success or failure in achieving objectives, accomplishing tasks, and creating desired effects during the planning process to measure progress. This allows commanders to adjust to emerging situations and threats proactively. Many indicators are observable/collectible intelligence indicators integrated into intelligence plans for collection and analysis to enable assessments, warning, and other decisions. Assessments are only valuable when they inform decisions and actions.

c. The assessment of space operations nests within the larger operational assessment of the supported campaign or operation. When space operations constitute the main effort of an operation, the assessment provides feedback to USSPACECOM concerning the effectiveness in achieving the required objectives. Other CCMDs, partners, and allies support space operations assessments by providing any requested data to help assess mission success or failure. A collaborative effort across the joint force supporting assessment makes the process efficient with comprehensive, timely, and effective products for the commander.

d. Assessments measure the progress toward accomplishing a task, creating an effect, achieving an objective, or attaining an end state by comparing forecasted outcomes to actual events to determine the overall effectiveness of force employment. During space operations planning, operations assessment can inform the decision concerning the best way to employ limited resources in support of military operations. As planners identify specific space tasks, they should also develop measures of performance and measures of effectiveness to assess each task and objective. Given the complexity and challenges of operations in space, planners should consider measures of performance and effectiveness, or leverage intelligence and information sources, and monitor the response of the adversary in other domains that may indicate the effect of an action in space.

e. Military operations that require tasks or support from space operations may change based on the required or available space capability. Each task or objective for space operations should have the appropriate measures of performance or measures of effectiveness defined and the means to collect necessary information or intelligence for assessment. As space operations progress, the assessment of space tasks guides the

decision to adapt plans and resources for future space operations. For multinational operations, the assessment process for space support should reside within the larger operation assessment process. Assessors should integrate all partner nations' space support to specific space tasks and the appropriate measures developed for the assessment process.

For more information on assessment, see JP 5-0, Joint Planning.

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CHAPTER IV
SPACE MISSION AREAS

" United States (US) national security interests are inextricably linked with actions that occur in space. Our air, land and sea forces rely on critical capabilities delivered by systems on orbit. Our adversaries know this, and it is why they are fielding weapons capable of destroying US satellites that deliver intelligence, navigation, missile warning and global communications to our forces. Failure to address these threats would be catastrophic to our soldiers, sailors, airmen and Marines in a conflict, let alone the outcome of a war. It is long past time to recognize this reality and start treating the space domain like we do every other warfighting domain."

General Kevin Chilton, United States Air Force (retired), former Commander United States Strategic Command and National Aeronautics and Space Administration astronaut, *Defense News,* 28 January 2022

1. General

Space operations help preserve freedom of action, enable joint lethality and effectiveness, and provide independent options in all domains for the United States and its allies. Due to the complexities of the OE, the required integration and synchronization between elements of the joint force, and the degree to which space capabilities enable the joint functions, a shared understanding of selected aspects of specific space capabilities and their interactions is essential to foster and enhance unified actions.

2. Space Domain Awareness

a. SDA, primarily supported by enabling capabilities, is a timely, relevant, and actionable understanding of the OE. SDA allows military forces to plan, integrate, execute, and assess space operations. SDA is achieved through the integration of ISR, EM, and friendly force tracking. SDA goes beyond space surveillance (object tracking and characterization), to include understanding intent, motive, predicted actions across the terrestrial and link segments. SDA incorporates multiple intelligence and information capabilities, including terrestrial and space-based surveillance, space and terrestrial weather, and information and data-sharing capabilities. Operators, users, and decision makers obtain SDA through a timely appreciation of factors and actors—including friendly, adversary, and third party—affecting all the joint functions.

b. SDA provides insight across all segments of space systems. Every spacecraft and ballistic missile launch is detected, characterized, and assessed. Spacecraft maneuvers are detected, evaluated, and understood, as they may precede potential aggressive actions or lead to future collisions. Insight and awareness of terrestrial systems, such as jammers, is critical to SDA. SDA considers multiple events (e.g., launches, maneuvers, actions in the EMS) in a broader context to help identify and characterize space activities. Rapid identification of change, combined with intelligence analysis, allows threat determination and warning, to enable security and defense of space systems and capabilities. SDA

enables commanders to understand threats that could deny friendly space capabilities in their operational areas and warns commanders when an adversary would have visibility of friendly operations. Timely and current knowledge of national and foreign space systems is an essential part of SDA and is required to support operations across multiple AORs.

c. SDA enables joint planning and operations by characterizing the OE, which includes operations and effects in the orbital, terrestrial, and link segments. Space operations, across all segments, produce and consume vast amounts of information and intelligence data. Intelligence on foreign launches (e.g., missiles, spacecraft, and antisatellite weapons), foreign threat systems, foreign space systems and their status, are important contributors to SDA. Persistent surveillance of adversary space systems facilitates understanding and prediction of behavior and the formulation and execution of defensive (protection, movement and maneuver, or fires) actions. SDA can provide information on adversary space operations that may be precursors to, or associated with, operations in another domain. SDA information, when analyzed and assessed in conjunction with other intelligence, adds valuable data to the IC and joint force. SDA information provides a holistic picture that can assist planners to understand and attribute adversary action against space capabilities.

d. Space situational awareness, a subset of SDA, focuses on the orbital segment. Space situational awareness is the requisite foundational, current, and predictive knowledge and characterization of space orbital objects and the OE upon which space operations depend. Space situational awareness is the foundational, current, and predictive knowledge of space orbital objects and the space domain. It provides commanders with knowledge and characterization of assets in orbit to ensure safe, stable, and sustainable C2 of space activities.

3. Offensive and Defensive Space Operations

a. Offensive and defensive space operations, primarily supported by direct capabilities, use a broad range of measures to provide continued, sustainable use of space; deter adversaries; attribute attacks; and support the inherent right to self-defense. Offensive and defensive space operations can be active or passive, lethal or nonlethal, reversible or nonreversible, and occur in any segment of a space system. Offensive and defensive space operations, including NAVWAR, enable freedom of action in space and counter efforts to interfere with or attack space forces of the United States, allies, or commercial partners.

b. Defensive and offensive space operations preserve friendly freedom of action and deny enemy freedom of action by destroying, temporarily disrupting, or partially degrading enemy space forces. JFCs should specify the degrees and duration of denial. Deception should also be considered as a means to create the JFC's desired effects.

c. **Offensive Space Operations.** Offensive space operations, including suppression of enemy space capabilities, consist of effects created by direct capabilities in the orbital, link, or terrestrial segments to disrupt, degrade, deny, or destroy adversary space systems

or services. Planners may also consider deceptive operations with appropriate authorities. Offensive space operations target an adversary's space capabilities and forces with reversible (e.g., jammers to disrupt the PNT signal for precise targeting) or nonreversible (e.g., destruction of launch site) means. Effective suppression of enemy space capabilities creates space superiority and the freedom of action and access for friendly joint forces. In keeping with the principles of joint operations, the United States maintains the ability to prevent an adversary's use of space capabilities and services for malign activities.

d. **Defensive Space Operations.** Defensive space operations consist of active and passive measures taken to protect friendly space forces from attack, interference, or hazards. Defensive space operations safeguard assets from hazards, including direct or indirect attack, space debris, electromagnetic interference, and naturally occurring phenomena such as radiation. Defensive space operations measures can protect any segment of a space system.

(1) Defensive space operations include the ability to protect against attacks and natural hazards. Defensive space operations leverage SDA to predict, detect, and characterize natural and man-made events and attribute an attack to an adversary. Defensive space operations contribute to deterrence by employing a variety of measures that help ensure uninterrupted access to space capabilities, consistent with the inherent right of self-defense; protect our space systems; and contribute to the defense of allied and partner space systems. Robust defensive space operations influence perceptions about US space capabilities making adversaries less confident of success in interfering with those capabilities.

(2) Active space defense consists of temporary actions taken to neutralize specific, imminent threats (natural or man-made) to friendly space forces and space capabilities. An example of active defensive action might be closing a sensor cover to avoid damage from an adversary laser or during a solar flare.

(3) Passive space defense consists of measures inherent in the design of space assets and the implementation of space operations that minimize the effectiveness of threats to friendly space forces and capabilities. Passive space defense measures could include camouflage and concealment, proliferation and distribution of space systems, and hardening of space system links and nodes. An example of proliferation might be using a constellation of small spacecraft rather than one large, unique asset.

e. **NAVWAR.** NAVWAR is supported by both direct and enabling capabilities. Direct capabilities such as offensive fires and enabling capabilities such as defensive space actions ensure the integrity and availability of friendly PNT and prevent adversary use of PNT information and capabilities. The availability of global navigation satellite systems from multiple countries means adversaries may leverage multiple sources to create an operational advantage increasing the challenges of disrupting or defending PNT capabilities. A JFC may gain a desired advantage by integrating diverse capabilities to create NAVWAR effects. NAVWAR requires a coordinated employment of space, cyberspace, and electromagnetic warfare capabilities, enabled by ISR and EMS

management. When formulating NAVWAR courses of action, JFCs should understand the tradeoffs between NAVWAR effects and potential degradation to friendly forces and civil, commercial, and scientific users. A JFC should ensure adequate sensor coverage is available to provide situational awareness of adversary NAVWAR effects to understand when and where PNT is challenged in the OE.

For additional information about NAVWAR, see JP 3-85, Joint Electromagnetic Spectrum Operations, *and JP 3-12,* Joint Cyberspace Operations.

4. Positioning, Navigation, and Timing

a. PNT, primarily supported by enabling capabilities, provides precise and accurate location, navigation, and time reference services. PNT information is mission-essential, enabling most modern weapon systems and critical infrastructure. Several countries, including the United States, have developed spacecraft constellations that provide PNT services. This service can also be augmented by terrestrial assets to increase accuracy, precision, or coverage.

b. PNT information is integral to operations and significantly reduces collateral damage from friendly fires, as many types of guided munitions and friendly force tracking devices use space-based PNT for increased accuracy. PNT further supports movement and maneuver of forces and assets and is integral to accurate C2 operations and intelligence collection. PNT is essential for coordination and execution of fires (offensive space operations) against an adversary's terrestrial space systems, enhances movement and maneuver in the terrestrial and orbital segments, enables multiple C2 network linkages by providing highly accurate timing signals, supports collection and validation of intelligence or SDA, and is essential for execution of protection operations (defensive space operations).

c. For decades, the United States has provided the global community largely uncontested access to space-based PNT services via GPS. Because of its constant availability, free access, high accuracy, and modest cost of user equipment (i.e., GPS receivers), other nations' military forces integrate GPS into their tactics, techniques, and procedures and are acutely aware of their dependence on, and consequent vulnerability from, GPS. As a result, several countries and organizations have or are actively developing their own systems (e.g., China: Beidou, Japan: Quasi-Zenith Satellite System, European Union: Galileo, India: Navigation with Indian Constellation, and Russia: Global Navigation Satellite System) to support civil and military users.

d. GPS provides two levels of positioning services. The standard positioning service is available to all users through the broadcast of an unencrypted signal. The protected positioning service, used by DoD, authorized government agencies, and some US allies and multinational partners, leverages an encrypted code broadcast over two frequencies. Protected positioning service users retain a significant advantage over standard positioning service users due to the relative robustness of the encrypted signal and the ability to correct for environmental conditions by accessing two frequencies. Newer military GPS receivers

incorporate an architecture (both hardware and software) that safeguards classified GPS cryptographic keys and algorithms and protects signals from exploitation.

For additional information on PNT, see Department of Defense Instruction (DoDI), 4650.08, Positioning, Navigation, and Timing and Navigation Warfare, *and Space Policy Directive-7,* (U) The United States Space-Based Positioning, Navigation, and Timing Policy.

5. Intelligence, Surveillance, and Reconnaissance

a. ISR, primarily supported by enabling capabilities, includes the collection of diverse intelligence data across political, military, economic, social, information, and infrastructure systems, providing decision makers with timely, accurate data for information that can create a decisive advantage across the competition continuum. ISR is defined in JP 2-0, *Joint Intelligence,* as "an integrated operations and intelligence activity that synchronizes and integrates the planning and operation of sensors; assets; and processing, exploitation, and dissemination systems in direct support of current and future operations." Space-based ISR collection platforms have mission longevity and coverage over denied areas where terrestrial, maritime, or airborne sensors may not be able to collect data. While these platforms are able to provide near worldwide coverage, demands on individual space-based systems often exceed their capacity. The associated orbital characteristics of these spacecraft (e.g., revisit rates) and targeting prioritization may limit the ability to meet operational requirements.

b. Space-based ISR collection contributes to C2, enhancing the joint force's ability to observe areas of interest to understand the threat and increases situational awareness. ISR assets enhance planning by providing updated information relevant to the OE for the JFC and joint planners. Space-based data and analysis, in particular, support military intelligence activities, including warning, current intelligence, order of battle, scientific and technical intelligence assessments, targeting and combat assessments, and mission planning and rehearsal. Data collected by space-based assets contributes to joint intelligence processes and shared understanding by providing information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations. Space-based sources provide ISR data that complements non-space-based intelligence. Often, the product of a space or terrestrial capability enhances intelligence accuracy and shortens reaction time by cueing another space system to survey an area of interest. A space-based capability may also cue a terrestrial-based system to provide a more precise location, discrimination from other targets, or other specific targeting information.

c. Military, nonmilitary, and IC organizations operate a variety of space-based ISR systems. International cooperation in military space-based intelligence collection systems with allies and other partners contributes to US national security objectives by improving resilience and interoperability, supporting multinational operations, and building partnership capacity and capability.

6. Satellite Communications

a. SATCOM, primarily supported by enabling capabilities, provides global communications and data transmission to forces around the globe. SATCOM provides national and strategic leadership with a means to maintain situational awareness and convey their intent to the operational commanders conducting joint operations. SATCOM also provides critical connectivity for tactical maneuver forces and disadvantaged users whose rapid movement and geographically dispersed deployments remove them from direct access to terrestrial communications infrastructures.

b. The inherent capabilities of SATCOM provide significant advantages over other communications systems, including:

(1) **Global Coverage.** Collectively, SATCOM systems provide global coverage, supporting forces over wide and diverse areas. If required, spacecraft can focus capacity (e.g., bandwidth) in areas of special interest.

(2) **Near Real Time, Over-the-Horizon Transmission of Voice and Data.** SATCOM provides near real time connectivity for both voice and data, including the ability to support the tracking of force disposition and status.

(3) **Independence from Terrestrial Communications Architecture.** Some SATCOM links preclude the need for long terrestrial communications links. These SATCOM links enable forces to communicate without the need for physical connectivity or terrestrial line-of-sight communication over relay infrastructure.

(4) **Flexibility.** Spacecraft systems enable global coverage and interlinking between frequency bands and systems, and certain systems are able to provide a relatively low probability of detection and intercept. Flexibility gives the JFC a great deal of latitude in mixing and matching SATCOM systems to meet specific operational requirements. Space system designs that can enhance flexibility include the use of directional antennas, specific waveforms, wide bandwidths, and mobile ground station. The ability for SATCOM operators to encrypt transmissions, change frequencies, shift users to another spacecraft (whether commercial or military), conduct frequency hopping, move spot beams, alter beam shape, change modulation schemes, execute crosslinking (communications from one spacecraft to another), and perform cross-banding (the ability to cross from one band of the EMS to another band via the spacecraft) introduces significant flexibility for ensuring operational communications.

c. SATCOM systems provide voice and data connectivity that facilitate C2, which includes survivable communications for Presidential support, nuclear C2, and intelligence. SATCOM enables assured C2 by providing global, two-way, secure, integrated communications across the EMS to convey plans and orders to all forces. The precision, speed, and interoperability with which SATCOM systems operate improves access to the information, thereby establishing and reinforcing a common perspective of the OE.

7. Environmental Monitoring

a. EM, primarily supported by enabling capabilities, supports the joint force's understanding of the natural environment and is a key contributor to SDA. Space-based EM of phenomena in the space and terrestrial environment informs planning and the ability to assess the impact of natural environmental hazards and intentional threats to operations and capabilities. Space-based EM provides regional weather, sea states, and terrain information, which supports movement of supplies and personnel (sustainment) for the joint force. Space-based EM provides awareness and status of severe weather events that may affect the safety of friendly forces or their ability to conduct effective military operations.

b. **Terrestrial EM.** Terrestrial EM provides information on meteorological and oceanographic (METOC) factors that affect military operations in land, maritime, and air domains. Space-based environmental sensing supports the development of METOC forecasts and assessments of environmental impacts on friendly and adversary systems and operations. EM information includes data provided by non-DoD sources, such as National Oceanic and Atmospheric Administration (NOAA) operational weather and National Aeronautics and Space Administration (NASA) research sources, as well as foreign sources such as the European and Japanese geostationary weather spacecraft. Air Force and Navy weather offices, as well as individual forecasters in the field, use this data to support joint forces, Services, and local units. EM support to joint operations provides the JFC awareness (intelligence) of the OE through METOC forces assigned to one or more participating components. A prime advantage of space-based EM is the ability to gather data in remote or hostile areas, where little or no data is available via surface reporting stations. For example, space-based environmental data is critical over most oceanic regions, where terrestrially observed data is often sparse.

c. **Space EM.** Space EM provides data that supports forecasts, alerts, and warnings for the space environment that may affect space capabilities, space operations, and their users. Space-based monitoring provides the ability to detect and mitigate the impacts of space weather on spacecraft and communications to, from, and through space. Detection of solar events and measurement of the radiation environment enable operators to protect resources and deduce likely causes of spacecraft anomalies.

For more information on the organization of METOC forces, see JP 3-59, Meteorological and Oceanographic Operations.

8. Missile Warning

a. Missile warning, primarily supported by enabling capabilities, employs an architecture of ground-based and space-based sensors to protect joint forces and allies by providing early warning. Space-based and terrestrial space systems, correlation center C2 systems, and CCDR/national leadership decision support systems support time-critical event conferencing for decision makers. Space-based sensors typically provide the first indication of a missile launch (strategic and theater). Terrestrial-based radars provide

follow-on intelligence (e.g., impact prediction) and information on launches to support confirmation of strategic attack. This intelligence and information are essential to the warning mission executed by North American Aerospace Defense Command to notify national leaders of a missile attack against North America, multinational partners, or forward-deployed personnel via shared early warning.

b. Collectively, space-based sensors provide persistent coverage of all AORs. Terrestrial-based radars provide overlapping coverage of specific AORs. The fusion of data from these sensors, linked via multiple processing and dissemination systems, provides information to CCDRs and subordinate forces. Missile warning systems rely on direct downlinks, key survivable and protected SATCOM, and tactical communications systems. The theater-event system architecture enables rapid dissemination of missile-event warning messages (information) to the joint force, thereby enabling effective protection (passive defense and active defense) and fires (offensive operations).

For information on air and missile defense, see JP 3-01, Joint Countering Air and Missile Threats.

9. Nuclear Detonation Detection

NUDET detection, primarily supported by enabling capabilities, consists of persistent, integrated sensors to provide global surveillance coverage. NUDET detection also provides warning and assessment recommendations to the President, SecDef, and CCDRs, indicating place, height of burst, and yield of endoatmospheric and exoatmospheric NUDETs. Allies, partners, and senior leaders require timely warning and characterization of NUDETs to support protection of forces and assets, including threat/non-threat determination and follow-on decision making. In countering weapons of mass destruction, detection of NUDETs can help identify proliferators. NUDET detection is also essential for preventing mischaracterization of large meteors or other substantially large non-nuclear explosions that may be confused for NUDETs in times of crisis or conflict.

10. Spacecraft Operations

a. Spacecraft operations, primarily supported by enabling capabilities, include TT&C, movement and maneuver, monitoring state-of-health, and sustainment sub-functions. Spacecraft operations monitor onboard systems, transmit the status of those systems to the control segment on the ground, and receive and process instructions from the control segment. Payload operations monitor and control the spacecraft payload to collect information or provide a capability in the OE. The movement and maneuver of spacecraft includes the deployment, repositioning, or re-orientation of joint space forces. These movements may support service optimization, protection from environmental hazards, passive defense from threats, or the positioning of assets to enable active defensive or offensive measures. A rendezvous proximity operation is purposeful positioning of a spacecraft in close proximity to or in contact with another spacecraft. This can be conducted for purposes of defense, offense, ISR collection, sustainment, training, research and development, or to fulfill other missions.

b. Spacecraft operations centers, linked to on-orbit spacecraft via dedicated and shared networks, execute spacecraft operations. Additionally, as a critical and essential link between the spacecraft operator and joint force, and a significant contributor to SDA, spacecraft operations include protection mechanisms to ensure access to space capabilities. Terrestrial communication links connect spacecraft operations centers to remote TT&C (C2) ground terminals and connect payload-processing centers to other payload support centers and user locations, making them critical components in space operations.

c. Service component spacecraft operations centers monitor, sustain, and operate DoD globally dispersed antennas (i.e., those of the Satellite Control Network, the wideband SATCOM operations centers, NASA networks, NRO, and GPS ground antennas) that provide the necessary links between the spacecraft operations centers and satellite to execute spacecraft and payload operations. For units that provide TT&C, deployable mobile systems and alternate backup locations provide redundancy by providing geographically dispersed locations, if a primary location becomes disabled.

d. **Space Sustainment Operations.** Space sustainment operations requirements include support at terrestrial locations, reconstitution/replenishment of orbital assets, and various operations supporting human space flight. Reconstitution replaces or replenishes lost or diminished space capabilities. Space operators can reposition, reconfigure, and augment spacecraft to reconstitute a capability. Changing the position or operating frequency of space assets can make them more difficult to target. All terrestrial sites (permanent or temporary) require supplies, utilities, and personnel support. Space operations require periodic resupply of food, fuel, primary and alternate sources of electricity, water, critical infrastructure spares, and sewage and trash removal. Personnel require base operating support and integration and medical support. The supported CCMDs will likely direct Service components to provide the logistics support. Deploying units should expect to provide teams for pre-deployment site surveys to identify and begin coordination of logistic requirements.

11. Spacelift

a. Spacelift, primarily supported by enabling capabilities, delivers payloads (spacecraft or other materials) into space and, in some cases, enables the safe reentry and recovery of launch vehicles. Assured access to space includes spacelift operations and range operations. USSF conducts spacelift operations for USG programs as a Service function and provides support as required to non-USG programs.

b. Range operations are critical to spacelift operations and provide assured, responsive access to space with an emphasis on public safety. Space ranges provide launch support, pre-launch testing, launch traffic control, and scheduling services for spacelift operations. Space launch ranges may also plan and execute space launch vehicle and spacecraft recovery operations.

c. **Human Space Flight Support.** Support to human space flight entails coordination with NASA, CCMDs, Services, the Joint Staff, and commercial providers. This collaboration plans and executes logistic operations for personnel recovery, spacecraft recovery and salvage, medical evacuation, and contingency operations during flight launch and recovery operations for USG programs.

APPENDIX A
ADDITIONAL SPACE SUPPORT RELATED TO THE JOINT FORCE

1. General

a. DoD space operations and capabilities cannot always satisfy CCDRs' requirements. National, foreign, civil, and commercial capabilities supplement DoD space capabilities. Utilization of non-DoD space capabilities to meet requirements continues to grow. When requested, USSPACECOM supports integration of DoD and non-DoD operations (e.g., concept of operations; tactics, techniques, and procedures) to satisfy the supported CCDR's objectives.

b. By leveraging non-DoD capabilities, CCDRs can mitigate the consequences of lost, degraded, or limited DoD space capability and capacity, improving the joint forces' ability to operate in a degraded environment and/or with finite resources. Options include leveraging multinational, foreign, and/or commercial space and non-space capabilities, as well as use of hosted payloads on a mix of USG, commercial, and multinational spacecraft in different orbits.

c. Other USG departments and agencies acquire and operate space systems that are not under CDRUSSPACECOM authority. CDRUSSPACECOM facilitates unity of effort between DoD and the IC by increasing information sharing across USG space operations, where and when appropriate, and establishes relationships with those USG departments and agencies. While USSPACECOM and NRO operations utilize separate chains of command, their subordinate commands and directorates coordinate to ensure unity of effort and information sharing to synchronize DoD and IC space activities. NASA has launch facilities and environmental Earth science products potentially applicable to joint operations. NOAA, under the Department of Commerce, provides METOC information through the polar-orbiting operational environmental spacecraft and the geostationary operational environmental spacecraft, data sharing and partnerships with foreign countries' systems, and other EM systems. NOAA is able to locate distress alerts via the search and rescue satellite-aided tracking (SARSAT) system. Additionally, civil spacecraft programs such as automatic identification system and long-range identification and tracking contribute to homeland security through global tracking of shipping traffic.

2. Combat Support Agencies

a. The joint force uses DoD space capabilities supplemented by national, civil, and commercial partners. In most cases, the CCDR's staff requests support from the combat support agencies.

b. The **Defense Information Systems Agency** provides services and support for a wide range of missions, including communications, C2, implementation of cybersecurity policy, and DoD information network services, and plays a key role in ensuring US capability to operate in space is maintained. The Director, Defense Information Systems Agency:

(1) Assists USSPACECOM with cyberspace security for SATCOM services.

(2) Provides SATCOM teleport services to support capacity in space.

(3) Develops visualization and spectrum management tools supporting space control and NAVWAR spectrum planning.

For additional information, see DoDD 5105.19, Defense Information Systems Agency.

c. **National Geospatial-Intelligence Agency (NGA).** The NGA provides timely, relevant, and accurate geospatial intelligence (GEOINT) to DoD, the IC, and other USG departments and agencies; conducts other intelligence-related activities; prepares and distributes maps, charts, books, and geodetic products; designs, develops, operates, and maintains systems related to the processing and dissemination of GEOINT; and provides GEOINT. The NGA is a DoD agency, a designated combat support agency, and an element of the IC.

(1) The Director, NGA, serves as the DoD GEOINT mission manager for all acquisition or exchange of commercial and foreign government-owned, imagery-related, remote-sensing data for DoD. The NGA also serves as the DoD lead for terrain environment modeling and simulation, coordinating with DoD modeling and simulation activities related to the geospatial aspects of natural and man-made features across the Earth, the atmosphere, and near-Earth space. The NGA is the DoD lead for GEOINT standards. The NGA produces timely, relevant, and accurate GEOINT for the joint force. The NGA manages spacecraft collection requirements and develops distribution protocols for the National System for Geospatial Intelligence in accordance with the *National Intelligence Priorities Framework.*

(2) The Director, NGA, is also the functional manager for the National System for Geospatial Intelligence, which integrates technology, policies, and capabilities to conduct GEOINT in a multi-intelligence environment. The NGA provides GEOINT to support senior national decision makers and helps plan and prosecute military objectives. The NGA provides foundational geospatial data, which may include imagery, elevation, magnetic, and gravity data, and selected feature information, which can be rapidly augmented and fused with other intelligence, weather, and logistics data. The result is an integrated, digital view of the operational area.

(3) Per agreement between CDRUSSPACECOM and Director, NGA, requests for overhead persistent infrared support are executed by the Joint Overhead Persistent Infrared Planning Center, which is a joint USSPACECOM and NGA organization. The Joint Overhead Persistent Infrared Planning Center conducts integrated mission management using the Joint Overhead Persistent Infrared Priority Framework, which is derived from USSPACECOM operation orders and the *National Intelligence Priority Framework.*

For additional information on GEOINT, see JP 2-0, Joint Intelligence.

For additional information on the NGA, see DoDD 5105.60, National Geospatial-Intelligence Agency (NGA).

d. **National Security Agency (NSA)/Central Security Service (CSS).** The NSA/CSS leads the USG in cryptology that encompasses both signals intelligence and cybersecurity policy and technical support activities and enables cyberspace operations to gain a decision advantage for the United States and its allies and partners under all circumstances. The NSA/CSS collects signals from space and processes, analyzes, produces, and disseminates signals intelligence. The Director, NSA/Chief, CSS, serves as the principal signals intelligence and cybersecurity advisor to DoD and other USG offices. NSA/CSS is a DoD agency and an element of the IC.

e. **Defense Intelligence Agency (DIA).** DIA, a DoD agency and element of the IC, provides intelligence support to all CCMDs, including, but not limited to, all-source military analysis, measurement and signature intelligence, human intelligence, counterintelligence, cyberspace operations, operations in the information environment, personnel recovery, peacekeeping and multinational support, warning, targeting, battle damage assessment, collection management, and intelligence support to operations planning.

(1) DIA's core space-related functions are to:

(a) Coordinate DoD and national technical collection policy with agencies having policy responsibilities for those systems.

(b) Facilitate and oversee the processing, exploitation, and dissemination of tailored and timely measurement and signature intelligence.

(c) Serve as the senior defense-intelligence collection representatives and primary CCMD advocate for measurement and signature intelligence and technical collection capabilities.

(d) Characterize the OE, threats, and challenges and define technical and operational capabilities in support of DoD and IC planning.

(e) Conduct evaluations and assessments concerning space-based collection capabilities supporting the DoD Intelligence Information System.

(2) **The Missile and Space Intelligence Center** is an element of DIA that produces finished, all-source, scientific, and technical intelligence in support of the CCMDs, Services, force planners, and policy makers. It develops and disseminates scientific and technical intelligence on foreign threat systems, including guided missile systems; directed energy weapons; selected space programs or systems; and related command, control, and communications in support of operationally deployed forces and the materiel acquisition process. The Missile and Space Intelligence Center also develops

and distributes digital simulations of threat weapon systems and provides threat simulation support to force developers and operational forces.

(3) **Defense Special Missile and Aerospace Center** is a collaborative DIA and NSA activity that provides tasking, technical support, analysis, and reporting for various DIA and NSA intelligence activities.

For additional information, see DoDD 5105.21, Defense Intelligence Agency (DIA).

f. **The Defense Threat Reduction Agency** is a combat support agency that enables DoD and the USG to prepare for and counter weapons of mass destruction and emerging threats and to deter strategic attack by supporting nuclear deterrence. Programs include research and development and operational support to the joint force. The Defense Threat Reduction Agency develops and enhances space capabilities for arms control and verification and for chemical, biological, radiological, and nuclear defense, forensics, and response. The Defense Threat Reduction Agency provides support for modeling NUDET effects, including radiation plumes and electromagnetic pulse. The agency also researches, develops, and transitions technologies and capabilities to mitigate the threat or effects of nuclear/radiological events and to enhance the safety, security, survivability, and performance of US nuclear systems and facilities.

For additional information, see DoDD 5105.62, Defense Threat Reduction Agency (DTRA).

g. **The Defense Logistics Agency** functions as an integral element of the military logistics system that provides effective, efficient, and risk-mitigated worldwide logistics support to DoD under conditions of peace, crisis, and conflict, as well as to federal agencies, and, when authorized by law or by agreement, state and local government organizations, foreign governments, and international organizations. Its Nuclear and Space Enterprise Support Office provides direct support to the joint force.

For additional information, see DoDD 5105.22, Defense Logistics Agency (DLA).

3. Other Agencies and Organizations

a. The **NRO** is responsible for research and development; acquisition, launch, deployment, and operation of overhead systems; and related data processing facilities to collect intelligence and information.

(1) The Director, NRO, receives and implements SecDef and Director of National Intelligence guidance and direction by establishing strategic guidance policy and procedures for executing the NRO mission and accomplishing national security space responsibilities.

(2) The NRO designs, builds, and operates the nation's reconnaissance spacecraft, which are one of the primary collection sources for GEOINT data. The

spacecraft also provide imagery to support DoD targeting and mapping requirements. Applications of this data include warning, monitoring of arms-control agreements, and the planning and execution of military operations. NRO field representatives are located within each of the CCMDs and serve as a link between the NRO and CCDRs and their staffs. NRO field representatives provide support covering pre-deployment training, education, weapon system integration, and dissemination of products and services.

For additional information, see JP 2-0, Joint Intelligence, *and DoDD 5105.23,* National Reconnaissance Office (NRO).

b. **The National Air and Space Intelligence Center** is a USAF organization that assesses foreign air, missile, and cyberspace threats. The National Air and Space Intelligence Center can provide deployed forces with unique aerospace intelligence capabilities for DoD operational commands, research and development centers, weapon acquisition agencies, and national planners and policy makers. The center provides authoritative, engineering-level scientific and technical intelligence on missile threats. The National Air and Space Intelligence Center is an all-source integrator for intelligence relating to suspected purposeful interference and electromagnetic attack directed against USG or allied space systems.

c. **The National Ground Intelligence Center** is responsible for intelligence concerning threat, ground-based, space-related, and mobile electromagnetic warfare systems; technical characteristics, performance, signatures, capabilities, limitations, and vulnerabilities of current and projected ground-based spacecraft jammers; and electromagnetic warfare systems impacting space capabilities.

d. **NOAA.** A component of the Department of Commerce, NOAA has many programs and products with military applications, including nearly all of its OE products.

(1) NOAA supports USG and civilian space weather customers through operations of the Space Weather Prediction Center, which partners with USAF to provide support to DoD. The two organizations work together to provide real-time monitoring and forecasting of solar and near-Earth space weather events.

(2) NOAA's operational environmental spacecraft system is composed of geostationary and polar orbiting spacecraft. Both kinds of spacecraft are necessary for providing a complete global weather monitoring system. The spacecraft also carry additional instruments that are used to support aviation safety and maritime/shipping safety, which can impact military operations.

(3) NOAA, in conjunction with the United States Coast Guard (USCG) and the Department of the Air Force, operates SARSAT, a global search and rescue system that detects and locates distress signals from civilian emergency beacons. This information is relayed to search and rescue authorities around the world. This system also supports military units, particularly in permissive OEs. Both the USAF and USCG rescue coordination centers receive SARSAT alerts for all US-coded beacons (globally) and all

beacon alerts in the US search and rescue region. DoD use of the SARSAT system is discussed in DoDI 3003.01, *DoD Support to Civil Search and Rescue (SAR).*

e. **USAF.** The USAF supports the space operations of the USSF with the provision of support activities as appropriate (e.g., security, communications, finance, medical, legal, logistics). The 557th Weather Wing delivers worldwide weather products to Air Force, Space Force, and Army personnel; unified commands; national programs; and national-level authorities. The 2nd Weather Group delivers terrestrial, space, and climatological global environmental information to joint warfighters.

f. **USCG.** The USCG, through its USCG Navigation Center, monitors and reports on the differential GPS and nationwide automatic identification system signals, stations, and sites. The USCG, along with NOAA, NASA, and the Department of the Air Force, provides the governance, funding, management, and operation of the US SARSAT program.

For more information on USCG support to space operations, see 2019 Federal Radionavigation Plan.

g. **The United States Naval Observatory**, a subordinate activity of the Naval Meteorology and Oceanography Command, provides a variety of information to DoD, other USG departments and agencies, and the public. The observatory's mission employs four separate departments: precise time, astrometry, Earth orientation, and astronomical applications. Time signals are used to calibrate DoD systems, including GPS, national systems, Network Time Protocol servers, and other critical services and infrastructure. The United States Naval Observatory also develops tools to integrate star catalogs into space surveillance planning and simulation applications.

h. **The National Space Intelligence Center** provides space domain intelligence and technical expertise to national leaders, joint force warfighters, and acquisition professionals. As the Service intelligence center for the USSF, it characterizes threats from space and threats to US and allied space systems. To execute these missions, the National Space Intelligence Center analyzes the capabilities, limitations, employment methods, and vulnerabilities of adversary systems that threaten our space assets or provide support to adversary forces.

i. **The Joint Navigation Warfare Center** plans, integrates, and supports integrated NAVWAR worldwide. Support to CCMDs is provided via the Navigation Warfare Operations Center and theater NAVWAR coordination cells that provide reachback capabilities and deployable subject matter experts. CCDR requests for NAVWAR forces are supported by USSPACECOM after deconfliction and prioritization of ongoing missions.

j. **The Missile Warning Center** coordinates, plans, and executes worldwide missile, NUDET, and space reentry event detection to provide timely, accurate, and unambiguous strategic warnings in support of the United States and Canada. Additionally, the Missile

Warning Center is the primary theater sensor manager and backup strategic sensor manager.

k. **The Joint Overhead Persistent Infrared Planning Center** is a joint endeavor between USSPACECOM and the NGA to develop collection and exploitation plans for integrated overhead persistent infrared sensors in support of missile warning, missile defense, awareness of the OE, technical intelligence, and civil/environmental missions.

l. **The Federal Aviation Administration** regulates the US commercial space transportation industry to ensure compliance with international obligations of the United States and to protect the public health and safety, safety of property, and national security and foreign policy interests of the United States. The administration facilitates the strengthening and expansion of the US space transportation infrastructure in the private sector.

m. **The Federal Communications Commission** regulates communications by radio, television, wire, satellite, and cable across the United States. The Federal Communications Commission maintains jurisdiction over the communications aspects of broadband access, fair competition, radio frequency use, media responsibility, public safety, and homeland security.

4. Multinational Considerations

a. Multinational space operations provide the joint force opportunities to increase interoperability with and extend advantages to allies and partners, demonstrate responsible behavior in space, and reassure allies of our commitments to mutual defense. Partnerships can enhance collective security capabilities and provide a deterrent effect against adversaries from attacking or interfering with friendly space capabilities. Space capabilities derived from a mix of DoD, commercial, and multinational spacecraft enhance the resilience of our overall national space enterprise and increase the ability of joint forces to operate effectively through a denied, degraded, or disrupted space OE. Allied and partner forces typically have the same vulnerabilities to space threats as the United States, due to their similar reliance on space assets. It is important for joint planners to consider this when multinational forces are involved in operations.

b. USSPACECOM, often in coordination and cooperation with other CCMDs, leads the multinational effort to enhance cooperative space operations with allies and selected international partners. This effort focuses on building cooperation, collaboration, and integration of military space activities. Interested countries combine their resources to strengthen deterrence, improve mission assurance, and optimize increased synchronization. This effort extends to sharing information, data, and resources with militaries from partner nations.

c. The North Atlantic Treaty Organization has integrated several space capabilities and established offices that coordinate specific programs. Supreme Headquarters Allied Powers Europe oversees most programs, such as coordinating with USSPACECOM and

United States European Command for the shared early warning system. The North Atlantic Treaty Organization Consultation, Command and Control Board oversees the Consultation, Command and Control Agency, which is responsible for North Atlantic Treaty Organization's commercial space imagery and SATCOM programs.

d. The civilian and commercial sectors dominate space operations in many nations. Therefore, civilian space agencies often take the leadership role for national space issues. There are allied space operations centers, such as the European Union Satellite Centre, and several others, but they are not typically part of military forces. However, there may be agreements and procedures in place for them to support military operations.

e. US forces rely extensively on foreign environmental spacecraft capabilities to augment military weather and oceanographic spacecraft data. Foreign geostationary environmental spacecraft data is essential for military operations in Europe, Asia, and the western-Pacific and Indian Oceans.

f. Multinational forces have many of the same requirements as US forces for space operations and capabilities. However, US foreign disclosure policy establishes the nature and scope of disclosure and release of space-derived products to multinational partners. Commercial imagery products are normally unclassified and benefit multinational partners. Weather data is also readily available, as is GPS navigation support data. Of special importance is the provision for missile warning and defense against attack from ballistic missiles. USSPACECOM is responsible, as part of an interagency process and in coordination with CCMDs, for assisting in development of missile warning architectures and providing this information to multinational forces under shared early warning.

For additional information, see JP 3-16, Multinational Operations.

APPENDIX B
REFERENCES

The development of JP 3-14 is based upon the following primary references:

1. General

a. Title 10, United States Code.

b. Title 50, United States Code.

c. *2020 National Space Policy of the United States of America.*

d. *2022 National Security Strategy of the United States of America.*

e. *(U) 2022 National Defense Strategy of the United States of America.*

f. *Department of Defense Space Strategy* (2020).

g. *(U) National Military Strategy, 2018*.

h. National Security Presidential Directive-27, *(U) US Commercial Remote Sensing Space Policy.*

i. *National Space Transportation Policy.*

j. *National Strategy for Space* (2018).

k. Space Policy Directive-2, *Streamlining Regulations on Commercial Use of Space.*

l. Space Policy Directive-3, *National Space Traffic Management.*

m. Space Policy Directive-7, *(U) The United States Space-Based Positioning, Navigation, and Timing Policy.*

n. *Unified Command Plan* (2022).

2. Department of Defense Publications

a. Report to Congressional Defense Committees, *DoD Plan for Operationally Responsive Space.*

b. *DoD Global Positioning System Security Policy.*

c. DoDD 3100.10, *Space Policy.*

d. DoDD 3100.16, *DoD Management of Space Professional Development.*

e. DoDD 4650.05, *Positioning, Navigation, and Timing.*

f. DoDD 5100.01, *Functions of the Department of Defense and Its Major Components.*

g. DoDD 5105.19, *Defense Information Systems Agency.*

h. DoDD 5105.22, *Defense Logistics Agency (DLA).*

i. DoDD 5105.23, *National Reconnaissance Office (NRO).*

j. DoDD 5105.60, *National Geospatial-Intelligence Agency (NGA).*

k. DoDD 5105.62, *Defense Threat Reduction Agency (DTRA).*

l. DoDI 3003.01, *DoD Support to Civil Search and Rescue (SAR).*

m. DoDI 3100.12, *Space Support.*

n. DoDI S-3100.13, *(U) Space Force Application.*

o. DoDI S-3100.14, *Space Force Enhancement.*

p. DoDI S-3100.15, *Space Control.*

q. DoDI 4650.08, *Positioning, Navigation, and Timing and Navigation Warfare.*

r. DoDI 8420.02, *DoD Satellite Communications.*

3. Chairman of the Joint Chiefs of Staff Publications

a. Chairman of the Joint Chiefs of Staff Instruction 6250.01G, *Department of Defense Satellite Communications.*

b. Chairman of the Joint Chiefs of Staff Manual 3320.02E, *Joint Spectrum Interference Resolution (JSIR) Procedures.*

c. Chairman of the Joint Chiefs of Staff Guide 3130, *Adaptive Planning and Execution Overview and Policy Framework.*

d. JP 1, Volume 1, *Joint Warfighting.*

e. JP 1, Volume 2, *The Joint Force.*

f. JP 2-0, *Joint Intelligence.*

g. JP 3-0, *Joint Campaigns and Operations.*

h. JP 3-01, *Joint Countering Air and Missile Threats.*

i. JP 3-04, *Information in Joint Operations.*

j. JP 3-05, *Joint Doctrine for Special Operations.*

k. JP 3-08, *Interorganizational Cooperation*.

l. JP 3-09, *Joint Fire Support.*

m. JP 3-12, *Joint Cyberspace Operations.*

n. JP 3-16, *Multinational Operations.*

o. JP 3-20, *Joint Security Cooperation.*

p. JP 3-27, *Homeland Defense.*

q. JP 3-30, *Joint Air Operations.*

r. JP 3-59, *Meteorological and Oceanographic Operations.*

s. JP 3-60, *Joint Targeting.*

t. JP 3-85, *Joint Electromagnetic Spectrum Operations.*

u. JP 4-0, *Joint Logistics.*

v. JP 5-0, *Joint Planning.*

w. JP 6-0, *Joint Communications System.*

4. Treaties and International Agreements

a. Charter of the United Nations, 1945.

b. Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, 1977.

c. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 1967.

5. Service Publications

a. Air Force Doctrine Publication 3-14, *Counterspace Operations.*

b. Army Regulation 115-13, *Installation Geospatial Information and Services.*

c. Army Regulation 900-1, *Department of the Army Space Policy.*

d. Field Manual 3-14, *Army Space Operations.*

e. Secretary of the Navy Instruction 5400.39E, *Department of the Navy Space Policy.*

f. Office of the Chief of Naval Operations Instruction 5400.43B, *Navy Space Policy Implementation.*

g. Commandant Instruction M16130.2F, *US Coast Guard Addendum to the National Search and Rescue Supplement (NSS) to the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR).*

h. Marine Corps Order 5400.53A, *Marine Corps Space Policy.*

i. Space Capstone Publication—Spacepower.

j. Space Doctrine Publication 5-0*, Space Planning.*

APPENDIX C
ADMINISTRATIVE INSTRUCTIONS

1. User Comments

Users in the field are highly encouraged to submit comments on this publication using the Joint Doctrine Feedback Form located at: https://jdeis.js.mil/jdeis/jel/jp_feedback_form.pdf and e-mail it to: js.pentagon.j7.mbx.jedd-support@mail.mil. These comments should address content (accuracy, usefulness, consistency, and organization), writing, and appearance.

2. Authorship

The lead agent for this publication is the United States Space Command. The Joint Staff doctrine sponsor for this publication is the Director for Operations (J-3).

3. Supersession

This publication supersedes JP 3-14, *Space Operations*, 10 April 2018, incorporating Change 1, 26 October 2020.

4. Change Recommendations

a. To provide recommendations for urgent and/or routine changes to this publication, please complete the Joint Doctrine Feedback Form located at: https://jdeis.js.mil/jdeis/jel/jp_feedback_form.pdf and e-mail it to: js.pentagon.j7.mbx.jedd-support@mail.mil.

b. When a Joint Staff directorate submits a proposal to the CJCS that would change source document information reflected in this publication, that directorate will include a proposed change to this publication as an enclosure to its proposal. The Services and other organizations are requested to notify the Joint Staff J-7 when changes to source documents reflected in this publication are initiated.

5. Lessons Learned

The Joint Lessons Learned Program's (JLLP's) primary objective is to enhance joint force readiness and effectiveness by contributing to improvements in doctrine, organization, training, materiel, leadership and education, personnel, facilities, and policy. The Joint Lessons Learned Information System (JLLIS) is the DoD system of record for lessons learned and facilitates the collection, tracking, management, sharing, collaborative resolution, and dissemination of observations, issues, best practices, and lessons learned to improve the development and readiness of the joint force. The JLLP integrates with joint doctrine through the joint doctrine development process by providing insights and lessons learned derived from operations, exercises, war games, and other events. As these inputs are incorporated into joint doctrine, they become institutionalized for future use, a major

goal of the JLLP. Insights and lessons learned are routinely sought and incorporated into draft JPs throughout formal staffing of the development process. The JLLIS Website can be found at https://www.jllis.mil (NIPRNET) or http://www.jllis.smil.mil (SIPRNET).

6. Distribution of Publications

LIMITED. This JP is approved for limited release. The authors of this publication have concluded that information in this publication should be disseminated on an as-needed basis and is limited to common access cardholders. Requests for distribution to noncommon access cardholders should be directed to the Joint Staff J-7.

7. Printing and Distribution

Before distributing this JP, please e-mail the Joint Staff J-7, Joint Doctrine Branch, at js.pentagon.j7.mbx.jedd-support@mail.mil, or call 703-692-7255/DSN 692-7255, or contact the lead agent or Joint Staff doctrine sponsor.

a. The Joint Staff does not print hard copies of JPs for distribution. An electronic version of this JP is available on:

(1) NIPRNET Joint Electronic Library Plus (JEL+) at https://jdeis.js.mil/jdeis/index.jsp (limited to .mil and .gov users with a DoD common access card) and

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GLOSSARY
PART I—SHORTENED WORD FORMS (ABBREVIATIONS, ACRONYMS, AND INITIALISMS)

AOR	area of responsibility
C2	command and control
CCDR	combatant commander
CCMD	combatant command
CDRUSSPACECOM	Commander, United States Space Command
CSS	Central Security Service (NSA)
CSTO	combined space tasking order
DIA	Defense Intelligence Agency
DoD	Department of Defense
DoDD	Department of Defense directive
DoDI	Department of Defense instruction
EM	environmental monitoring
EMS	electromagnetic spectrum
GEO	geosynchronous Earth orbit
GEOINT	geospatial intelligence
GPS	Global Positioning System
HEO	highly elliptical orbit
IC	intelligence community
ISR	intelligence, surveillance, and reconnaissance
JFC	joint force commander
JFSCC	joint force space component commander
JIST	joint integrated space team
JP	joint publication
LEO	low Earth orbit
MEO	medium Earth orbit
METOC	meteorological and oceanographic
NASA	National Aeronautics and Space Administration
NAVWAR	navigation warfare
NGA	National Geospatial-Intelligence Agency
NOAA	National Oceanic and Atmospheric Administration (DOC)
NRO	National Reconnaissance Office
NSA	National Security Agency

NUDET	nuclear detonation
OE	operational environment
PNT	positioning, navigation, and timing
SARSAT	search and rescue satellite-aided tracking
SATCOM	satellite communications
SDA	space domain awareness
SecDef	Secretary of Defense
SSE	space support element
TT&C	telemetry, tracking, and commanding
US	United States
USA	United States Army
USAF	United States Air Force
USCG	United States Coast Guard
USG	United States Government
USN	United States Navy
USSF	United States Space Force
USSPACECOM	United States Space Command

PART II—TERMS AND DEFINITIONS

1. JP 3-14, *Joint Space Operations,* 23 August 2023, Active Terms and Definitions

constellation. In space operations, a system of spacecraft acting in concert to perform a specific mission. (Approved for incorporation into the DoD Dictionary.)

defensive space operations. Actions taken to preserve friendly freedom of action in space. (Approved for inclusion in the DoD Dictionary.)

navigation warfare. Actions that maintain friendly use of positioning, navigation, and timing information while denying the same to an adversary. Also called **NAVWAR.** (Approved for incorporation into the DoD Dictionary.)

offensive space operations. Actions taken to deny an adversary freedom of action in space. (Approved for inclusion in the DoD Dictionary.)

space domain. The area above the altitude where atmospheric effects on airborne objects become negligible. (Approved for incorporation into the DoD Dictionary.)

space domain awareness. The timely, relevant, and actionable understanding of the operational environment that allows military forces to plan, integrate, execute, and assess space operations. Also called **SDA.** (Approved for inclusion in the DoD Dictionary.)

space forces. The space and terrestrial systems, equipment, facilities, organizations, and personnel, or combination thereof, necessary to conduct space operations. (DoD Dictionary. Source: JP 3-14)

space operations. The employment of space forces in, to, or from space to achieve objectives. (Approved for inclusion in the DoD Dictionary.)

space situational awareness. The requisite foundational, current, and predictive knowledge and characterization of space orbital objects and the space domain. (Approved for incorporation into the DoD Dictionary.)

space superiority. The degree of control in the space domain of one force over another that permits freedom of access and action without prohibitive interference. (Approved for incorporation into the DoD Dictionary.)

2. Terms Removed from the DoD Dictionary

- **Supersession of JP 3-14, *Space Operations,* 10 April 2018:** defensive space control; Global Positioning System; negation; offensive space control; overhead persistent infrared; polar orbit; reconstitution; space asset; space capability; space control; space coordinating authority

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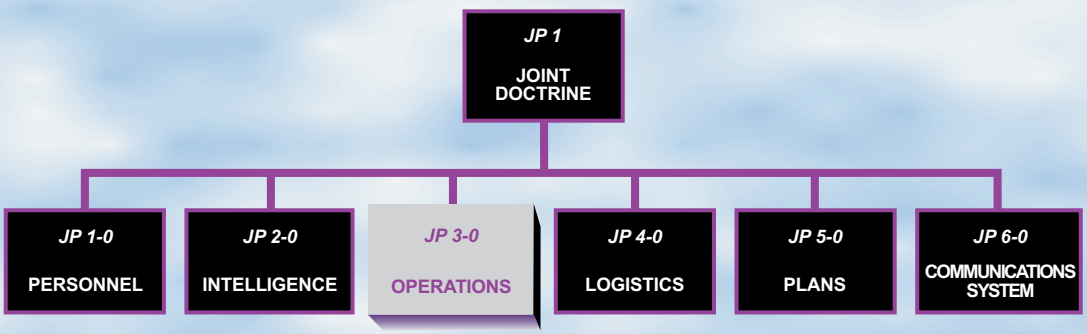
JOINT DOCTRINE PUBLICATIONS HIERARCHY



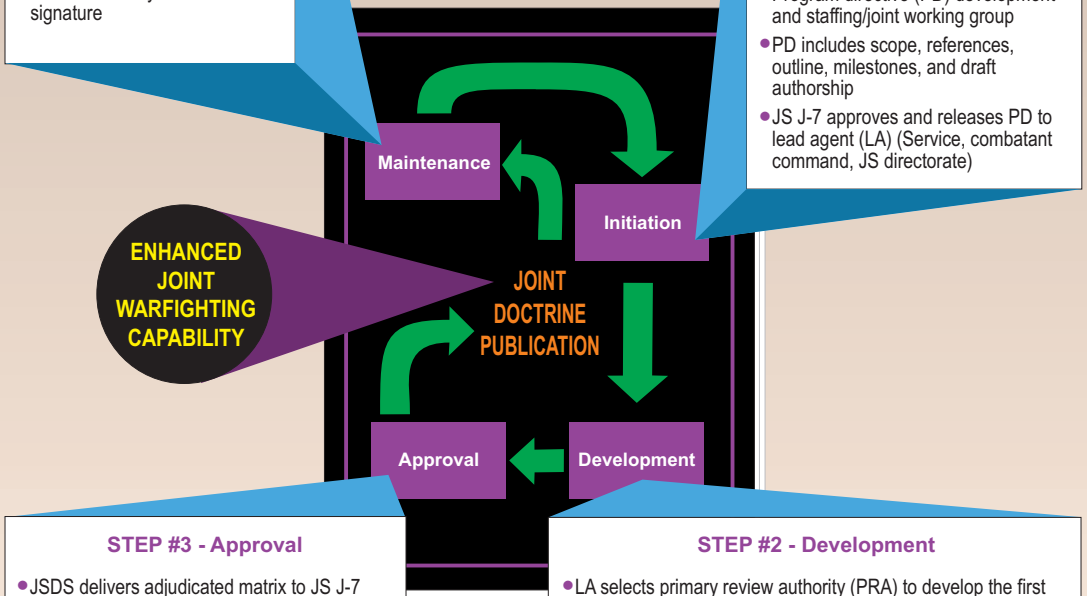
All joint publications are organized into a comprehensive hierarchy as shown in the chart above. **Joint Publication (JP) 3-14** is in the **Operations** series of joint doctrine publications. The diagram below illustrates an overview of the development process:

STEP #4 - Maintenance

- JP published and continuously assessed by users
- Formal assessment begins 24-27 months following publication
- Revision begins 3.5 years after publication
- Each JP revision is completed no later than 5 years after signature

STEP #1 - Initiation

- Joint doctrine development community (JDDC) submission to fill extant operational void
- Joint Staff (JS) J-7 conducts front-end analysis
- Joint Doctrine Planning Conference validation
- Program directive (PD) development and staffing/joint working group
- PD includes scope, references, outline, milestones, and draft authorship
- JS J-7 approves and releases PD to lead agent (LA) (Service, combatant command, JS directorate)



STEP #3 - Approval

- JSDS delivers adjudicated matrix to JS J-7
- JS J-7 prepares publication for signature
- JSDS prepares JS staffing package
- JSDS staffs the publication via JSAP for signature

STEP #2 - Development

- LA selects primary review authority (PRA) to develop the first draft (FD)
- PRA develops FD for staffing with JDDC
- FD comment matrix adjudication
- JS J-7 produces the final coordination (FC) draft, staffs to JDDC and JS via Joint Staff Action Processing (JSAP) system
- Joint Staff doctrine sponsor (JSDS) adjudicates FC comment matrix
- FC joint working group


JOINT
CHIEFS OF STAFF