FM 3-14

Army Space Operations

FEBRUARY 2026

DISTRIBUTION RESTRICTION:

Approved for public release; distribution is unlimited.

This publication supersedes FM 3-14, dated 30 October 2019.

HEADQUARTERS, DEPARTMENT OF THE ARMY

*FM 3-14

Field Manual
No. 3-14

Headquarters
Department of the Army
Washington, DC, 25 February 2026

ARMY SPACE OPERATIONS

Contents

Figures

Tables

Preface

Field manual (FM) 3-14, *Army Space Operations,* provides an overview of space operations in the Army and is consistent and compatible with joint doctrine. FM 3-14 links Army space operations doctrine to joint space operations doctrine as expressed in joint publication (JP) 3-14, *Joint Space Operations,* and other joint doctrinal publications. This FM establishes guidance for employing space and space-based systems and capabilities to support United States (U.S.) Army land warfighting dominance. It provides a general overview of support to Army operations, reviews national guidance and direction, and outlines selected unique space-related and enabled Army capabilities. The doctrine in this FM represents the Army's best use of its space capabilities.

The principal audience for FM 3-14 encompasses all members of the Army profession, including Army commanders and staffs, and Army Space Professionals to assist in the planning and incorporation of space capabilities into operations. It aids Army and joint force commanders (JFCs) in planning and executing cohesive joint operations throughout the entire operational environment. Commanders and staffs of Army headquarters serving as joint task force or multinational headquarters can also refer to applicable joint or multinational doctrine concerning the competition continuum and joint or multinational forces. Trainers and educators throughout the Army may also use this manual.

Army space operations integrate into military operations using established joint and Army processes such as the intelligence process, targeting, and the military decision-making process. This publication includes space staff responsibilities to the military decision-making process, targeting, and intelligence products. It also highlights the importance of intelligence support to space operations.

Commanders, staffs, and subordinates ensure their decisions and actions comply with applicable U.S., international, and in some cases, host-nation laws, and regulations. Commanders at all levels ensure their Soldiers operate in accordance with the law of war and the rules of engagement (see FM 6-27).

FM 3-14 uses joint terms where applicable. Selected joint and Army terms and definitions appear in both the glossary and the text. Terms for which FM 3-14 is the proponent publication (the authority) are marked with an asterisk (*) in the glossary. When first defined in the text, terms for which FM 3-14 is the proponent publication are boldfaced and italicized, and definitions are boldfaced. When first defining other proponent definitions in the text, the term is italicized with the proponent publication designator and number at the end of the definition. Subsequent uses of the term are not italicized.

FM 3-14 applies to the Active Army, Army National Guard/Army National Guard of the United States, and United States Army Reserve unless otherwise stated.

The proponent of FM 3-14 is the United States Army Space and Missile Defense Command (USASMDC). The preparing agency is the Space and Missile Defense Center of Excellence. Send comments and recommendations on a Department of the Army Form 2028 (*Recommended Changes to Publications and Blank Forms*) directly to usarmy.peterson.smdc.list.smdc-doctrine@army.mil or USASMDC Space and Missile Defense Center of Excellence, Attn: Commandant Doctrine Office, 350 Vandenberg Street, Bldg #3, Peterson SFB, CO 80914.

This page intentionally left blank.

Introduction

Over the last three decades, assumptions of individual domain supremacy and the break in great-power security competition drove the U.S. joint force doctrine, equipment, and readiness posture. These assumptions have evolved when faced with recent changes and the modernization efforts of acute and persistent threats and their approaches to warfare.

The space domain is a warfighting domain with different characteristics from the land, air, maritime, and cyberspace domains. To win in a complex operational environment, Army forces provide the joint force with multiple options, integrate the efforts of multiple partners, operate across multiple domains, and present threats with multiple dilemmas. Space operations provide Army and joint forces with highly technical capabilities to create multiple dilemmas for threats on the battlefield, enabling commanders to fight from positions of relative advantage.

Nearly every Army operation relies on the advantages provided by space capabilities. Space capabilities permit enhanced situational understanding; provide global communications; enable precise and accurate fires; support the timing and tempo of joint operations; and provide access for cyberspace operations. These capabilities directly support operations at all levels of warfare by extending the operational reach of Army forces.

Potential adversaries have identified U.S. reliance on space-based capabilities as a critical vulnerability and will attempt to exploit this to deter and degrade our ability to act. Army space operations deliver effects to maintain assured access to space capabilities and interdict adversary space capabilities and offensive and defensive space efforts.

Army space operations are conducted around the globe but engaged regionally. Army space professionals are subject matter experts responsible for integrating space capabilities into Army operations and interdicting adversary space capabilities used to hold friendly forces at risk. They are an integral part of a joint team to plan, fight, and adapt operations across the competition continuum. Army space operations continually evolve to meet the requirements of a complex and rapidly changing operational environment.

Army space doctrine refines and expands upon joint space doctrine by defining space tactics and procedures relevant to the Army within its operating concept (multidomain operations) and applicable to large-scale combat operations. Army space operations can deliver effects at all levels of warfare at any point on the competition continuum. This FM is rooted in Army operations and consistent with joint doctrine.

Chapter Organization

FM 3-14 contains four chapters and three Appendices:

Chapter 1 is an overview of the operational environment. It includes the Army space core competencies, the fundamentals of the space domain, and discussions of the space domain as a warfighting domain. It concludes with how space contributes to the warfighting functions and combat power.

Chapter 2 presents Army space operations fundamentals in the context of the Army's operating concept, multidomain operations. It discusses in depth the joint and Army space mission areas and the role of Army space across the competition continuum.

Chapter 3 describes Army space forces.

Chapter 4 discusses how Army space forces participate in the operations process and intelligence preparation of the operational environment.

Appendix A identifies Annex N–Space Operations to the base order, its relationship to other annexes, and its content.

Appendix B provides an example of a space running estimate.

Appendix C provides an example of a space support request.

The following terminology has been added, as noted.

Introductory table 1. New Army terms

Term	Remarks
Army space professionals.	New term for which this manual is the proponent.
Meaconing.	New term for which this manual is the proponent.
Space control.	Service retained term. ATP 3-14.1 is the proponent publication.

Chapter 1
Operational Environment Overview

This chapter describes the operational environment as it relates to the space domain. It outlines the core competencies of Army space forces and the fundamentals of the space domain. Additionally, this chapter discusses interdependencies between space and all other domains. It concludes with how space operations contribute to the warfighting functions and support the generation and application of combat power.

SECTION I – ARMY SPACE CORE COMPETENCIES AND FUNDAMENTALS

1-1. *Space operations* are the employment of space forces in, to, or from space to achieve objectives (JP 3-14). *Space forces* are the space and terrestrial systems, equipment, facilities, organizations, and personnel, or combination thereof, necessary to conduct space operations (JP 3-14). ***Army space professionals*** **are members of a specialized cadre of Army personnel who are trained in and dedicated to performing space operations**.

CORE COMPETENCIES

1-2. A *core competency* is an essential and enduring capability that a branch or an organization provides to Army operations (Army Doctrine Publication (ADP) 1-01). The core competencies for space forces are those attributes that bring strengths, advantages, and contributions to the Army. The core competencies provide the foundation for Army space tasks related to those functions. Army space forces understand and excel at these core competencies. The three Army space core competencies are:

- Integrate space capabilities into operations.
- Deliver effects in, from, and through the space domain.
- Understand the space domain and its interdependence with other domains.

INTEGRATE SPACE CAPABILITIES INTO OPERATIONS

1-3. Integration is the arrangement of military forces and their actions to create a force that operates by engaging as a whole. Army forces rely on space capabilities and their integration into operations across all domains and throughout the competition continuum. Space operations are not conducted independently of other operations and must remain cognizant of other efforts in the area of operations. In doing so, space cadre seek opportunities to integrate complementary capabilities to satisfy the tenets of operations (agility, convergence, endurance, and depth). This integration may require space cadre to look beyond Army capabilities to joint or multinational assets. Integration and synchronization are vital to achieving convergence. *Synchronization* is the arrangement of military actions in time, space, and purpose to produce maximum relative combat power at a decisive place and time (JP 2-0).

1-4. Army forces use a combined arms approach, leveraging capabilities from multiple domains to create complementary and reinforcing effects. This strategy preserves combat power and maintains flexible options for the JFC. By seamlessly integrating all available space capabilities into both planning and execution, space personnel provide commanders with options to mitigate risk and enhance the likelihood of success. Employing diverse and redundant attack methods further increases this probability by avoiding reliance on a single detection, tracking, and strike system. Successful operations compel enemy forces to respond and reveal more of their capabilities, generating additional opportunities within the space domain.

1-5. To operate in complex environments, the Army depends greatly on assuring access to and optimizing effects from vital space capabilities. To ensure this access, Army space forces:

- Plan, develop, acquire, and integrate Army, joint, coalition, and commercial space capabilities across the warfighting functions to achieve convergence at echelon.
- Synchronize effects from space control, navigation warfare (NAVWAR), and integrated joint special technical operations (IJSTO) to achieve desired outcomes.

- Ensure resiliency in a denied, degraded, and disrupted space operational environment (D3SOE).
- Prepare and train all echelons of Army forces to fight through a D3SOE.
- Plan and integrate Army space capabilities to support homeland defense.
- Integrate space capabilities with cyberspace networks to deliver and defend critical mission data.
- Exercise operational and technical control of Army high-altitude systems.
- Conduct high-altitude operations.

DELIVER EFFECTS FROM AND THROUGH THE SPACE DOMAIN

1-6. Army space forces deliver effects in, from, and through the space domain against threat networks, systems, weapons, and munitions. These effects enhance Army forces' capacity to maintain agility, achieve convergence, improve endurance, and exploit depth, ultimately dominating the decision space.

1-7. To deliver effects, Army space forces:

- Coordinate with Army and joint space forces at echelon to execute space operations in support of large-scale combat operations.
- Participate in the information collection and targeting processes.
- Conduct space control.
- Provide theater missile warning.
- Provide accurate, timely, and actionable friendly force tracking (FFT) information and analysis.
- Create effects across multiple domains by leveraging space capabilities to shape the operational environment (OE), dominate the battlefield, and to meet commanders' objectives.

1-8. Army space forces conduct operations to interdict adversary space capabilities. *Interdiction* is an action to divert, disrupt, delay, or destroy the enemy's military surface capability before it can be used effectively against friendly forces or otherwise be used to achieve enemy objectives (JP 3-03). Army space forces understand adversary space capabilities and advise the rest of the staff on potential opportunities for exploitation. They coordinate, manage, and execute operations to interdict adversary capabilities to achieve desired effects.

1-9. Interdiction may be planned to create friendly advantages at any level of warfare and may support or be supported by another commander to achieve higher-level objectives. Interdiction operations require detailed planning to ensure the appropriate resources are apportioned, allocated, and positioned to be effective. Appropriate coordination and execution of interdiction activities preserves initiative and secures positions of relative advantage not just in the space domain but in all other domains.

Note. See JP 3-03 for more on interdiction.

UNDERSTAND THE SPACE DOMAIN AND ITS INTERDEPENDENCE WITH OTHER DOMAINS

1-10. Army space professionals understand the fundamentals of the space domain and how the space domain affects and is affected by the other domains. They apply their expertise and creativity to support and enhance achieving objectives at all levels of warfare. This manual explains in detail how the space domain is interconnected with the other domains.

FUNDAMENTALS OF THE SPACE DOMAIN

1-11. The *space environment* is the environment corresponding to the space domain, where electromagnetic radiation, charged particles, and electric and magnetic fields are the dominant physical influences, and that encompasses the Earth's ionosphere and magnetosphere, interplanetary space, and the solar atmosphere (JP 3-59). The *space domain* is the area above the altitude where atmospheric effects on airborne objects become negligible (JP 3-14). The von Kármán line is a conventional definition of the edge of space or the altitude where atmospheric effects on airborne objects becomes negligible. The international record-keeping body, Fédération Aéronautique Internationale (FAI) defines the Kármán line at an altitude of 100 kilometers above mean sea level. Most international organizations and regulatory agencies (including the United Nations) accept the FAI's von Kármán line definition. The von Kármán line is used to differentiate between aircraft and spacecraft.

1-12. The space domain is the ultimate high ground and gives users the advantage of a global and persistent perspective. Satellites are well-suited for long-range communications; positioning, navigation and timing (PNT); environmental monitoring; reconnaissance and surveillance; collecting imagery; and missile detection and warning, as they are not constrained by geographic borders or denied regions in the land, sea, and air domains. However, international law and policy and the laws of physics constrain space operations. Each of these constraints presents a unique set of advantages and disadvantages. To overcome these challenges, the Army and Joint forces adapt and develop space systems able to respond to evolving technology and state and nonstate actors.

1-13. Satellites (or spacecraft) consist of two components, the bus and the payload. The bus contains the power systems, control units, and other systems that keep the satellite operational. The payload is the capability mounted onto the bus and can be a sensor, a communications array, or other capability. A spacecraft can have multiple payloads conducting disparate missions. Groups of satellites carrying payloads performing similar missions are constellations. A single agency typically operates an entire constellation performing a particular function.

1-14. Space systems are divided into three distinct but interdependent segments.

- The orbital segment consists of the spacecraft beyond Earth's atmosphere and the path on which it travels around the earth.
- The link segment consists of signals connecting ground-to-space (uplink), space-to-ground (downlink), and space-to-space (crosslink) segments through the electromagnetic spectrum (EMS). This includes telemetry, tracking, and commanding (also known as TT&C) signals necessary for controlling the spacecraft and its payloads. Separate from the telemetry, tracking, and commanding signals, the spacecraft payload may provide a direct downlink of data (e.g., imagery), Satellite Communications (SATCOM) signals between two terminals on the ground, or a PNT signal.
- The terrestrial segment consists of personnel, facilities, and equipment that exist in the other physical domains (air, land, maritime) that affect or are affected by using either the orbital or link segments. This segment includes facilities and equipment supporting command and control (C2) of space assets, ground-based processing equipment, Earth terminals, user equipment such as Global Positioning System (GPS) receivers, space situational awareness (SSA) sensors, and the networks connecting the facilities in which this equipment is housed.

ELECTROMAGNETIC SPECTRUM

1-15. The space domain is accessible only through space lift or the electromagnetic spectrum (EMS), a maneuver space consisting of all frequencies of electromagnetic radiation. The nature of the EMS makes the space and cyberspace domains inextricably linked. Many cyberspace networks transit the space domain, and most space capabilities require the cyberspace domain to provide any utility to the warfighter.

1-16. The *electromagnetic environment* (EME) is the resulting product of the power and time distribution, in various frequency ranges, of the radiated or conducted electromagnetic emission levels encountered by a military force, system, or platform when performing its assigned mission in its intended operational environment (JP 3-85). It is the actual radiation encountered in an area, irrespective of its source and effects on operations.

1-17. The electromagnetic operational environment (EMOE) is a composite of the actual and potential electromagnetic radiation, conditions, circumstances, and influences that affect the employment of capabilities and the decisions of the commander. It includes the existing background radiation (i.e., EME) as well as the friendly, neutral, adversary, and enemy electromagnetic systems able to radiate. For more on the EMS, EME, and EMOE, refer to JP 3-85 and FM 3-12.

1-18. The Army acknowledges it is in persistent electromagnetic contact with threat forces and that electromagnetic warfare capabilities enhance understanding of the operational environment. It recognizes the significant advantage the side has, that coordinates their actions, controls, and exploits activities in the EMS, while preventing the enemy from doing the same. For more on owning the EMS, refer to FM 3-0.

Frequency bands for space applications

1-19. See figure 1-1 (from JP 3-85) below for a representation of the EMS. Most space capabilities leverage the microwave bands through the visible spectrum.

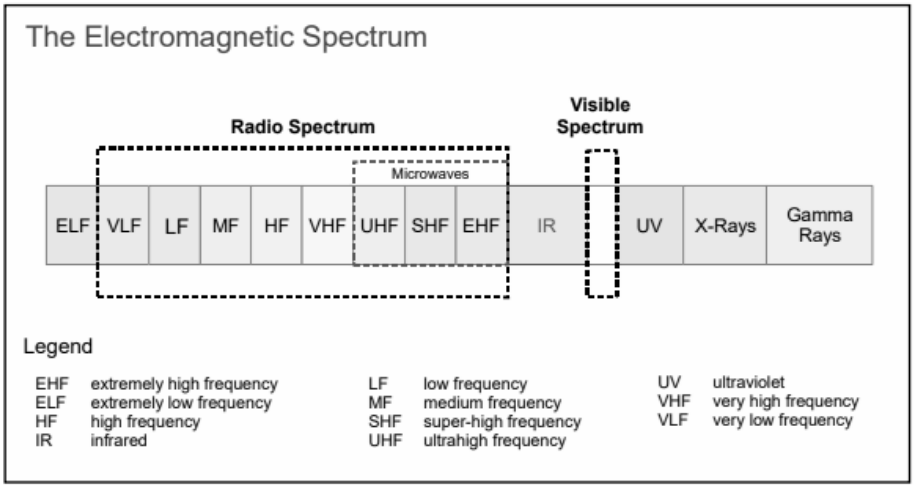


Figure 1-1. The electromagnetic spectrum

1-20. Frequency band designations are often confusing as organizations apply different designations to them or overlap frequency ranges. Refer to table 1-1 below for a comparison of bandwidth frequencies showing the most common standards. This table is specific to the frequencies that are used for space application; it does not include the entire EMS.

Table 1-1. Bandwidth comparison for space applications

Designation Used in FM 3-14	ITU Band	ITU Frequency Range (gigahertz)	NATO / EU / US for ECM	NATO / EU / US Frequency Range (gigahertz)	IEEE Band	IEEE Frequency Range (gigahertz)
Narrowband	UHF	0.3 – 3	A	0.3 – 3	UHF	0.3-1
			B	0.39-1.55	L	1-2
			C	1.55-4.20	S	2-4
Wideband	SHF	3 – 30	D	3 – 30		
			CE	4.20-5.75	C	4-8
			X	5.75-10.90	X	8-12
			Ku	10.90-22.0	Ku	12-18
			K	10.90-36.0	K	18-26.5
			Ka*	22.0-36.0	Ka	26.5-40
Protected band	EHF	30 - 300	EHF	30 – 300		
*Note that Ka band spans wideband and protected band frequencies.						
EHF – extremely high frequency SHF – super-high frequency UHF – ultrahigh frequency ECM – Electronic Countermeasures			EU – European Union IEEE – Institute of Electrical and Electronics Engineers ITU – International Telecommunication Union NOTE: Band letter designations are not abbreviations.			

1-21. Each frequency band exhibits certain characteristics based on its inherent properties. These characteristics include data capacity, uplink and downlink footprint size (accessibility), power requirements, and receiver size requirements. As one moves up in frequency from narrowband to wideband to protected band, power requirements and data capacity increase, while footprint and ground receiver sizes decrease. Higher frequencies are more difficult to jam and have the capacity to include more complex encryption.

However, higher frequencies, especially in the protected band, are more susceptible to terrestrial weather effects such as rain and cloud cover.

ORBITAL CHARACTERISTICS

1-22. Satellites travel around the earth in paths called orbits. Orbits exhibit distinct characteristics governed by the laws of physics and are described by the orbital elements. Using these elements and physics, satellite designers tailor the design, launch, and operation of the spacecraft to satisfy specific mission requirements.

1-23. There are six orbital elements that describe the position of a spacecraft along its orbit. The six orbital elements are illustrated in figure 1-2 on page 6.

- Period: The length of the orbit's semi-major axis determines the size of the orbit and directly relates to the spacecraft's altitude above the earth and the time (period) it takes to complete an orbit.
- Eccentricity: Every orbit is an ellipse. The eccentricity of the orbit determines how circular that ellipse is. The point on an orbit at which the spacecraft is farthest from the earth is called the apogee. The point at which the spacecraft is closest is called the perigee. For near-circular orbits, the apogee and perigee reside near the same altitudes. The more elliptical (less circular) the orbit, the higher the apogee is relative to the perigee.
- Inclination: The angle at which the orbit tilts relative to the earth's equator. An orbit with zero degrees inclination traces a path on the ground—called the ground trace—over the equator. As the inclination increases, the angle of tilt relative to the equator also increases.
- Right Ascension of the Ascending Node (RAAN): The point on the orbit at which the spacecraft crosses over the equator from south to north. This element determines the orbit's "twist" relative to a fixed coordinate system. Satellite designers leverage this element to build constellations that provide greater coverage of the earth.
- Argument of Perigee: Corresponds to the location of the perigee of the orbit relative to the ascending node and describes the orientation of the orbit within its orbital plane.
- True Anomaly: Corresponds to the actual location of the spacecraft in its orbit relative to perigee.

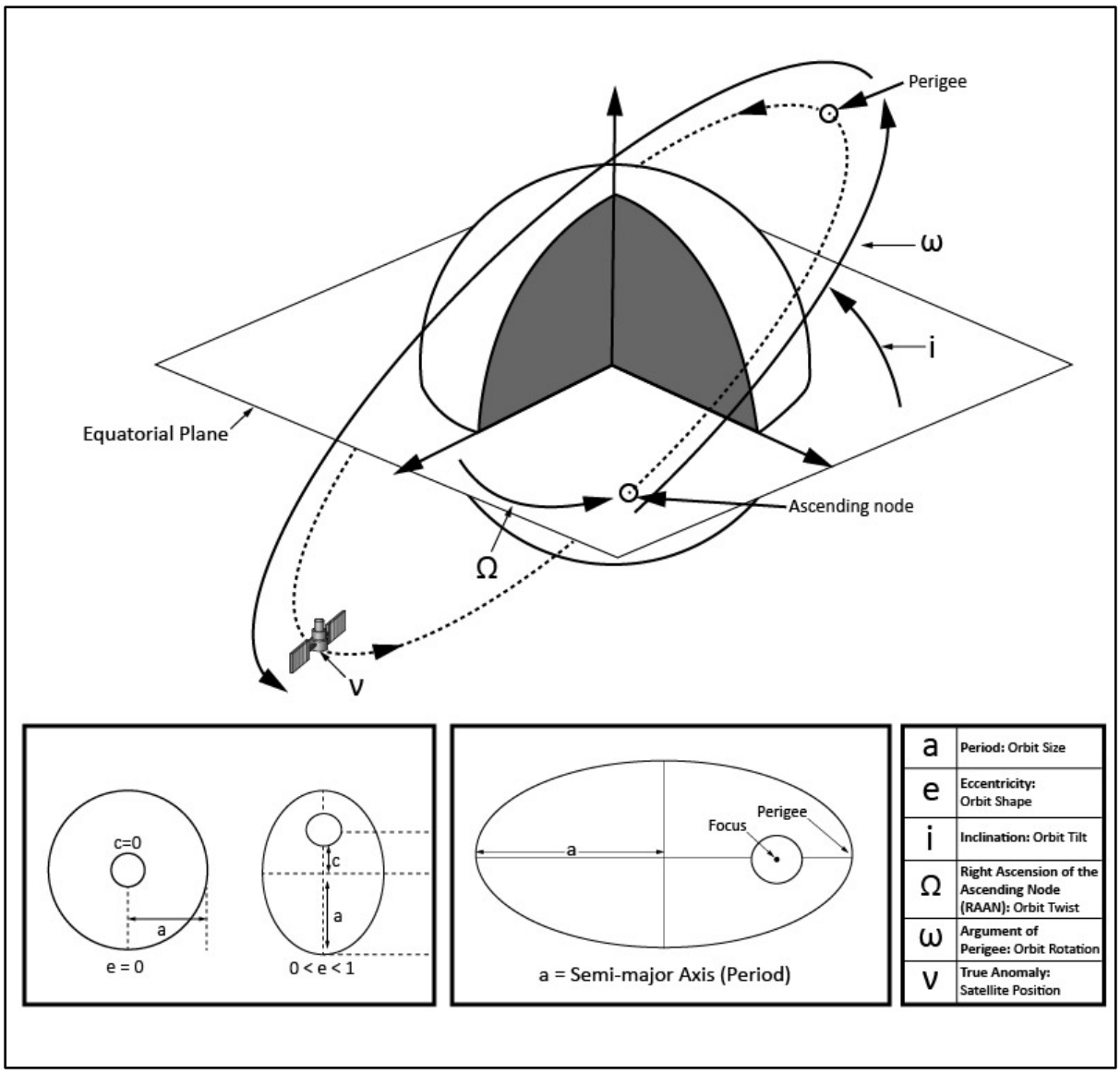


Figure 1-2. Orbital elements

1-24. There are four orbital regimes in which most satellites orbit. Each is defined by its shape and size and present unique capabilities. The four primary orbit types are briefly discussed and illustrated in figure 1-3 on page 7.

- Low Earth Orbit (commonly known as LEO)—up to 2,000 kilometers (km) (1,243 miles) above Earth's surface. Satellites in this orbital regime move extremely fast relative to the ground, typically completing one orbit in 90-120 minutes. This orbital regime is ideal for imagers and some communications.

Note: Very low earth orbit is orbital altitudes below 400km (250 miles) but above the von Kármán line. Satellites in very low earth orbit provide high imaging resolution, high revisit rates (orbits per day) and reduced latency.

- Medium Earth Orbit (commonly known as MEO)—between 2,000–35,000 km (1,243–22,000 miles) altitude, though most satellites in this regime operate at approximately 19,300 km (12,000 miles) altitude with periods of about 12 hours. The GPS constellation resides in this regime.

- Geosynchronous Orbit (commonly known as GEO)—approximately 35,000 km (22,000 miles) altitude with a period of 24 hours, keeping pace with the earth's rotation. A geosynchronous orbit with inclination of zero is called a geostationary orbit, in which the satellite appears to remain stationary over one point on the earth's surface, directly over the equator. This regime is ideal for communications and persistent imaging, with lower resolution than in low earth orbit.
- Highly Elliptical Orbit (commonly known as HEO)—as the name implies, these orbits consist of low perigees (around 1,000 km, or 621 miles) and very high apogees (up to 40,000 km, or 24,855 miles). This regime is ideal for providing communications or sensing at high latitudes. Spacecraft in this regime appear to loiter near apogee and move extremely fast near perigee.

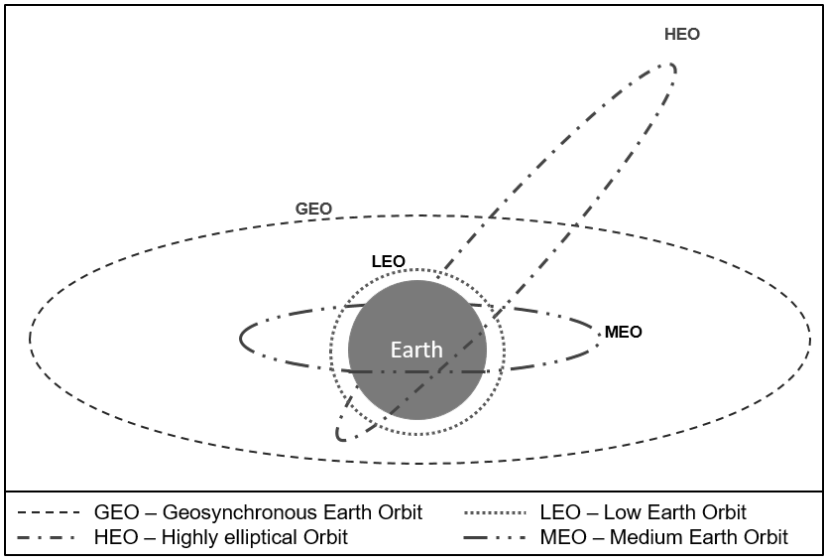


Figure 1-3. Illustration of basic satellite orbits

1-25. For comparison of scale, if the earth was the size of a basketball, most low earth orbits would be within one inch of the ball. A medium earth orbit would reside 14.5 inches above the ball and a geosynchronous orbit 27 inches above the ball. Space-based sensors and communication arrays provide vital data and access to all phases of operations, particularly in non-contiguous areas. Each orbital regime provides varying advantages and disadvantages, outlined in Table 1-2 on page 8.

Table 1-2. Characteristics of satellite orbits

Type	*Description*	*Advantages*	*Disadvantages*	*Uses*
Low Earth Orbit	• Near-circular. • ~160–2,000 km (100-1,243 miles) altitude. • Period: 90-120 minutes.	• High resolution. • Strong signal strength. • Lowest cost for lift.	• Small coverage area over Earth surface. • Very short dwell time over one location.	• Surveillance. • Reconnaissance. • Imagery. • Communications. • Weather collection. • Human space flight. • Alternative navigation. • Missile tracking.
Medium Earth Orbit	• Near-circular. • Between ~2,000-35,780 km (1,243-22,233 miles) above Earth. • Period: ~12 hours.	• Stable orbit. • Lower signal latency than for geosynchronous satellites.	• Highest radiation level environment.	• Positioning, navigation, and timing. • Communication.
Geosynchronous Earth Orbit	• Near-circular. • ~35,780 km (22,233 miles) above Earth. • Period: 24 hours.	• Continuous coverage over a specific area. • Coverage is nearly hemispheric.	• Resolution and signal limitations. • Easier to jam. • Signal latency.	• Communication. • Surveillance. • Reconnaissance. • Weather collection. • Missile warning.
Highly Elliptical Orbit	• Elliptical. • Perigee: ~ 1000 km (621 miles). • Apogee: ~40,000 km (24,855 miles). • Period: ~12 hours.	• Long dwell time over a large area. • Coverage of high north or south latitudes.	• Continuous coverage requires multiple satellites. • Highest cost for lift.	• High latitude/polar communication. • Scientific. • Surveillance. • Reconnaissance. • Missile warning.

km – kilometers

LIMITATIONS

1-26. Predictability. The position of satellites in all orbits can be accurately predicted weeks or even months in advance based on the orbital elements. This predictability makes space-based information collection susceptible to camouflage, concealment, and deception by both friendly and enemy forces. Satellite reconnaissance advanced notice (known as SATRAN) reports can provide overflight predictions of reconnaissance and surveillance satellites.

1-27. Weather. Space and terrestrial weather affect the satellite bus, its payloads, and the link segments. Solar radiation, scintillation, and terrestrial storms all need to be accounted for when considering orbital assets.

1-28. Demand. Many satellites are high-demand, low-density assets and may not be able to satisfy all requests.

1-29. Physics. Satellites in orbit around the earth do not fly; they fall around the earth at tremendous speed. They cannot hover over the earth and require tremendous amounts of fuel to alter their paths. As a result, certain capabilities may not be available at certain times depending on the type of orbit and payloads.

1-30. Energy requirements. The energy, or power, of transmitted signals dissipates over distance. Ground terminals transmitting to satellites in Geosynchronous Earth Orbit require more power than those transmitting to Low Earth Orbit; the same is true for satellites transmitting back to Earth. Jamming is also about power. To jam a signal, a jammer must overcome the power of that signal at the intended receiver. Additionally, the more energy a terminal transmits, the easier it is to detect in the spectrum.

SECTION II – THE SPACE DOMAIN AS A WARFIGHTING DOMAIN

1-31. For over a half century, space capabilities enhanced the effectiveness of joint forces, reinforcing the significance of space capabilities when employed within the competition continuum. The joint force enjoyed unfettered access to space-based and space-enabled capabilities for near-real time situational awareness (SA), over-the-horizon communications and information collection, and precision navigation and timing. In present and future operational environments (OEs), the joint force must be prepared to fight in and through a contested space domain. The space domain is a physical location where military, civil, and commercial space activities are conducted, and the upper limit extends infinitely outward.

1-32. Space operations are critical to enable and support operations in all other domains. The space domain is interdependent with the air, land, and maritime domains and interconnected with the cyberspace domain. Activities in the space domain enable freedom of action for operations in all other domains. Operations in the other domains may create effects in and through the space domain.

1-33. Land capabilities enable space operations in multiple ways. Some of these ways include—

- Destroying enemy space ground stations, ground links, and launch sites with surface-to-surface fires.
- Securing ground links and launch sites.
- Securing bases and C2 nodes for units controlling space capabilities.
- Securing bases and C2 nodes from which to launch attacks against enemy space capabilities.

1-34. Space capabilities enable land operations in multiple ways. Some of these ways include—

- Enabling geolocation and timing-dependent technology, including global positioning systems and precise and accurate fires.
- Enabling a global C2 network through satellite communications.
- Enhancing situational understanding by providing meteorological, oceanographic, and space environmental factors and detailed imagery of land areas and enemy dispositions on land.
- Deceiving, disrupting, degrading, denying, or destroying enemy space systems.
- Conducting navigation warfare to disrupt enemy use of positioning, navigation, and timing-enabled devices.
- Enabling theater missile warning and other warning intelligence.

1-35. The Army no longer regards the space domain as a permissive environment—an environment where freedom of action is uncontested. When operating in and through the space domain, space professionals must continually consider threats and vulnerabilities and achieve understanding of the OE.

SPACE POLICY

1-36. Space operations derive their authorities from these national, Department of Defense (DOD), and Service policies. The *National Security Strategy* identifies modernization and integration across domains as key efforts to maintain a responsive, agile, and lethal military.

> *We will enhance the resilience of U.S. space systems that we rely on for critical national and homeland security functions. These efforts aim to protect U.S. interests in space, avoid destabilizing arms races, and responsibly steward the space environment.*
>
> National Security Strategy

1-37. Space operations are used for peaceful purposes by means of deterrence while developing civil and commercial use of the space environment. The U.S. continues to be a leader in the space domain while working with the international community to ensure the domain‘s sustainability, safety, stability, and security for all who wish to use it for peaceful purposes.

1-38. National, DOD, and Army space policies embrace the prudent use of the space environment for security purposes. These policies make it clear space operations are a critical element of national defense. The Services develop capabilities carefully and purposefully to help provide a balanced overall capability for the range of military operations.

NATIONAL SPACE POLICY

1-39. The *National Space Policy* commits the U.S. space program to a leadership role in the world. The U.S. will use the space domain to preserve peace and protect national security, civil, and commercial interests. The *National Space Policy* has specific guidelines for DOD and are directly applicable to DOD and space operations. The Army is directed to:

- Defend the use of space for U.S. national security purposes, the U.S. economy, and *unified action partners* (ADP 3-0).
- Protect freedom of navigation and preserve lines of communication that are open, safe, and secure in the space domain.
- Conduct operations in, from, and through space to deter conflict, and if deterrence fails, to defeat aggression while protecting and defending U.S. vital interests with unified action partners.

1-40. The policy identifies a set of guidelines that apply to all federal departments, agencies, and activities conducted in three distinct but independent sectors of commercial, civil, and national security space capabilities. Army operations contribute to some prominent national security space activities as identified in the ‘National Security Space Guidelines’ section of the document.

- Develop, acquire, and operate space systems and supporting information systems and networks to aid U.S. national security interests and enable defense and intelligence operations.
- Ensure cost-effective survivability of space capabilities and assurance of space-enabled missions, including supporting information systems and networks, commensurate with their planned use and considering the value these systems provide in countering or mitigating threats, the consequences of their loss or degradation, and the availability of other means to perform the mission.
- Develop, implement, and exercise plans, procedures, techniques, and capabilities necessary to assure critical national security space-enabled missions.
- Develop and apply advanced technologies, capabilities, and concepts that anticipate and rapidly respond to changes to the threat environment and improve the timeliness and quality of intelligence and data to support operations.

DEPARTMENT OF DEFENSE SPACE POLICY

1-41. Department of Defense Directive (DODD) 3100.10, *Space Policy*, implements the *National Space Policy*, establishes DOD space policy, and assigns DOD responsibilities for space capabilities. It addresses the need to strengthen the safety, stability, sustainability, and accessibility of the space domain. *Space Policy* recognizes the space domain as a priority domain of national military power that underpins multi-domain, joint, and combined military operations to advance national security.

1-42. The Services act in accordance with Department of Defense Directive 3100.10:

- Integrate space operations, intelligence, capabilities, and personnel into national, joint, and combined operations for space security and intelligence activities.
- Develop military space expertise, doctrine, and operational concepts commensurate with growing space and offensive and defensive space threats.
- Shape the strategic environment to enhance deterrence and stability in the space domain.

1-43. DOD space capabilities, effects, and activities contribute to national security by:

- Preserving access to and freedom to operate in the space domain.
- Protecting and defending the use of space for U.S. national security purposes, the U.S. economy, and unified action partners of the U.S.

- Enhancing DOD and Intelligence Community partnership to increase unity of effort and the effectiveness of space operations and space-related activities.
- Delivering advanced space capabilities to deter conflict, and if deterrence fails, to counter and defeat aggression.
- Developing and fielding capabilities to counter hostile use of space and protect and defend U.S., mission partner, and commercial space capabilities

ARMY SPACE POLICY

1-44. The Secretary of the Army and the Chief of Staff of the Army approved Army Regulation (AR) 900-1, *Department of the Army Space Policy*, in April 2017.

> *The U.S. Army is one of the largest users of space-based capabilities in DOD. As the Army transforms, its operational characteristics will, in large part, be achieved through the use and exploitation of transformational space systems. This dependency requires the Army to actively participate in defining space related capability needs that ensure necessary force structure and systems are developed and acquired to enable the land force to conduct the full range of military operations now and in the future.*
>
> Army Space Policy

1-45. The Army's space policy clearly recognizes the Army's dependency on space capabilities and continuing commitment to space operations. Army strategic space goals are explicitly echoed in AR 900-1. The Army has four broad space-related objectives.

- Maximize the effectiveness of current space capabilities in support of operational and tactical land warfighting needs.
- Influence the design, development, acquisition, and concepts of operation of future space systems that enable and enhance future land forces.
- Advance the development and effective use of responsive, timely, and assured joint interoperable space capabilities.
- Seamlessly integrate relevant space capabilities into the operating force.

1-46. The Army space policy confirms that access to, and use of space capabilities are essential to operational success. Army space capabilities provide effects on the battlefield, enhance operational support to operating forces, and contribute to successful execution of Army missions.

1-47. The *National Space Policy*, *DOD Space Policy*, and Army space policy reflect the critical aspect space capabilities serves for current and future military operations. Space capabilities are an integral part of Army operations and necessary to achieve and maintain Army and joint land warfighting dominance.

THE SPACE OPERATIONAL ENVIRONMENT

1-48. An *operational environment* is the aggregate of the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander (JP 3-0). An OE for any specific operation not only includes isolated conditions of interacting variables that exist within a specific area of operations (AO) but also interconnected influences from a global or regional perspective. Interconnected influences such as social, political, and economic issues can also impact conditions and operations. Defining the OE results in the identification of significant threat characteristics which may affect friendly and enemy operations.

1-49. For Army forces, an operational environment includes portions of the land, maritime, air, space, and cyberspace domains understood through three dimensions (human, physical, and information). Commanders and staffs analyze and describe an operational environment in terms of eight interrelated operational variables: political, military, economic, social, information, infrastructure, physical environment, and time (known as PMESII-PT). See FM 3-0 for further discussion of these variables.

1-50. A *permissive environment* is defined as uncontested conditions in which joint forces have freedom of movement (JP 3-0). A *hostile environment* is an operational environment where the freedom of movement is contested (JP 3-0). Hostile environments describe circumstances where threats deliberately exhibit unfavorable influence upon one or more domains producing effects to impact friendly operations.

1-51. *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 (JP 3-14). Space superiority enables freedom of maneuver and accurate fires, when and where needed. Space superiority is a function of the space domain and may be maintained for long periods of time or obtained for short windows of time for specific operations. Space superiority contributes decisive wins in high-intensity conflicts against any adversary, anytime, and anywhere.

1-52. A space operations officer's insights and understanding of how space operations enable Army and joint operations across the range of military operations are critical to developing a comprehensive understanding of the space OE. This includes improving awareness and understanding of friendly forces' dependency on space capabilities, leveraging space capabilities to shape the OE to meet commanders' objectives, improving understanding of capabilities and limitations for friendly forces and adversaries, and highlighting other conditions of the OE.

1-53. Understanding the space OE is iterative throughout the operations process. The variables defining the OE continuously evolve as a result of emerging technologies and the ability of friendly and enemy forces to adapt to changing conditions. As threats take action within an OE, the OE changes. Commanders, staffs, and Soldiers continuously reassess the OE for these changing conditions.

1-54. Commanders seek opportunities for exploiting success. Continuous analysis of operational variables help reveal opportunities, such as greater cooperation among the local population of a town or the ability to advance forces along a previously unsecured route. To exploit opportunities successfully, commanders and staffs thoroughly understand and appreciate the application of the operational variables.

1-55. Operations in the space domain are contested, congested, and competitive. Army and joint forces plan to operate in a contested space domain to mitigate risk to operations and prepare to conduct operations against adversary offensive and defensive space activities. Threats seek to discover, exploit, or create vulnerabilities to Army and joint operations from a contested, degraded, and competitive space domain. **A *denied, degraded, and disrupted space operational environment* (D3SOE) is a composite of those conditions and influences in which space-enabled capabilities have been impaired by hostile threats or non-hostile means**.

1-56. The space environment extends from the earth's atmosphere into interplanetary space and beyond. Key aspects of the space environment include all forms of electromagnetic radiation, charged particles, electric and magnetic fields, and space debris.

THREATS, HAZARDS, AND VULNERABILITIES

1-57. Army forces are organized, trained, and equipped for large-scale combat operations against peer threats. Army units supporting combatant commanders (CCDRs) where no peer threat exists focus on other missions, but they can alter their priorities to support large-scale combat operations when necessary. Army space forces analyze threats, hazards, and vulnerabilities in the space domain, advising staffs and generating options and recommendations for commanders.

Threat

1-58. A *threat* is any combination of actors, entities, or forces that have the capability and intent to harm United States forces, United States national interests, or the homeland (ADP 3-0). A threat is a fundamental part of the OE. Threats may include individuals, groups of individuals (organized or not organized), paramilitary or military forces, nation-states, or national alliances.

1-59. A threat can be categorized as an enemy or an adversary.

- An *enemy* is a party identified as hostile against which the use of force is authorized (ADP 3-0). An enemy is also a combatant under the law of war.
- An *adversary* is a party acknowledged as potentially hostile to a friendly party and against which the use of force may be envisaged (JP 3-0). Adversaries pursue interests that compete with those of the United States and are often called competitors.

1-60. Peer threats use various methods to render U.S. military power irrelevant whenever possible. See FM 3-0 for discussion of the threat methods (information warfare, systems warfare, preclusion, isolation, sanctuary) used against the U.S. and its unified action partners.

Hazards

1-61. A hazard is a condition with the potential to cause injury, illness, or death of personnel; damage to or loss of equipment or property; or mission degradation. Hazards differ from threats in that they are usually predictable, often preventable, and may be reduced through effective risk management. Commanders who understand environmental hazards and their effects on space operations can better visualize potential impacts on operations and mitigation measures.

1-62. Hazards occur naturally or are man-made. The most common hazard affecting space systems is *electromagnetic interference* (EMI), which is any electromagnetic disturbance, induced intentionally or unintentionally, that interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics and electrical equipment (JP 3-85). EMI can result from the natural interactions between solar radiation and Earth's magnetic field or incidentally from an abundance of emissions from military equipment. Sources of EMI in the space environment include geomagnetic storms and energetic particle events causing ionospheric scintillation and coronal mass ejections or solar flares causing radio bursts across frequency bands in the EMS. EMI can affect satellite subsystems resulting in a variety of impacts.

- Interference to SATCOM signals causing distorted, intermittent, or denied signals.
- Distorted or interrupted high frequency ground and aircraft radio communications, which includes radio propagation errors, short wave fade, and blackout.
- Radar interference leading to false returns, inaccurate ranging, and observation of reflected objects outside system characteristics.
- Reduced PNT accuracy.
- Drag, charging, and damage to on-board systems or the satellite itself.
- False or incomplete readings from satellite sensor payloads.
- Interference with or damage to terrestrial networks and power grids.

1-63. Other hazards to space systems include space debris, multipathing, and terrestrial weather. Space debris consists of natural or man-made objects orbiting the earth. Space debris presents unique and potentially devastating impacts on satellites and manned space flight. Satellite operators routinely conduct on-orbit maneuvers to avoid space debris. Multipathing is a phenomenon in which a user receives a reflected or diffracted replica of a desired signal. Multipathing causes timing errors in PNT resulting in inaccurate positioning; it most often occurs in urban areas or mountainous terrain. Terrestrial weather affects sensors and networks in different ways depending on system type. Cloud cover blocks certain types of imagers from seeing the ground. Rain inhibits SATCOM frequencies in the extremely high frequency (EHF) band.

1-64. Electromagnetic pulse (EMP) from a nuclear detonation can disrupt, damage, or destroy electronic equipment and infrastructure by inducing undesired electric currents. High-altitude nuclear detonations can affect up to hundreds of thousands of square kilometers and EMP may be the desired primary effect. In addition to disruption and damage to electronic equipment, nuclear detonations can also disrupt radio and radar waves. High-altitude nuclear detonations can be incredibly disruptive to communications and navigation systems, including high-frequency, very-high-frequency, and ultrahigh-frequency transmissions. The key to protecting these capabilities against EMP effects include nuclear hardening using avoidance, mitigation, reconstitution and redundancy measures. For additional information on EMP impacts on space and missile defense operations see ATP 3-72, Operations in a Nuclear Environment.

Vulnerabilities

1-65. Army space forces understand and analyze vulnerabilities. A *vulnerability* is the characteristics of a system that cause it to be incapable of performing a designated function or mission when subjected to a specific threat action (JP 3-60).

1-66. Army space forces continually analyze the space OE through the operations process to identify vulnerabilities, especially those which threats may easily exploit. Army space forces advise commanders and staffs on methods to mitigate risks associated with vulnerabilities, coordinating for and managing space capabilities to assure access to the space domain and reduce threat effects against those vulnerabilities.

1-67. Possible vulnerabilities related to space operations are:

- Ground control stations and terminals exposed to indirect fires and network attacks.

- Overreliance on or undisciplined use of electromagnetic emissions.
- Lack of cyberspace defense of link segments.
- Large electromagnetic signatures.
- Poor operations security.
- Large power requirements for satellite communications.
- Predictability of satellite orbits.

DENIED, DEGRADED, AND DISRUPTED SPACE OPERATIONAL ENVIRONMENT

1-68. The nature of the space domain necessitates access and use of the EMS. Threats endeavor to exploit our reliance on the space domain to reduce our ability to deploy forces and fight effectively in other domains. Both threat actions and naturally-occurring phenomena contribute to a D3SOE. Additionally, the actions of friendly forces may inadvertently contribute to a D3SOE through, for example, a lack of proper spectrum management leading to EMS fratricide. The D3SOE is a component of the EMOE.

1-69. A D3SOE is a hostile environment where threats exert persistent, successful influence on objects in the space domain or through the EMS. A D3SOE occurs when physical and electromagnetic conditions, circumstances, and influences from any domain affect the employment of space capabilities. Threats may choose to attack networks via the EMS or strike terrestrial segments with indirect fires. Other examples include:

- Denying or disrupting PNT signals through jamming or spoofing.
- Degrading electro-optical sensors through dazzling.
- Degrading or denying satellite communications through uplink jamming or on-orbit actions.

1-70. Threats have developed capabilities to attack the terrestrial, link, and orbital segments of SATCOM, PNT, space-based surveillance and reconnaissance, missile warning, and environmental monitoring. These attacks can have significant impacts on operations in all domains, preventing convergence and disrupting endurance and depth.

1-71. Due to advances in the development of low-cost and accessible technologies, state and non-state actors alike can easily effect a D3SOE. Army commanders detect and defeat threats to space capabilities to enable freedom of action in the land domain. Army space forces continually analyze the D3SOE to identify mitigation measures (whether active or passive) and educate their formations on the latest tactics, techniques, and procedures (TTP) for fighting effectively in a D3SOE.

SECTION III – CONTRIBUTIONS TO THE WARFIGHTING FUNCTIONS AND COMBAT POWER

1-72. This section describes how space operations support the warfighting functions. It also discusses how space operations support the generation and application of combat power. Army space forces understand warfighting at all levels of warfare and how to leverage space capabilities in support of the warfighting functions.

COMMAND AND CONTROL

1-73. The *command and control warfighting function* is the related tasks and a system that enable commanders to synchronize and converge all elements of combat power (ADP 3-0). The primary purpose of the C2 warfighting function is to assist commanders in integrating the other warfighting functions effectively at echelon and to apply combat power to achieve objectives and accomplish missions. The C2 system includes people, processes, networks, and command posts. All elements of the system are critical in supporting effective decision making and the tempo required to defeat enemy forces. Refer to ADP 6-0 for more on the C2 warfighting function.

1-74. C2 depends on space capabilities and effects to command forces, control operations, drive the operations process, and establish the C2 system. A large percentage of the information required to drive the operations process for employment of ground forces is obtained from space assets.

- Satellite communications (SATCOM) enable inter-theater and intra-theater communications by providing over-the-horizon voice and data networks. SATCOM provides secure, integrated

communications at echelon to ensure mission orders and commander's intent are clearly and securely conveyed to all Soldiers and formations. SATCOM on-the-move allows a commander to maintain connectivity during rapidly evolving operations. Space-enabled C2 systems provide situational understanding and awareness to a commander who can move to the best position to assess, direct, and lead. Refer to FM 6-02 for more on signal dependence on space capabilities.

- PNT provides extremely accurate timing critical to tactical and theater networks. FFT information feeds real-time positioning data into the common operational picture (COP), providing commanders and planners the most timely and relevant location information to ensure synchronization and avoid fratricide.
- Space-based collection sensors support effective C2 by providing information collection through the depth of the battlefield, enabling timely decision making based on accurate enemy dispositions.
- Space control and navigation warfare assure access to SATCOM and PNT.
- Environmental monitoring provides weather data and predictions of future conditions to aid situational understanding.
- Space situational awareness (SSA) identifies adversary space capabilities and threats to friendly space capabilities, and provides insight to understand adversary intent.

MOVEMENT AND MANEUVER

1-75. The *movement and maneuver warfighting function* is the related tasks and systems that move and employ forces to achieve a position of relative advantage over the enemy and other threats (ADP 3-0). Movement is necessary to position and disperse the force as a whole or in part when maneuvering. Maneuver directly gains or exploits positions of relative advantage. Refer to ADP 3-0 for more on the movement and maneuver warfighting function.

1-76. SATCOM and PNT provide critical connectivity and awareness for moving and maneuvering forces to maintain tempo and achieve surprise, shock, and momentum. All Army echelons—from theater Army to individual Soldiers and vehicles—depend on, at a minimum, SATCOM and PNT when executing movement and maneuver.

- SATCOM enables communications in areas where terrain or great distances restrict terrestrial systems. SATCOM enables depth and agility and extends the operational reach of maneuver forces. SATCOM and PNT enable the close coordination between fires and movement necessary for effective maneuver.
- Space-based geospatial information and environmental monitoring promote understanding of terrain and weather effects for planning and execution. Planners use these capabilities, for example, to assess water depth for wet gap crossings.
- Space control and NAVWAR assure uninterrupted SATCOM and PNT and protect friendly force access to space capabilities.

INTELLIGENCE

1-77. The *intelligence warfighting function* is the related tasks and systems that facilitate understanding the enemy, terrain, weather, civil considerations, and other significant aspects of the operational environment (ADP 3-0). Intelligence involves analyzing information from all sources, which includes the other warfighting functions, and conducting operations to collect information. The integration of intelligence into operations facilitates understanding of an operational environment and assists in determining when and where to employ capabilities against adversaries and enemies. Refer to ADP 2-0 for more on the intelligence warfighting function.

1-78. Space-based sensors provide critical inputs to intelligence. They provide data used in the development of signals, electronic, measurement and signature, and geospatial intelligence as well as enemy dispositions during operations.

- SATCOM provides the link for direct communications and dissemination of intelligence analysis and products across the breadth and depth of the battlefield.
- PNT provides the precision for orthorectified imagery and the ability to report enemy locations accurately. (Orthorectification is the process of removing distortions from electro-optical images

and then placing the images onto a usable digital terrain map.) Both manned and unmanned aerial sensors use PNT to navigate and orient sensors.
- Overhead imagery supports planning, battle damage assessment, situational awareness, and cartography. Remote sensing capabilities include synthetic aperture radar and the suite of electro-optical imagers (including infrared and multispectral) which provide planners with current information on surface, subsurface and air conditions. This information can be used to determine trafficability, accessibility, water conditions, vegetation, change detection, and land use.
- Missile warning sensors provide indicators of enemy unit locations and activities.
- Other space-based sensors enable better situational understanding and awareness. For example, environmental monitoring provides data for space and terrestrial weather, including forecasts, from which planners can assess potentially negative impacts on systems and capabilities.

FIRES

1-79. The *fires warfighting function* is the related tasks and systems that create and converge effects in all domains against the adversary or enemy to enable operations across the range of military operations (ADP 3-0). These tasks and systems create lethal and nonlethal effects delivered from both Army and joint forces and other unified action partners. The fires warfighting function does not entirely encompass, nor is it wholly encompassed by any particular branch or function. Refer to ADP 3-19 for more on the fires warfighting function.

1-80. Many lethal and nonlethal fires capabilities depend on space capabilities to support, integrate, and deliver fires. Space capabilities can provide commanders with options to defeat, destroy, disrupt, deny, or manipulate enemy networks, information, and decision making. Space capabilities also support delivery of precision munitions and the mechanisms to support targeting and achieve convergence.
- SATCOM provides the architecture for firing elements to share targeting data on systems such as the Advanced Field Artillery Tactical Data System.
- PNT provides precise positioning data to firing units and feeds friendly positions into the COP, enabling accurate fires and preventing fratricide. PNT enables precision guided munitions to reduce collateral damage.
- Space-based intelligence, surveillance, and reconnaissance supports deep fires by providing enemy composition and disposition.
- Space control and NAVWAR assure access to SATCOM and accurate PNT. Space control and NAVWAR offer a suite of effects for the fires warfighting function.
- Missile warning indications can provide a footprint of adversary indirect fire activity to include integrated air defense and multiple rocket launcher systems.
- Environmental monitoring provides data on terrestrial weather, surface and sub-surface conditions, which provides important mission planning data for fires.

SUSTAINMENT

1-81. The *sustainment warfighting function* is the related tasks and system that provide support and services to ensure freedom of action, extended operational reach, and prolong endurance (ADP 3-0). Sustainment employs capabilities from all domains and enables operations through each domain. Sustainment determines the limits of depth and endurance during operations. Refer to ADP 4-0 for more on the sustainment warfighting function.

1-82. Sustainment employs an integrated network of information systems linking sustainment to operations. Space capabilities provide a multitude of those networks. Sustainment depends on space capabilities to facilitate data transfer, tracking, reporting, navigation, and situational awareness.
- SATCOM enables connectivity to the sustainment COP, allowing for a clear and complete picture of the disposition of sustainment forces across large geographic areas. SATCOM enables reach-back to technical centers and libraries and provides beyond-line-of-sight network extension. It allows tactical level logistics to coordinate requirements from deployed locations to anywhere in the world.
- PNT provides precise locations of in-transit vessels enabling delivery forecasts of resupply efforts en route to theaters or for logistics packages supporting tactical operations. PNT supports logistics

movements; establishment of logistics resupply points, ambulance exchange points, and landing zones; search and rescue; tracking of casualties and materiel; and unmanned resupply.
- Space control and NAVWAR assure access to SATCOM and accurate PNT signals used for situational awareness, navigation, and tracking.
- Weather and terrain data help impact dispersion patterns for chemical, biological, and radiological material, depicted in modeling of hazard predictions that can affect force protection and medical and health services. For example, imagery can help identify potential decontamination sites, water sources, drainage, routes, cover and concealment, and environmental hazards.
- Overhead collection can provide information on mobility corridors and trafficability, survivability requirements, and force protection by providing warning of enemy activity. Combined with GPS, this information can be used for assessment of local utilities, land use, reservoirs, roads, and bridges.

PROTECTION

1-83. The *protection warfighting functio*n is the related tasks, systems, and methods that prevent or mitigate detection, threat effects, and hazards to preserve combat power and enable freedom of action (FM 3-0). Protection encompasses everything that makes Army forces hard to detect and destroy. Commanders balance their protection efforts with the need for tempo and resourcing the main effort. Protection results from many factors, including operations security, dispersion, deception, survivability measures, and the way forces conduct operations. Refer to ADP 3-37 for more on the protection warfighting function.

1-84. Space operations support the protection warfighting function through preserving the commander's freedom of action in all domains while protecting the force. Army forces leverage space capabilities to support decision making and as part of the commander's protection efforts.

- SATCOM provides the ability to transport data securely to all levels of command and extends operational reach. SATCOM feeds the COP and many FFT systems to enable SA. It allows timely dissemination of friendly force unit locations and dispositions, which greatly assists in fratricide avoidance, and dissemination of information related to all types of threats.
- PNT is important to protection to accurately identify threats such as minefields, obstacles, and other potential hazards to friendly forces. PNT enables FFT, assists in personnel recovery, helps reduce fratricide, and enables protection through SA. PNT also provides timing signals to synchronize operations and equipment such as radios, computer networks, and many other forms of information technology.
- Intelligence gathered from space-based surveillance and reconnaissance assists force protection by providing known launch locations and likely launch vehicles. Space-based surveillance and reconnaissance enable access to denied areas to help detect enemy camouflage and sense friendly and enemy use of obscurants.
- Offensive space operations may target and preemptively interdict adversary capabilities.
- Defensive space operations and NAVWAR contribute to assured, uninterrupted PNT.
- Missile warning provides launch locations, predicted missile impact points, and warning to forces within the footprint of the predicted impact area to take protective actions.
- Environmental monitoring provides information on surface and sub-surface conditions and environmental data.
- SSA can inform friendly forces of adversary satellites when they are in position to view and record ground activity.

COMBAT POWER

1-85. *Combat power* is the total means of destructive and disruptive force that a military unit/formation can apply against an enemy at a given time (JP 3-0). It represents the ability to fight effectively. Army forces generate this power through a combination of five key dynamics:

- *Leadership* is the activity of influencing people by providing purpose, direction, and motivation to accomplish the mission and improve the organization (ADP 6-22).
- Firepower is the primary source of lethality, and it is essential to defeating an enemy force's ability and will to fight.

- Information contributes to the disruption and destruction of enemy forces. It is central to the application and amplification of combat power.
- *Mobility* is a quality or capability of military forces which permits them to move from place to place while retaining the ability to fulfill their primary mission (JP 3-36).
- *Survivability* is a quality or capability of military forces which permits them to avoid or withstand hostile actions or environmental conditions while retaining the ability to fulfill their primary mission (ATP 3-37.34).

1-86. Space capabilities augment the Army's ability to generate and apply combat power, leading to greater adaptability, lethality, and overall effectiveness on the battlefield. Space operations enhance combat power by:

- Improving communications. Providing secure channels for commanders to convey intent and adapt quickly.
- Enhancing situational awareness. Facilitating real-time understanding of the battlefield through surveillance and reconnaissance.
- Boosting firepower. Enabling precise targeting and concentration of force to defeat the enemy's will to fight.
- Ensuring information dominance. Supporting the fight for enemy information while protecting friendly information.

Chapter 2

Army Space Operations Fundamentals

This chapter provides a foundational overview of multidomain operations. It presents the joint space mission areas and defines the Army space mission areas. It concludes with discussing Army space across the competition continuum.

SECTION I – MULTIDOMAIN OPERATIONS

2-1. The Army's contribution to unified action is multidomain operations. *Multidomain operations* are the combined arms employment of joint and Army capabilities to create and exploit relative advantages that achieve objectives, defeat enemy forces, and consolidate gains on behalf of JFCs (FM 3-0). Army forces conduct multidomain operations in an OE consisting of five physical domains (land, maritime, air, space, and cyberspace) and three dimensions (physical, information, and human) and execute at echelon during competition, crisis, and conflict while respecting the principles of war, reflecting the tenets of operations, and adhering to the imperatives of operations through the conduct of offensive, defensive, and stability operations to accomplish missions, defeat enemy forces, and consolidate gains that meet joint and national objectives.

> *The Army's next fight will occur across multiple domains. Successful operations in and through the space domain will be critical to our success. Space has become more important as both enabler and dependency to our Warfighting.*
>
> 2024 Army Space Vision Supporting Multidomain Operations

2-2. Space operations are pivotal to the Army's contribution to joint and multinational warfighting. They directly support Army operations, with Army space forces collaborating closely with various Army echelons, unified action partners, and commercial and civil sectors to seamlessly integrate and employ space capabilities.

2-3. Army space forces include Army space professionals educated on the fundamentals of, and capabilities provided by, the space domain. These professionals ensure continuous access to space capabilities and deliver effects that support offensive, defensive, and stability operations when necessary. They also serve as subject matter experts to commanders and staffs on the space domain and the D3SOE. Not all Soldiers who configure and use equipment reliant on space capabilities are designated as space forces; however, these Soldiers are vital to ensuring Army forces retain the capacity and capability to conduct operations in the current and future OEs.

Note: See FM 3-0 for discussions of warfare, including its nature, principles, characteristics, and methods.

OFFENSE, DEFENSE, AND STABILITY

2-4. Offensive, defensive, and stability operations are inherent elements of conventional and irregular warfare. An *offensive operation* is an operation to defeat or destroy enemy forces and gain control of terrain, resources, and population centers (ADP 3-0). Offensive operations are how commanders impose their will on an enemy and are characterized by audacity, concentration, surprise, and tempo. Army space professionals provide analysis and deliver effects for commanders to successfully apply these characteristics to win decisively. Army space forces seek opportunities in the space domain to seize, retain, and exploit the initiative and enable Army forces to fight from positions of relative advantage.

2-5. A *defensive operation* is an operation to defeat an enemy attack, retain key terrain, gain time, and develop conditions favorable for offensive or stability operations (ADP 3-0). Normally the defense cannot achieve a decisive victory. However, it sets conditions for a counteroffensive or a counterattack that enables forces to regain the initiative. Defensive operations are characterized by disruption, flexibility, maneuver, mass and

concentration, operations in depth, preparation, and security. Army space professionals provide analysis and deliver effects for commanders to regain the initiative and set the conditions for counteroffensives or counterattacks. They preserve friendly force access to the space domain.

Note. See ADP 3-90 for more on the characteristics of the offense and the defense.

2-6. A *stability operation* is an operation conducted outside the United States in coordination with other instruments of national power to establish or maintain a secure environment and provide essential governmental services, emergency infrastructure reconstruction, and humanitarian relief (ADP 3-0). Army space professionals assist the commander and staff in creating foundations for long-term stability as part of broader efforts by the joint force and other agencies and organizations. See ADP 3-07 for discussion on the fundamentals of stabilization.

LARGE-SCALE COMBAT OPERATIONS

2-7. The focus of Army readiness is on large-scale combat operations. *Large-scale combat operations* are extensive joint combat operations in terms of scope and size of forces committed, conducted as a campaign aimed at achieving operational and strategic objectives (ADP 3-0). Peer threats employ networks of sensors and long-range massed fires that exploit electromagnetic signatures and other detection methods to create high risk for ground forces, particularly when they are static. Army forces must account for constant enemy observation, including the threat from unmanned systems that saturate the operational environment. Army space forces leverage capabilities to enable Army forces to defeat the enemy's ability to effectively mass effects while creating exploitable advantages to mass effects against enemy capabilities and formations.

2-8. Army space forces prepare for large-scale combat operations by planning, executing, and assessing training under realistic conditions. They study and understand threat space capabilities, architectures, and doctrine and apply this knowledge into live, virtual, and constructive training environments. Army space professionals prepare their formations for large-scale combat by developing realistic multidomain training, exposing commanders and staffs at echelon and individual Soldiers to the same or similar conditions they would face. Army space professionals train and fight as part of a combined arms approach, ensuring complementary effects and mitigating vulnerabilities in space and the other domains. *Combined arms* is the synchronized and simultaneous application of arms to achieve an effect greater than if each element was used separately or sequentially (ADP 3-0).

2-9. Army space professionals expertly plan for and assess space capabilities within their unit's planning horizons. They coordinate with other space forces to ensure delivery of timely effects at the commander's discretion. They forecast conditions that will require space capabilities to ensure successful operations.

2-10. Commanders use Army and joint targeting to select and prioritize targets, integrating lethal and nonlethal effects from different capabilities in support of large-scale combat operations. Commanders may converge effects from multiple systems, either simultaneously or in close succession, to effectively enable joint force freedom of action during large-scale combat operations. Commanders must synchronize the effects created with lethal and nonlethal fires with the actions of the rest of the joint force. This synchronization initially takes place during planning, where commanders and their staffs determine the timing of the creation of the effect and link that timing to a clearly defined, conditions-based trigger. Commanders must also plan for assessment of the effects and determine alternate courses of action if the effects are not created as planned. (ADP 3-19)

LEVELS OF WARFARE

2-11. The *levels of warfare* are a framework for defining and clarifying the relationship among national objectives, the operational approach, and tactical tasks (ADP 1-01). While the various methods of warfare are ultimately expressed in concrete military action, the four levels of warfare—national strategic, theater strategic, operational, and tactical—link tactical actions to achievement of national objectives.

- The *national strategic level of warfare* is the level of warfare at which the U.S. government formulates policy goals and ways to achieve them by synchronizing action across government and unified action partners and employing the instruments of national power (FM 3-0).

- The *theater strategic level of warfare* is the level of warfare at which combatant commanders synchronize with unified action partners and employ all elements of national power to fulfill policy aims within the assigned theater in support of the national strategy (FM 3-0).
- The *operational level of warfare* is the level of warfare in which campaigns and operations are planned, conducted, and sustained to achieve operational objectives to support achievement of strategic objectives
(JP 3-0).
- The *tactical level of warfare* is the level of warfare at which forces plan and execute battles and engagements to achieve military objectives (JP 3-0).

2-12. Army space professionals serve at echelons and within agencies at all levels of warfare. They understand the respective OEs in which they operate, providing the necessary subject matter expertise to advise the formulation of policy and strategy, contribute to unified action, and deliver effects for campaigns and engagements throughout the competition continuum.

ARMY STRATEGIC CONTEXTS

2-13. Joint doctrine describes the strategic environment in terms of a competition continuum. Rather than a world either at peace or at war, the competition continuum describes three broad categories of strategic relationships—cooperation, competition below armed conflict, and armed conflict. Cooperation, competition, and even armed conflict commonly occur simultaneously in different parts of the world. Army doctrine describes the strategic situation through three contexts in which Army forces conduct operations: competition below armed conflict, crisis, and armed conflict. See figure 2-1 below for an illustration of the Army strategic contexts.

- Competition below armed conflict exists when two or more state or non-state adversaries have incompatible interests, but neither seeks armed conflict.
- A *crisis* is an emerging incident or situation involving a possible threat to the United States, its citizens, military forces, or vital interests that develops rapidly and creates a condition of such diplomatic, economic, or military importance that commitment of military forces and resources is contemplated to achieve national and/or strategic objectives (JP 3-0).
- Armed conflict occurs when a state or non-state actor uses lethal force as the primary means to satisfy its interests.

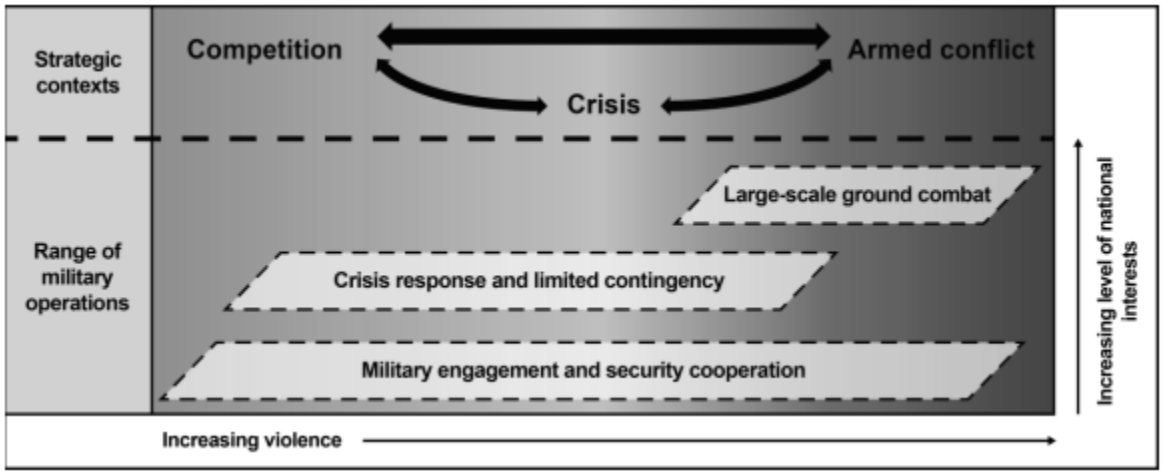


Figure 2-1. Army strategic contexts and operational categories

2-14. Discussions of the role of Army space operations within each of the strategic contexts occur later in this chapter.

CONSOLIDATING GAINS

2-15. *Consolidate gains* are activities to make enduring any initial operational success and to set the conditions for a sustainable security environment, allowing for a transition of control to other legitimate authorities (ADP 3-0). Consolidation of gains is an integral and continuous part of competition, and it is necessary for

achieving success across the range of military operations. Successful consolidation of gains requires a realistic and pragmatic assessment of strategic conditions, unified action partner legitimacy, friendly and adversary relative advantages, and the viability of a sustainable political outcome.

2-16. Army space forces consolidate gains throughout space operations to achieve objectives and promote lasting outcomes. They assess the short- and long-term impacts of space operations and provide recommendations to commanders on the best way to achieve those desired outcomes.

TENETS AND IMPERATIVES

2-17. The tenets of operations are desirable attributes that should be built into all plans and operations, and they are directly related to how the Army's operational concept should be employed. Commanders use the tenets of operations to inform and assess courses of action throughout the operations process. The degree to which an operation exhibits the tenets provides insight into the probability of success. The tenets of operations are agility, convergence, endurance, and depth.

- *Agility* is the ability to move forces and adjust their dispositions and activities more rapidly than the enemy (FM 3-0).
- *Convergence* is an outcome created by the concerted employment of capabilities from multiple domains and echelons against combinations of decisive points in any domain to create effects against a system, formation, decision maker, or in a specific geographic area (FM 3-0).
- Integration, as defined in Chapter 1, plays a vital role in achieving convergence and is one of the core competencies of Army space forces.
- Synchronization, also defined in Chapter 1, entails the employment and effects of the right capabilities at the right times.

2-18. Army space forces are agile and innovative, harnessing their creativity to leverage space capabilities for maximum impact. They are quintessential team players, reliably executing critical tasks to support victory on the battlefield. Their expertise is invaluable in identifying and resolving challenges faced by Army forces across all domains.

2-19. The Army leverages offensive and defensive space capabilities to enable and enhance the Army's ability to communicate, navigate, protect and sustain friendly forces, conduct precision targeting, conduct intelligence preparation of the operational environment (IPOE), consolidate gains, and assess. Army space forces support the commander's adherence to the imperatives of operations:

- See yourself, see the enemy, and understand the operational environment.
- Account for being under constant observation and all forms of enemy contact.
- Create and exploit relative physical, information, and human advantages in pursuit of decision dominance.
- Make initial contact with the smallest element possible.
- Impose multiple dilemmas on the enemy.
- Anticipate, plan, and execute transitions.
- Designate, weigh, and sustain the main effort.
- Consolidate gains continuously.
- Understand and manage the effects of operations on units and Soldiers.

OPERATIONAL APPROACH

2-20. *Operational art* is the cognitive approach by commanders and staffs—supported by their skill, knowledge, experience, creativity, and judgment—to develop strategies, campaigns, and operations to organize and employ military forces by integrating ends, ways, and means (JP 3-0). Through operational art, commanders develop their *operational approach*—a broad description of the mission, operational concepts, tasks, and actions required to accomplish the mission (JP 5-0). An operational approach is the result of the commander's visualization of what needs to be done in broad terms to solve identified problems. It is the main idea that informs detailed planning. When describing an operational approach, commanders—

- Consider ways to defeat enemy forces in detail and potential decisive points.
- Employ combinations of defeat mechanisms to isolate and defeat enemy forces, functions, and capabilities.

- Assess options for assuming risk.

Note. See FM 3-0 and FM 5-0 for more on operational art.

2-21. Commanders consider all aspects of the space OE when developing their operational approach. Army space professionals aid commanders in achieving situational understanding of the OE and visualizing what needs to be done in and through the space domain to solve problems in all domains.

2-22. Integrated space, cyberspace, and electromagnetic warfare operations can disrupt enemy communications and compromise their decision-making, fracturing enemy formations. By isolating reserves and follow-on echelons from the main body through strategic fires, Army forces can create favorable force ratios and contribute to their defeat. This dismantles the cohesion of enemy attacks or defenses. Additionally, targeting enemy sustainment capabilities separates their combat operations from vital supplies, delaying resupply and further degrading their effectiveness.

STRATEGIC FRAMEWORK

2-23. The strategic framework accounts for factors in the strategic environment and the connection of strategic capabilities to operational- and tactical-level operations. The strategic framework includes four areas:

- Strategic support area.
- Joint security area.
- Extended deep area.
- Assigned operational area.

2-24. Army space forces operate within each of these areas, and the nature of the space domain allows space forces to deliver effects into any area. See FM 3-0 for more on the strategic framework.

OPERATIONAL FRAMEWORK

2-25. The *operational framework* is a cognitive tool used to assist commanders and staffs in clearly visualizing and describing the application of combat power in time, space, purpose, and resources in the concept of operations (ADP 1-01). Commanders build their operational framework on their assessment of the operational environment, including all domains and dimensions. They may create new models to fit the circumstances, but they generally apply a combination of common models according to doctrine. The three models commonly used to build an operational framework are—

- Assigned areas.
- Deep, close, and rear operations.
- Main effort, supporting effort, and reserve.

2-26. Space operations provide the ability to support all phases of operations and achieve convergence at any point throughout the framework. They also allow commanders to understand and affect not only their area of operations but their area of influence and area of interest. The same applies to enemy space operations. Commanders and staffs ensure appropriate coordination for effects and consider enemy effects originating from outside their area of operations.

- An *area of operations* is an operational area defined by a commander for the land or maritime force commander to accomplish their missions and protect their forces (JP 3-0).
- An *area of influence* is an area inclusive of and extending beyond an operational area wherein a commander is capable of direct influence by maneuver, fire support, and information normally under the commander's command or control (JP 3-0).
- An *area of interest* (AOI) is that area of concern to the commander, including the area of influence, areas adjacent to it, and extending into enemy territory (JP 3-0).

2-27. See figure 2-2 (from FM 3-0) on page 24 for notional corps areas with contiguous divisions.

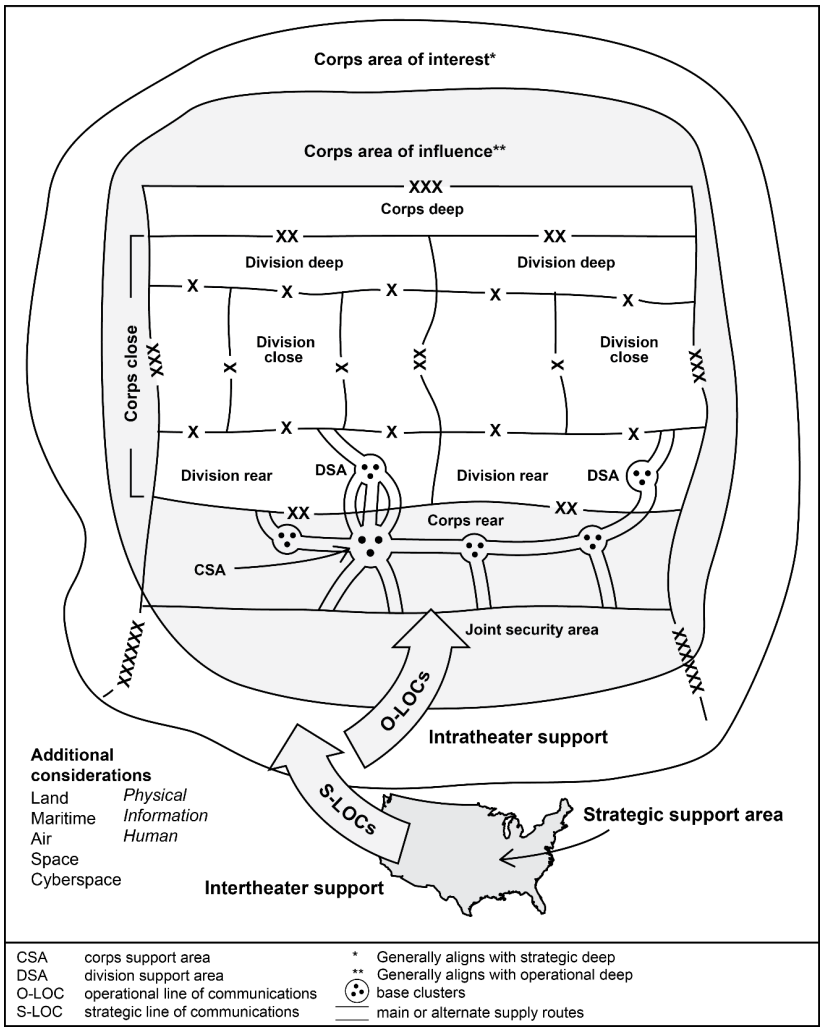


Figure 2-2. Notional corps deep, close, rear areas with contiguous divisions

DEEP OPERATIONS

2-28. *Deep operations* are tactical actions against enemy forces, typically out of direct contact with friendly forces, intended to shape future close operations and protect rear operations (FM 3-0). Space operations provide the necessary access to the deep area by enabling long-range communications, information collection, and fires intended to disrupt C2 and disintegrate enemy formations. This disintegration separates enemy reserves and follow-on echelons from the main body and allows maneuver forces or fires to isolate echelons and achieve favorable force ratios to destroy those echelons. Army Special Operations Forces (ARSOF) operating in the extended deep area can detect targets and provide access to denied areas for joint and partner forces. Strategic deep areas are beyond the feasible range of movement for conventional ground forces or where policy prohibits their operations. These areas are where the combatant commander, and/or national agencies employ strategic intelligence capabilities, joint fires, ARSOF, cyber, and space capabilities. Army space operations in the deep area disrupt the enemy's ability to generate tempo, mass forces, and mass fires, decreasing the lethality of enemy actions in the close fight.

CLOSE OPERATIONS

2-29. *Close operations* are tactical actions of subordinate maneuver forces and the forces providing immediate support to them, whose purpose is to employ maneuver and fires to close with and destroy enemy forces (FM 3-0). Space operations are as active in the close area as they are in the deep area. The focus is to disrupt the coherence and momentum of enemy operations, disintegrate enemy formations, disrupt sustainment

operations, disrupt enemy reorganization of formations, and disrupt the enemy's ability to re-attack. Space operations can expose the enemy in all domains, decreasing the time needed for friendly forces to acquire, target, and employ effects.

REAR OPERATIONS

2-30. *Rear operations* are tactical actions behind major subordinate maneuver forces that facilitate movement, extend operational reach, and maintain desired tempo (FM 3-0). This includes continuity of sustainment and C2. Rear operations support close and deep operations. Enemy forces use space-based sensors, communications, and PNT to support long-range fires, including electromagnetic warfare, to disrupt rear operations. Joint forces anticipate enemy jamming of communications and GPS to disrupt the coherence and momentum of friendly rear operations. Army space operations facilitate assured PNT, support force protection and situational awareness, and contribute to freedom of action in the rear area. Enemy deep operations often target friendly rear operations because they are often both vulnerable and essential to friendly success. Space operations leverage space control assets to influence threat forces' access to their space capabilities.

COMMAND AND CONTROL OF DEEP, CLOSE, AND REAR OPERATIONS

2-31. Staffing, equipping, and organizational concerns vary among echelons of command. In every case, however, the purpose of C2 is to implement the commander's will and synchronize operations in pursuit of the unit's objectives. Space operations play an integral part in gaining and maintaining effective C2 for both contiguous and non-contiguous units conducting operations.

SECTION II – SPACE MISSION AREAS

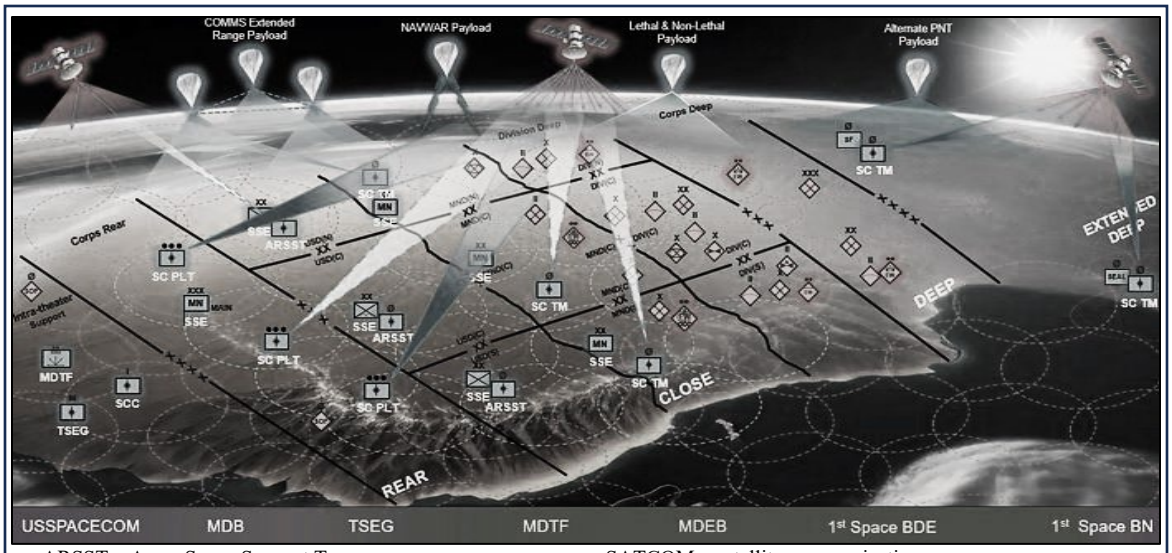
2-32. JP 3-14 establishes the basis for joint space doctrine, outlining principles for the integrated employment of space capabilities. It acknowledges that each Service plays a unique role in maximizing and integrating space capabilities into joint planning and operations.

- Each Service conducts space operations, leveraging and complementing the capabilities provided by the United States Space Force (USSF) without duplication.
- The Army organizes, trains, and equips dedicated space professionals for operations and support.
- All Services offer unique space control and EMI identification, attribution, and resolution capabilities.
- Each Service acquires specific ground terminals and other hardware to fully utilize space capabilities.
- The Army is the most extensive user of space capabilities within the Department of Defense.

2-33. Commanders must understand the fundamental principles, advantages, and risks associated with offensive and defensive space capabilities in Army operations. They are responsible for:

- Directing the appropriate task organization of Army space forces.
- Defining authorities and overseeing the employment of space capabilities.
- Ensuring the protection and sustainment of assigned Army space forces.
- Incorporating space domain aspects into the development of the operational approach and framework.

2-34. Figure 2-3 on page 26 illustrates the undeniable link between combined arms warfare and space operations.



ARSST – Army Space Support Team
BDE – brigade
MDB – missile defense battery
MDEB – Multi-Domain Effects Battalion
MDTF – Multi-Domain Task Force
MND – multinational division
NAVWAR – navigation warfare
PNT – positioning, navigation, and timing
SATCOM – satellite communications
SC PLT – Space Control Platoon
SSE – Space Support Element
SC TM – Space Control Team
TSEG – Theater Strike Effects Group
USD – United States division
USSPACECOM – United States Space Command

Figure 2-3. Army space operations concept overview

2-35. A space mission area is a category of similarly purposed operations, activities, and investments that support operations and global campaigns. Space mission areas are broader than single capabilities. Categorizing space activities into space mission areas provides a framework for how each activity contributes to supporting Army forces. All Services contribute to and use the ten joint space mission areas as listed in table 2-1 below. While the Army may not own these specific mission areas, Army space forces know and understand them to leverage their effects in support of operations.

Table 2-1. Joint space mission areas

• Space domain awareness.	• Environmental monitoring.
• Offensive and defensive space operations.	• Missile warning.
• Positioning, navigation, and timing.	• Nuclear detonation detection.
• Intelligence, surveillance, and reconnaissance.	• Spacecraft operations.
• Satellite Communications.	• Spacelift.

2-36. Regarding the ten joint space mission areas, commanders can expect Army space forces, and particularly Army space operations officers, to be experts on how the mission areas shown in table 2-2 on page 27 support Army operations. Army space forces and space professionals may be specialized in certain areas, such as information collection requests, integration of offensive and defensive space operations, environmental monitoring or missile warning, but Army space operations officers understand all of these as they relate to Army operations.

Table 2-2. Army space mission areas

• Satellite communications. • Positioning, navigation, and timing. • Space-based intelligence, surveillance, and reconnaissance.	• Space control. • Missile warning. • Environmental monitoring. • Space domain awareness.

2-37. Space capabilities consist of direct capabilities and enabling capabilities. 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.

2-38. This manual serves as the Army's principal doctrine for PNT, space control, and space domain awareness. This manual includes discussions of and considerations for the other mission areas as they relate to the space domain, its environment, and its capabilities. Army space operations officers support respective staff proponents with their expertise and understanding of the space domain and joint space operations.

SATELLITE COMMUNICATIONS

2-39. SATCOM is a key means of information transport for military operations. SATCOM systems provide connectivity for global communications, disaggregated options for tactical communications, and critical on-the-move connectivity for maneuver forces operating over large areas or in restricted terrain. SATCOM enables updated targeting information and intelligence updates in near real time. Sensor-to-shooter links enable improved situational awareness, allowing Soldiers to assess fire control techniques and effectiveness. SATCOM systems exist at every echelon in the Army and support all operations. Signal units and Soldiers plan, manage, and assess SATCOM networks as part of their duties. Refer to FM 6-02 for more on satellite communications.

2-40. SATCOM offers many unique features to the operating force, including:

- Multiple options for tactical communications.
- Connectivity over long distances or rugged and urban terrain.
- Communications on the move.
- Reduced infrastructure requirements when using small terminals and direct-to-satellite devices.
- Architecture for FFT.
- Global reach from the national command authority to deployed forces.
- Near real time connections from sensor to shooter.
- Missile warning indications and dissemination.
- Space-based reconnaissance and surveillance data.
- Commercial imagery which can support planning, theater security cooperation and multinational operations, combat assessment, situational understanding, and cartography.
- Access for isolated forces without terrain or distance limitations.
- Immediate access to Army tactical networks.
- Long-haul backbone data transport and reach back to home station.
- Timely updates to common operational pictures.
- Video data from unmanned aircraft systems and backhauling to pilots and intelligence personnel for exploitation.
- Video teleconferencing.

2-41. The Army employs a combination of military and commercial space systems to support its SATCOM requirements. Army forces require a mixture of narrowband, wideband, and protected SATCOM networks to satisfy those requirements. Military SATCOM includes the Wideband Global SATCOM (commonly known as WGS), Advanced Extremely High Frequency (AEHF), Mobile User Objective System (commonly known as MUOS), Defense Satellite Communication System (DSCS), Enhanced Polar SATCOM (EPS), and Ultra high frequency (UHF) Follow On (commonly known as UFO) constellations managed by the USSF. Terrestrial segment systems using these constellations come in a wide array of equipment tailored to unit and mission requirements, each with its own advantages and disadvantages, discussed further below.

2-42. Army space operations officers on staffs support signal and network planners by tracking operational statuses of spacecraft carrying SATCOM payloads. They understand the science of signal propagation through the space environment and atmosphere and the capabilities resident on specific SATCOM satellites. They advise the staff on outages and interruptions and provide recommendations for primary, alternate, contingency, emergency (commonly known as PACE) communications plans. They also understand threat SATCOM architectures, how threats use SATCOM to achieve their objectives, and what threats can use to disrupt or deny friendly SATCOM.

2-43. Table 2-3 below outlines the three bands used for SATCOM. Each are discussed below. In the table, bandwidth refers to the maximum amount of data transfer over time that can be transmitted and received. Bandwidth can also refer to the difference between the upper and lower frequencies within a particular frequency band. For example, the bandwidth between 1 and 3.2 megahertz is 2.2 megahertz (3.2 - 1 = 2.2).

Table 2-3. Satellite communications attributes

SATCOM Frequency Band	*Advantages*	*Disadvantages*	*Examples*
Narrowband (UHF)	• Small terminals. • Battery operated, low power. • Economical. • Highly mobile. • Can penetrate foliage. • Provides large uplink and downlink footprints allowing easier access.	• Vulnerable to nuclear events. • Highly susceptible to jamming, interference, and scintillation. • Low capacity. • Highly congested (many users in a small band).	• Mobile User Objective System • UFO
Wideband (SHF)	• More bandwidth and channels. • Flexibility in routing. • Greater protection features. • Less vulnerability to nuclear blackout or scintillation.	• Limited frequency allocation. • Susceptible to jamming. • Ground terminals are larger, more expensive, and less mobile.	• WGS • DSCS • Milstar (downlink)
Protected band (EHF)	• Uncrowded spectrum. • Jam resistant. • Small uplink and downlink footprints. • Least vulnerable to nuclear blackout or scintillation.	• Technologically complex, limited access. • Susceptible to rain and atmospheric attenuation. • Expensive to outfit. • Ground terminals are large, complex, and expensive.	• Milstar (uplink) • Advanced EHF (AEHF) • Enhanced Polar SATCOM (EPS)

EHF – extremely high frequency
SHF – super-high frequency
UFO – UHF Follow On
UHF – ultrahigh frequency
GPS – Global Positioning System
WGS – Wideband Global SATCOM
DSCS – Defense Satellite Communications System

NARROWBAND

2-44. Narrowband SATCOM (UHF) supports secure voice and data transmission at relatively low data rates for mobile and fixed users. Compact terminals with directional or omnidirectional antennas allow forces to conduct tactical C2 and quickly exchange both voice and data. The nature of its signal propagation allows for large uplink and downlink footprints, enabling connectivity between forces who are largely dispersed, and signals can penetrate dense foliage. Narrowband SATCOM operates through terrestrial weather like rain and fog.

2-45. Narrowband SATCOM is highly susceptible to jamming relative to other SATCOM bands due to its signal characteristics and large uplink footprints. Threats can jam or spoof user equipment in the terrestrial layer more easily as well.

WIDEBAND

2-46. Wideband SATCOM (SHF) supports multichannel, secure voice, and high data rates for C2, crisis management, and data transfer. The heaviest use of wideband is for internet protocol networks providing voice, video, and data services. Unmanned aircraft systems typically use wideband SATCOM to relay video. Some wideband users employ large, fixed ground terminals to support DOD enterprise networks. Tactical users use mobile (towed or self-propelled) wideband terminals for high-capacity communications.

2-47. Wideband terminals cost more to employ and maintain than narrowband terminals. Wideband signals are also susceptible to jamming, but access to uplink footprints is more difficult as they are smaller. Terrestrial weather can disrupt wideband signals on the upper end of the frequency band.

PROTECTED

2-48. Protected SATCOM (EHF) supports survivable voice and data communications at lower data rates than wideband SATCOM. The unique characteristics of EHF band signals decrease susceptibility to jamming and scintillation while also providing greater capacity for encryption. Uplink and downlink footprints are small, reducing a threat's ability to detect and intercept signals.

2-49. Protected SATCOM equipment is generally much more expensive to employ and maintain. This type of SATCOM is generally reserved for high-priority or sensitive communications exploiting the inherent protection that the signals provide. Terrestrial weather such as rain and cloud cover can seriously degrade or deny EHF signals.

COMMERCIAL SYSTEMS

2-50. Commercial SATCOM offers additional capacity and disaggregation to meet and augment the Army's rapidly growing communications needs. Commercial systems use all frequency bands, though some are more common than others.

- Leased fixed satellite services provide gateway access to military networks.
- Leased mobile satellite services such as Starlink and Inmarsat complement military SATCOM for accessible and mobile communications.

2-51. Leasing commercial services affords the Army timelier access to advancing commercial technologies than through traditional government programs. Army space forces possess the knowledge of commercial space capabilities to advise commanders and staffs on their use, advantages, and risks. Use of commercial space capabilities presents unique challenges.

- Foreign commercial satellites may not be bound by the same regulatory requirements as U.S.-owned systems.
- U.S. policy may prohibit use of certain commercial systems.
- Commercial SATCOM links may not provide any protection of signals and data.

POSITIONING, NAVIGATION, AND TIMING

2-52. PNT 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 U.S., have developed spacecraft constellations that provide PNT services. This service can also be augmented by terrestrial assets to increase accuracy, precision, or coverage.

2-53. Army space forces understand how PNT supports operations. They know which equipment in their formations requires accurate PNT and understand the vulnerabilities and risks in employing that equipment. They advise commanders and staffs and educate their formations on mitigation measures. PNT provides Army and joint forces with the following:

- Accuracy and precision for predicted fires, which reduces collateral damage and ammunition expenditures and increases lethality.
- Accurate FFT to reduce risk of fratricide, protect the force, aid rescue operations, and support the principles of sustainment.
- Navigation capability for unmanned systems.
- The ability to synchronize digital networks.

- Support to C2 to maintain tempo, synchronize effects, and achieve convergence.
- Orthorectification of imagery.

GLOBAL POSITIONING SYSTEM

2-54. GPS is a satellite-based radio navigation system operated by the DOD to provide all military, civil, and commercial users with accurate and precise PNT service. GPS is one of several global navigation satellite systems (GNSS)—the term for any space-based PNT system. The GPS signal provides the necessary precision timing to synchronize military and commercial networks, navigation and tracking platforms, and financial institutions. GPS receivers mounted on communications systems, cell phone towers, and other such platforms use the timing signal to maintain network integrity. Financial institutions use the timing signal to ensure proper transactions and account management. Military systems and private citizens around the world use the signal for navigation and tracking.

2-55. 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 TTP 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 [GLONASS]) to support civil and military users. GPS works passively; a user receives the signal without having to transmit. As such, there is no constraint on the number of users who can receive the signal.

2-56. GPS consists of a constellation of satellites and associated ground control stations operated by the USSF. GPS satellites orbit the earth in six equally spaced orbital planes, each with at least four satellites completing an orbit once every 12 hours. This architecture ensures terrestrial users can access at least four satellites anywhere on the globe at any time (terrain-dependent). Receivers need the signals from at least four satellites to calculate position on the earth; the more signals they receive, the more accurate the calculation.

2-57. The GPS signal is transmitted from the satellites at a very low power and on specific frequencies which cannot be changed. This makes the GPS signal easily susceptible to threat and environmental effects, such as jamming, multipathing in urban areas, and other forms of EMI.

2-58. GPS provides two levels of positioning services. The standard positioning service is available to all users worldwide through the broadcast of an unencrypted signal. The protected positioning service 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. The DOD requires its members to use the protected positioning service to provide the best security and anti-jam protection. Users must load military receivers with the latest security keys prior to entering areas where GPS is denied or degraded. Commercial GPS receivers do not offer this level of performance or protection as military receivers.

FRIENDLY FORCE TRACKING

2-59. *Friendly force tracking* is the process of fixing, observing, and reporting the location and movement of friendly forces (JP 3-09). FFT systems provide a commander the ability to track Army and joint units of all sizes. It integrates SATCOM and PNT to provide continuous joint FFT to commanders and unified action partners. FFT improves SA by providing the location and movement of forces equipped with devices that transmit position location information to the theater common operational picture (COP). Integrating the FFT information into the theater COP is of great importance if a friendly force unit needs to be reinforced or removed from a difficult situation. FFT systems provide the exact location information necessary to track units, and thus contribute to effective C2, situational understanding, personnel recovery, and fratricide avoidance.

Note. The COP is the primary tool for supporting the commander's situational understanding. All staff sections provide input from their area of expertise to the COP.

2-60. The mission of FFT is to receive, process, and disseminate FFT tagging, tracking, and locating and personnel recovery data for authorized users. Force tracking systems and their data increase mission

effectiveness, enhance SA, facilitate C2, significantly reduce friendly fire and collateral damage potential, decrease response time to recover isolated personnel, and provide enhanced battlespace surveillance.

2-61. FFT provides data services to all combatant commands and unified action partners. The joint, interagency, intergovernmental, and multinational nature of the mission is unique and requires integration across the broad community of interest to execute responsibilities, address user needs, accomplish essential tasks to enable data sharing, and integrate operations. FFT capabilities comply with data sharing standards and dissemination needs to enable FFT systems. It is interoperable with other systems and feeds common C2 systems.

2-62. FFT systems provide the commander the ability to track appropriately-equipped small unit patrols and teams in an area of operations. FFT systems provide the location information necessary to track units, and thus contribute to effective C2, situational understanding, personnel recovery, and fratricide avoidance on the battlefield.

2-63. Most FFT devices depend on space assets to maintain vital communication links. The primary information technology application for situational awareness and C2 at tactical command posts is the Joint Battle Command-Platform. This platform leverages FFT to share GPS-enabled SA information among command posts across tactical units. FFT enhances the overall operational picture by providing accurate SA of the area of operations, improving the tracking and awareness of deployed and mobile forces, and supporting the monitoring of vehicles and personnel.

2-64. As FFT evolves and more systems and devices deploy globally, the critical need for data interoperability across security and C2 systems continues to increase. FFT roles include:

- Dissemination of information services such as tagging, tracking, locating, and personnel recovery support.
- System expertise for advice in planning, information assurance, device procurement and management, data owner guidance, and COP integration.
- Deliberate planning assistance in support of operational plans and concept plans for FFT activities.
- Data integration consistent with network enabled C2 modernization.
- Emergency message alerting and notification.
- Operations and limited exercise support to include troubleshooting, subject matter expert support, testing, and limited training.
- Analyzing and developing solutions to satisfy requests for FFT support.

2-65. The Army fulfills its FFT mission responsibilities through USASMDC's Mission Management Center, a globally connected hub that leverages the DOD information network (known as DODIN) to deliver tailored FFT data services, including data translation and cross-domain transfer and data dissemination to authorized users.

2-66. The Army prioritizes user support requests to address all valid operational needs effectively. FFT data is transmitted between devices and systems using line of sight (commonly known as LOS), tactical data link, and beyond-line-of-sight SATCOM. FFT devices transmit data to a processing node, where it is then routed directly to a COP or through the Mission Management Center for further processing and dissemination. The receiving platform collects and passes the location information to a central gathering point. Figure 2-4 on page 32 illustrates this data flow.

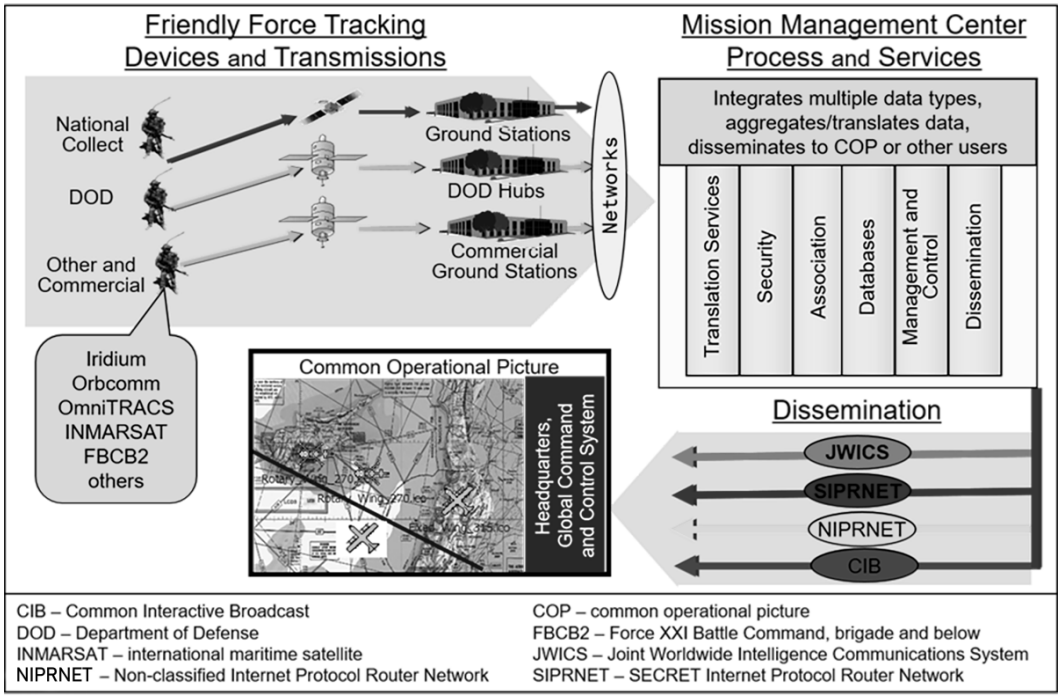


Figure 2-4. Friendly force tracking data flow overview

2-67. A variety of military and commercial SATCOM systems receive and transmit the signal to a ground site where a C2 system manager gathers individual platform location information. This information is sent to the designated AO and incorporated into the local COP. In most cases the data is provided to Global Command Control System via classified network or through a designated Integrated Broadcast Service satellite for broadcast over all or part of the AO.

SPACE-BASED INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE

2-68. Space-based collection, 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. Army access to overhead information collection is provided through established intelligence channels. Refer to FM 2-0 for more on intelligence.

2-69. Data and analyses from space-based intelligence, surveillance, and reconnaissance (ISR) collection:

- Contribute to C2, enhancing the joint force's ability to observe areas of interest to understand the threat and increase situational awareness.
- Enhance planning by providing updated information relevant to the OE for the commander and planners.
- Support intelligence activities, including warning, current intelligence, order of battle, scientific and technical intelligence assessments, targeting and combat assessments, and mission planning and rehearsal.
- Contribute to Army and 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.
- Cue other space- and terrestrial-based systems to enhance intelligence accuracy, shorten reaction time, and provide a more precise location, discrimination from other targets, or other specific targeting information.

2-70. Space capabilities provide the means for persistent or periodic overhead collection, depending on the orbital regime in which the collection payload resides, over areas to which other collection platforms are

denied access. Space-based information collection complements air and ground-based information collection. Surveillance from the space domain enables forces to overcome terrestrial line of sight restrictions and affords coverage of large areas of interest. In some cases, such as forced entry, the only early reconnaissance and surveillance available may be from space assets. Military and commercial space capabilities offer a myriad of specialized sensors for collecting multispectral, electro-optical/infrared, and synthetic aperture radar imagery; geospatial and signals intelligence; and others. The Army leverages space-based collection by requesting support through the joint collection management process.

2-71. While the deputy chief of staff, G-2, or S-2, in Army formations, owns intelligence processes to include space-enabled processes, Army space forces understand the architectures, physics, and operational capabilities of friendly and commercial space-based collection capabilities. They also possess knowledge of threat space-based sensors and threat capabilities in general that can adversely affect friendly space-based sensors. They also contribute expertise on impacts on space-based sensors from space and terrestrial environmental effects.

COMMERCIAL IMAGERY

2-72. Unclassified commercial satellite imagery is used by U.S. forces and mission partners to enhance knowledge of the environment. The National Geospatial-Intelligence Agency (NGA) serves as the DOD lead for all acquisition of commercial imagery. Army organizations and units requiring commercial imagery from a national database or new collection coordinate with their geospatial intelligence collection manager or space operations sections. Space cadre first seek to acquire commercial imagery through existing DOD or intelligence community imagery libraries to the greatest extent possible.

2-73. When required imagery is unavailable from an approved imagery library, Army space forces request a new tasking from space-based sensors following established procedures through their command's collection manager.

2-74. Unclassified commercial satellite imagery is especially useful during multinational operations because it is more easily approved for release to share with foreign militaries for enhanced mission operations. Sharing commercial imagery builds partnership capacity and improves resilience and interoperability.

SPACE CONTROL

2-75. *Space Control* - Offensive and defensive space operations that ensure freedom of action and when directed, defeat any efforts that interfere with, preclude access to, or attack United States or allied space systems (ATP 3-14.1)**.** Space control uses a broad range of measures to provide continued, sustainable use of space; deter adversaries; attribute attacks; and support the inherent right to self-defense. Space control can be active or passive, lethal or nonlethal, reversible or nonreversible, and occur in any segment of a space system. Space control enables freedom of action in space and counters efforts to interfere with or attack friendly forces of the U.S., allies, or commercial partners and includes both Offensive Space Operations and Defensive Space Operations.

Note. JP 3-14 uses "offensive space operations" and "defensive space operations" rather than the terms "offensive space control" and "defensive space control." Army doctrine retains the use of "space control."

OFFENSIVE SPACE OPERATIONS

2-76. *Offensive space operations* are actions taken to deny an adversary freedom of action in space (JP 3-14). Offensive space operations is one such action. It consists of effects created by direct capabilities in the orbital, link, or terrestrial segments to deceive, disrupt, degrade, deny, or destroy adversary space systems and denial of an adversary's freedom of access and action in the space domain. Offensive space operations includes using lethal means, for example, using indirect fires to destroy a satellite ground station. Offensive space operations is not executed in isolation and requires synchronization across the warfighting functions and through established joint processes. Offensive space operations employs both reversible and nonreversible effects.

2-77. The five desired effects of offensive space operations are:

- Deceive—to mislead by introducing false or invalid information on an adversary's system, usually without physical damage to the affected system.

- Disrupt—to temporarily impair an adversary's use or access of a system for a period, usually without physical damage to the affected system.
- Degrade—to permanently impair (either partially or totally) the adversary's use of a system, usually with some physical damage to the affected system.
- Deny—to temporarily eliminate an adversary's use, access, or operation of a system for a period, usually without physical damage to the affected system.
- Destroy—to permanently eliminate the adversary's use of a system, usually with physical damage to the affected system.

DEFENSIVE SPACE OPERATIONS

2-78. *Defensive space operations* are actions taken to preserve friendly freedom of action in space (JP 3-14). Army forces conduct defensive space operations to protect friendly SATCOM and other space capabilities from attack, interference, unauthorized intrusions, or unintentional hazards. Defensive space operations also include safeguarding assets from hazards such as space debris, interference, and naturally occurring phenomena such as radiation and space weather.

2-79. Defensive space operations preserve access to, and use of, space capabilities by reacting to events affecting U.S. and multinational space capabilities. Defensive space operations consist of active and passive measures taken to protect friendly space forces from attack, interference, or hazards. Defensive space operations are consistent with the inherent right of self-defense and, if deterrence fails, supports efforts to attack them.

2-80. A robust defensive space operations plan and its activities influence enemies' perceptions of friendly space capabilities and makes them less confident in successfully interfering with those capabilities. Defensive space operations protect assets from adversarial exploitation, ensuring Army forces' ability to communicate and navigate in a D3SOE.

NAVIGATION WARFARE

2-81. *Navigation warfare* are the actions that maintain friendly use of positioning, navigation, and timing information while denying the same to an adversary (JP 3-14). NAVWAR can be conducted both offensively and defensively. Planners scope NAVWAR effects to achieve objectives. These effects can range from localized disruption and deception to large-scale denial of PNT.

2-82. The approach to successful NAVWAR is through GNSS signal characterization, assured PNT, and NAVWAR attack. Army forces execute NAVWAR by integrating Army capabilities and effects into joint operations to create a leveraged force multiplier. Army NAVWAR includes operations to characterize the EMOE and friendly and threat capabilities and actions. Passive protection measures include encryption and electromagnetic hardening of GPS receivers to increase the likelihood Soldiers will receive accurate GPS data in a D3SOE. Active protection measures include geolocating jammers for targeting.

2-83. GNSS signal characterization is the ability to understand, visualize, and describe the local PNT environment. It involves accurate and timely assessments of the OE regarding the use of sensors, weapons, precision munitions, obscurants, enemy capabilities, and intent across domains. It evaluates the potential impact on these areas and missions to plan and conduct operations. This characterization provides an assessment of PNT availability throughout the duration of an operation. GNSS signal characterization requires a persistent and integrated network of surveillance and reconnaissance systems with an information processing capability to fuse data into a cohesive picture.

2-84. Assured PNT is reliable, secure, and resilient GNSS data delivered with integrity for friendly forces to conduct effective maneuver and employ accurately predicted fires and precision munitions. Assured PNT involves augmenting GPS with other PNT signals, whether from space or terrestrially. Passive measures include the use of anti-jam antennas to nullify adversary interference and ensure GPS reception. Active measures include shielding the receiver—if possible—to block the interference and using proven tactics, techniques, and procedures. Conducting realistic training in a D3SOE exposes Soldiers to these conditions, allowing them to exercise mitigation techniques.

2-85. NAVWAR attack is the ability to deny threats the use of GNSS through a variety of methods including offensive cyberspace operations, space control, and electromagnetic warfare. NAVWAR attack exploits

threat's dependencies and vulnerabilities identified during IPOE. NAVWAR can be used to support joint forcible entry operations, contribute to defeating anti-access and area denial strategies, and enable deep strikes while preserving access for friendly forces and civil use. NAVWAR planners must synchronize their desired effects with other effects.

2-86. NAVWAR capabilities are integrated into the operations process in anticipation of PNT disruptions. Army space forces and especially Army space operations officers understand how the enemy may attempt to negate PNT and identify threats to friendly capabilities.

2-87. Space operations in a NAVWAR scenario focus on space-based PNT signals, situational understanding, and space control operations. Cyberspace operations protect friendly networks that leverage GNSS, while targeting similar adversary capabilities. Electromagnetic warfare operations—consisting of electromagnetic support, electromagnetic attack, and electromagnetic protection—conducted in support of NAVWAR denies adversary access to GNSS information and protects friendly capabilities within the EMS. High-altitude and aviation platforms provide access across the battlefield for lethal and non-lethal engagement of threat PNT capabilities. Fires capabilities supporting NAVWAR attack operations employ munitions to destroy PNT jammers or disrupt the ability to electronically interdict friendly PNT systems.

2-88. Commanders and staffs, supported by their Army space operations officers, understand how their forces and equipment rely on PNT and how degraded or denied PNT impacts operations. They maintain situational understanding of the EMOE. Soldiers recognize the indications of NAVWAR on their equipment, employ basic techniques to mitigate the effects, and notify their headquarters and adjacent units when interference occurs. If basic techniques are not successful, Soldiers implement the primary, alternate, contingency, emergency plan and continue operations.

MISSILE WARNING

2-89. Missile warning constitutes crucial components to global missile defense. Missile warning provides the necessary persistent and reliable early warning networks using space-based, ground-based, and sea-based sensors to support strategic, cross- area of responsibility (AOR), and theater ballistic missile attacks. Missile warning is based on detecting an event that is identified as a missile. Space-based sensors detect the movement of missiles through high energy infrared (heat) events—such as the hot exhaust exiting from a ballistic missile. Theater missile warning stations report these detections as early warning reports. Early warning reports provide joint forces with time to react to incoming missiles. Missile warning ground stations are globally deployed and optimally located to provide the fastest and least uninterrupted warning, threat characterization, and cueing information to Army forces in support of ballistic missile defense and protection objectives.

2-90. Strategic missile warning is the notification of a missile attack against North America and may include attack notifications to some mission partner nations. Integrated tactical warning and attack assessment (known as ITW/AA) systems are essential for the detection, confirmation, and notification of ballistic missile launches threatening the sovereign territory and population of the U.S.

2-91. Theater missile warning is the immediate notification of a potential threat of a ballistic missile projected to impact an identified area within the same theater from which it was launched. Theater missile warning elements receive direct downlink signals from satellites and process the data as part of the theater event system (see FM 3-27 for more on the theater event system, known as the TES). Theater missile warning uses tactical message dissemination and voice notification to notify operations and command centers a ballistic missile attack is occurring.

2-92. Cross-AOR missile warning is theater-level missile warning that occurs when a missile crosses the boundaries of an AOR and impacts in another AOR and is likely to have theater strategic level of war impacts. Cross-AOR missile warning requires combatant command operation plans to coordinate responses and synchronized actions between combatant commands to ensure effective defense and fulfill policy aims in support of the national strategy.

2-93. Army space professionals understand missile warning network architectures and the capabilities of its sensors, including threats, hazards, and vulnerabilities. They assist in the planning for mitigating risks to ensure missile warning occurs quickly and seamlessly. Army space forces track and maintain operational status of space-based missile warning systems and know corresponding threat systems. Refer to FM 3-27 for more on global missile defense.

ENVIRONMENTAL MONITORING

2-94. Environmental Monitoring data is provided by Governmental space forces, such as National Oceanic and Atmospheric Administration (NOAA), foreign sources such as European and Japanese spacecraft. Army space integration forces leverage these capabilities to provide data for forecasts, alerts, and warnings for analysis of potentially negative impacts on operations. The products delivered from this integration inform commanders, so they understand environmental effects against friendly, threat, and commercial space and terrestrial capabilities and their impacts on operations. Environmental monitoring informs planning and decision making. Integrating space-based monitoring provides the ability to detect and develop mitigation measures against the impacts of space and terrestrial weather on the space mission areas and Army operations.

2-95. Army space forces analyze space weather data collected by the U.S. Air Force and USSF space weather squadrons to determine impacts on friendly and threat operations. Army space forces advise commanders on courses of action and risk mitigation to ensure friendly forces retain access to space capabilities and conduct operations under favorable conditions.

SPACE DOMAIN AWARENESS

2-96. *Space domain awareness* (SDA) is the timely, relevant, and actionable understanding of the operational environment that allows military forces to plan, integrate, execute, and assess space operations (JP 3-14). SDA tries to understand adversary intent and motive to anticipate adversary actions. SDA incorporates multiple intelligence and information capabilities including terrestrial and space-based reconnaissance and surveillance sensors, environmental monitoring, and data sharing. SDA is obtained through U.S., friendly, adversary, and neutral party actions and activities. SDA affects all warfighting functions in all domains. SDA contributes to a commander's ability to understand adversary intent and is the foundation for understanding and accomplishing all space-related activities.

2-97. Timely and current knowledge of national and foreign space systems is an essential part of SDA and is required to support a wide range of operations in all domains. SDA enables capabilities in joint operations by characterizing the space operations environment, which includes operations and effects in the orbital, terrestrial and link segments.

SPACE SITUATIONAL AWARENESS

2-98. *Space situational awareness* (SSA) is the requisite foundational, current, and predictive knowledge and characterization of space orbital objects and the space domain (JP 3-14). Simply stated, SSA incorporates understanding of orbital space capabilities and the possible intent of those who pose a threat to Army space operations. It integrates space-based surveillance, collection, and processing; status of U.S. and cooperative nations' satellite systems; status of U.S. and multinational space readiness; and analysis of the space domain.

2-99. SSA is a subset of SDA. SSA provides the JFC with knowledge and characterization of assets on orbit in order to ensure safe, stable, and sustainable C2 of space activities, including those providing information and intelligence to other domains. SSA combines the output of a wide variety of products and sources to provide insight into adversary use of space capabilities and their potential to threaten friendly space capabilities.

2-100. SDA and SSA are key components for space operations because they build the foundation for accomplishing all other space operations. SSA requires in-depth knowledge of the space domain, an understanding of the OE, intelligence on foreign space systems, correlation of effects to a cause, and proper distribution and sharing of SSA information. SSA operations are continuous to ensure the current and future locations of terrestrial and space systems are known with reliable accuracy. SSA characterizes space capabilities and integrates information collection analysis which contributes to the Army's ability to understand and react to enemy intent.

CYBERSPACE AND ELECTROMAGNETIC WARFARE OPERATIONS

2-101. The relationship between the space domain and the cyber domain is unique. Many space operations depend on cyberspace—a critical portion of cyberspace can only be provided via space operations—and some

space capabilities, such as NAVWAR, are dependent upon operations from both domains. Some cyberspace operations are enabled by the space domain. Utilizing the EMS, cyberspace provides the means by which space control and transmission of space sensor data are conducted. This interrelationship is critical, and the linkages used are considered during all phases of planning and operations to ensure synergy between space and cyberspace operations.

2-102. Cyberspace operations contribute to space operations by protecting friendly networks and connections while targeting adversary capabilities. Cyberspace continues to become increasingly congested and contested. Army forces rely on the EMS to effectively operate in cyberspace while controlling the ability of others to do the same.

2-103. Rapid developments in cyberspace operations continually challenge friendly advantages in cyberspace. While Army forces cannot defend against every kind of intrusion, commanders and staffs take steps to identify, prioritize, and defend their most important networks and data. Commanders, with their cyberspace operations experts must adapt quickly and effectively to enemy and adversary presence within cyberspace to protect space capabilities and systems.

SPACE ELECTROMAGNETIC WARFARE

2-104. Electromagnetic warfare is a military action involving the use of electromagnetic and directed energy to control the electromagnetic spectrum or to attack the enemy (JP 3-85). The EMS is a maneuver space essential for facilitating control within the operational environment (OE) and impacts all portions of the OE and military operations. Based on specific physical characteristics, the EMS is organized by frequency bands, including radio waves, microwaves, infrared radiation, visible light, ultraviolet radiation, x-rays, and gamma rays (FM 3-12). Space EW (SEW) is a subset of EW to control the electromagnetic spectrum or to attack the enemy into and through the space domain. See figure 2-5 below for the electromagnetic spectrum.

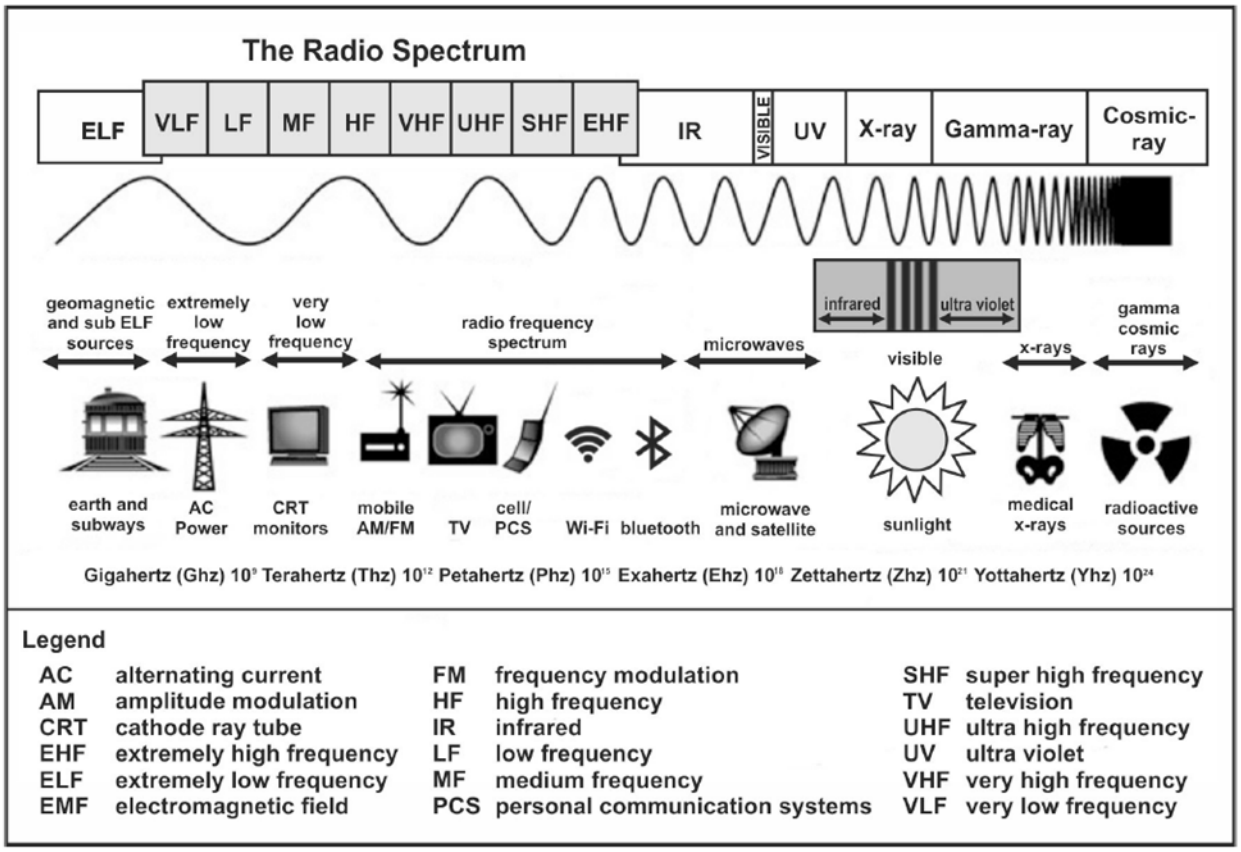


Figure 2-5. The electromagnetic spectrum

2-105. Due to the distances involved, and the nature of the space operating environment, the primary means of accessing capabilities provided from and through the space domain is to utilize radio waves. This forms the link segment connecting terrestrial (both user and control portions) and space (both bus and payload portions) segments. Because of this, freedom of use within the EMS is a critical requirement for successful space operations. Effects within the EMS are the primary way in which friendly and adversary forces will create a D3SOE for opposing forces.

2-106. Electromagnetic Warfare consists of three distinct divisions: Electromagnetic Attack (EA), Electromagnetic Support (ES), and Electromagnetic Protection (EP). These can be used in mutually supporting roles in order to make the greatest use of the EMS, and most efficient effects against adversary use. See figure 2-6 below for the electromagnetic warfare taxonomy.

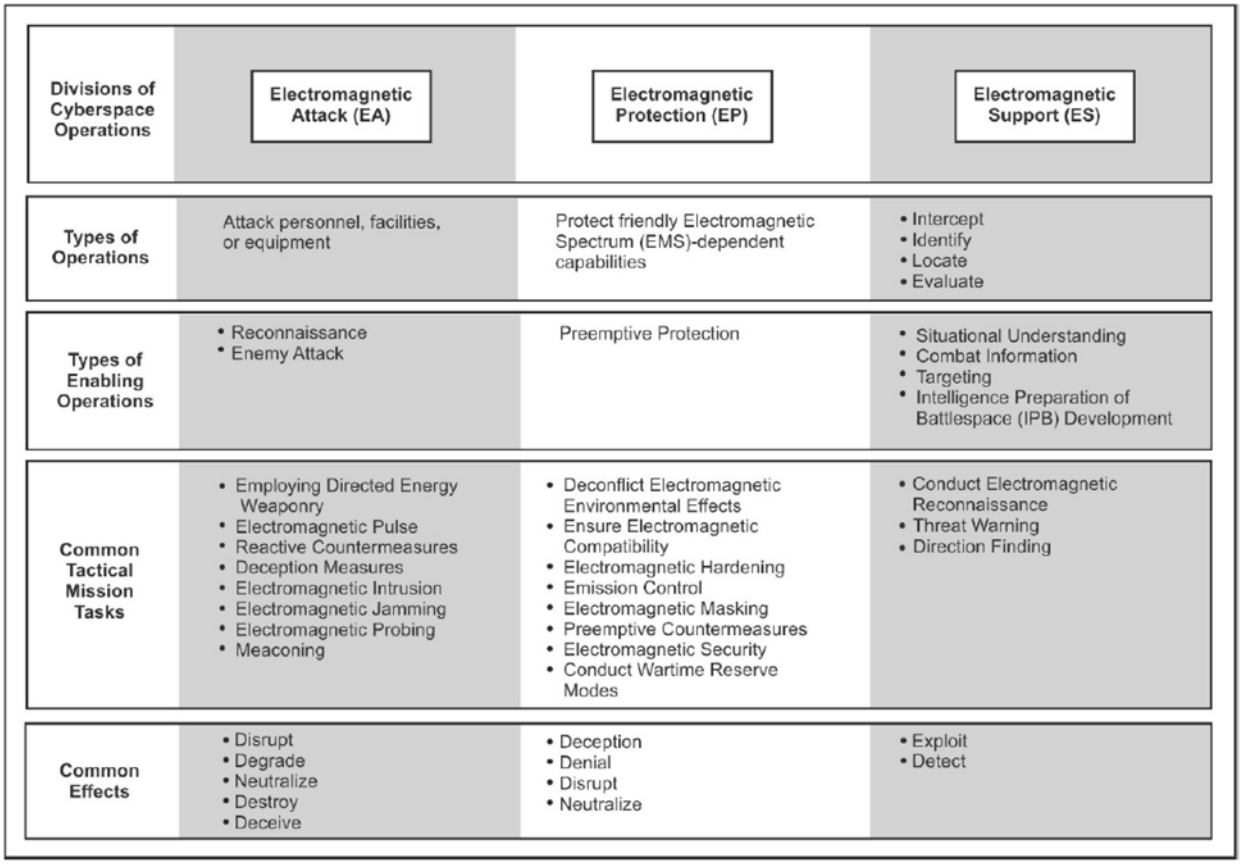


Figure 2-6. Electromagnetic warfare taxonomy

2-107. Electromagnetic attack is a division of electromagnetic warfare involving the use of electromagnetic energy, directed energy, or antiradiation weapons to attack personnel, facilities, or equipment with the intent of degrading, neutralizing, or destroying enemy combat capability and considered a form of fires (JP 3-85). Space EA utilizes EM energy that is normally directed into the space domain from a terrestrial source in order to affect a satellite in the orbital segment, or through the space domain where satellites conduct EA against other satellites.

2-108. EA against space-enabled capabilities in the terrestrial domains (ground, air, and maritime) are typically targeted at effecting—or jamming—the uplink or downlink signal. Uplink jamming attacks the link from a ground station or user to the satellite. In order for uplink jamming to be effective the jamming emitter must be within the uplink footprint of the target satellite, and transmit enough power so that the received power at the satellite is sufficient to affect (either disrupt or deny) the target signal. Downlink jamming attacks the link from the satellite to a ground station or user. In order for downlink jamming to be effective, the jamming emitter must be within line of sight and reception pattern of the receiver; and have sufficient power to

overpower the intended user's signal at the receiver. This is particularly difficult in the case of directional parabolic dishes used in most SATCOM applications in order to maximize gain.

2-109. Electromagnetic protection is the division of electromagnetic warfare involving actions taken to protect personnel, facilities, and equipment from any effects of friendly, neutral, or enemy use of the electromagnetic spectrum that degrade, neutralize, or destroy friendly combat capability (JP 3-85). EP measures eliminate or mitigate the negative impact resulting from friendly, neutral, enemy, or naturally occurring EMI (FM 3-12). For Army space capabilities, Space EP indicates any actions that ensure access to space through the EMS. Examples include increasing radiated power on a ground station emitter when receiving EMI over SATCOM in order to preserve a clear link, shielding a GPS receiver from sources of jamming by terrain- or body-masking, and encrypting or frequency-hopping SATCOM links in order to prevent adversary jamming effectiveness.

2-110. Electromagnetic support refers to the division of electromagnetic warfare involving actions tasked by, or under the direct control of, an operational commander to search for, intercept, identify, and locate or localize sources of intentional and unintentional radiated electromagnetic energy for immediate threat recognition, targeting, planning, and conduct of future operations (JP 3-85). Space ES is conducted from or through the space domain and operates much the same as ES within the terrestrial domains. This differs from SIGINT in that decryption of communications is an exclusively SIGINT function and may only be performed by SIGINT personnel operating under Director, National Security Agency and Chief, National Security Service SIGINT operational control (DODI O-3115.07).

2-111. Navigation warfare (NAVWAR) are the actions that maintain friendly use of positioning, navigation, and timing information while denying the same to an adversary (JP 3-14). NAVWAR includes a broad diversity of disciplines, is typically conducted through the EMS, and in these cases is a form of EW. NAVWAR is supported by, and can contain within it, all three forms of EW.

2-112. Army space professionals must seek coordination with Cyberspace and Electromagnetic Activity (CEMA), spectrum management, Information Operations, Joint EMS Operations (JEMSO), SIGINT, and other staff sections in order to successfully employ Space EW effects.

HIGH-ALTITUDE OPERATIONS

2-113. High-altitude platforms operate in the joint aerial layer network between 60,000 and 100,000 feet above mean sea level. These are not space assets, but payloads can provide similar capabilities to augment and complement space operations. High-altitude platforms are more responsive, in that they do not require nearly as much time and other resources to launch and can be operated by tactical formations.

2-114. High-altitude platforms provide rapidly deployable capabilities to tactical forces. Platforms include super-pressure balloons, zero-pressure balloons, long endurance fixed-wing aircraft, and dirigibles. Payloads may be configured to accommodate one or multiple missions and may be configured as requirements change and include transmitters, synthetic aperture radar, wide-area motion sensors, bi-static radar, peer-to-peer data links, and communications re-transmission or extensions.

2-115. High-altitude platforms give tactical commanders access to additional sensors for information collection and short-duration communications. Effective employment of such platforms relies heavily on accurate environmental data and analysis to determine the best launch locations to achieve desired effects. These platforms enable commanders to better understand the situation and make timely decisions when space-based or aerial reconnaissance assets are unavailable or ill-suited for the conditions of the OE. High-altitude platforms provide these advantages over space capabilities:

- Rapid launch and greater responsiveness to tactical commanders.
- Immediate feedback on conditions within the area of operations.
- Longer dwell times for imagers over specific points on the ground.
- Lower costs.
- Rapid extension of communications networks.

2-116. The disadvantages of employing high-altitude platforms include:

- The platform is at the whim of winds and other atmospheric conditions. It may not go where it needs to go.

- Payload power requirements and size dictate the size of the platform required to keep it aloft. Currently balloons and airships require less power to maintain station thereby offering more power for payloads. Large balloons and airships can lift heavier payloads than current fixed wing platforms.
- Certain platforms require sustainment capability not readily available.
- Payloads carried by balloons require real-time backhaul and will most likely not be recovered and reconstituted.

SECTION III – ARMY SPACE OPERATIONS ACROSS THE COMPETITION CONTINUUM

2-117. The Army may experience the competition continuum differently within each of the domains or geographic locations. For example, the Army may experience higher competition to the point of crisis in the space and cyber domains while experiencing lower levels of competition in the land, maritime, and air domains. Due to the global nature of space operations and peer competitors, the Army may experience competition, crisis, and armed conflict simultaneously based on an event's geographic location.

2-118. The success of space operations—and of operations in general—depends on proactive deliberate planning and preparation during competition to posture and prepare for a seamless transition into conflict, and back to competition when possible. Deliberate planning provides additional flexible deterrent options below the level of armed conflict and enables dynamic execution of space operations in and out of conflict in support of commanders' objectives.

2-119. Intelligence drives operations, and space operations are no exception. Effective Army space operations depend on intelligence support in competition to:

- Identify, develop, vet, and nominate targets.
- Develop the electromagnetic order of battle and space order of battle for relevant and efficient use of space effects.
- Re-validate and refresh target characteristics keeping legal targets from going stale.
- Develop and assess measures of performance and measures of effectiveness.
- Enable battle damage assessments.
- Identify adversary offensive and defensive space doctrine and TTPs.
- Identify potential adversary vulnerabilities for targeting or exploitation.
- Characterize and attribute activity in the space domain to relevant land domain military targets.

2-120. Conversely, as outlined in Chapter 1, space operations enable effective intelligence operations.

COMPETITION BELOW ARMED CONFLICT

2-121. Competition below armed conflict occurs when an adversary's national interests are incompatible with U.S. interests, and that adversary is willing to actively pursue them short of open armed conflict. By its nature, the space domain provides state and non-state actors with opportunities to employ their own instruments of national power to satisfy their strategic and operational objectives without escalating to armed conflict in other domains. While international norms prohibit weaponization of space capabilities, these norms remain ambiguous and only eventuate if actors are willing to enforce them. Considerations for proportionality, military necessity, discrimination, and humanity apply equally to the space domain as to operations elsewhere.

2-122. Operations during competition are intended to deter malign adversary action, set conditions for armed conflict on favorable terms when deterrence fails, and shape an operational environment with unified action partners in ways that support U.S. strategic interests and policy aims. Theater armies support combatant commanders (CCDRs) as they conduct operations to deter adversaries and achieve national objectives. Their operations, conducted as part of a combatant command campaign plan, are conducted over time and across broad areas without armed conflict. Army forces contribute to conventional deterrence during competition by preparing for armed conflict, including large-scale combat operations. Preparation for combat operations and demonstrating the interoperability of the U.S. joint force with unified action partners presents the strongest deterrence to adversaries. See FM 3-0 for more on operations during competition.

2-123. During competition, Army space forces posture appropriately to support the theater army to which they are assigned. Army space professionals conduct IPOE iteratively, updating threat assessments and operation plans and orders as necessary. They make recommendations to their commanders for adjustments to *force tailoring*, the process of determining the right mix of forces and the sequence of their deployment in support of a JFC (ADP 3-0). To prepare for crisis and conflict, they identify and coordinate for planned effects from and through the space domain for which proper authorities require lengthy deconfliction and approval times. Army space professionals participate in Army and joint targeting to identify and nominate targets applicable in each of the strategic contexts.

2-124. Engagement criteria are critical elements of planning. A National Command Authority or authorized delegate issues engagement criteria directives to delineate the circumstances and limitations under which U.S. space forces initiate and continue combat engagements with enemy forces. CJCSI 3121.01B, provides fundamental policies and procedures governing the actions of commanders and Soldiers during all military operations.

2-125. Procedurally, all weapon systems have engagement criteria which must be met before the weapon system can be permitted to engage a target. A designated authority—typically the unit commander—grants permission to engage a target in accordance with established guidance or the rules of engagement if the authority is delegated to that level of command. The specific procedures to permit a weapon system to engage its target is unique to each weapon system. As Army operations transition from competition to crisis and to armed conflict, authorities to conduct specific activities and tasks may expand. Although authorization is centralized, effective engagement requires decentralized execution for weapon release.

CRISIS

2-126. A crisis may be the result of adversary actions or indicators of imminent action, or it may be the result of natural or human disasters. During a crisis, opponents are not yet using lethal force as the primary means for achieving their objectives, but the situation potentially requires a rapid response by forces prepared to fight to deter further aggression. When directed, the Army provides a JFC with capabilities to help deter further provocation and sufficient combat power to maintain or reestablish conventional deterrence.

2-127. Regardless of the capabilities employed, there are generally two broad outcomes from a crisis. Either deterrence is maintained, and de-escalation occurs, or armed conflict begins. While this requires that Army forces be prepared for either type of transition, forces deploying during crisis always assume they are deploying to fight. Commanders ensure that space operations do not unintentionally escalate the situation nor cause the perception of escalation. Commanders can leverage space capabilities in several ways to de-escalate a crisis, to include:

- Space-based sensors provide accurate composition and disposition of threat forces which can be used for strategic messaging to undermine the threat's credibility or to support enforcement of sanctions and demarcations.
- Space-based sensors provide the ability to monitor mass migrations of displaced persons and aids in assessments of civilian infrastructure.
- Space control can be used to disrupt threat networks and media or to demonstrate such capability as a deterrent.

ARMED CONFLICT

2-128. Armed conflict encompasses the conditions of a strategic relationship in which opponents use lethal force as the primary means for achieving objectives and imposing their will on the other. The employment of lethal force is the defining characteristic of armed conflict, and it is the primary function of the Army. Lethality's immediate effect is in the physical dimension—reducing the enemy's capability and capacity to fight. However, the utility of lethal force extends into the information and human dimensions where it, along with the other instruments of national power, influences enemy behavior, decision making, and the will to fight.

2-129. The characteristics of large-scale combat operations vary based on the enemy and many other factors. When fighting against a less capable enemy, the U.S. joint force may have significant advantages in most domains. The principal concerns during such operations include how to win rapidly at minimal cost, consolidate gains, and transition responsibility for an area to legitimate authorities. When fighting against a

peer enemy, able to contest the joint force in all domains, the operational environment becomes much more difficult. Integrated air defense and long-range fires systems; cyberspace and electromagnetic warfare capabilities; chemical, biological, radiological, and nuclear (CBRN) capabilities; and global reconnaissance and surveillance networks can create parity or significant enemy advantages in one or more domains, particularly early during a conflict and when operating close to its own borders. To succeed, the U.S. joint force must create its own relative advantages, preserve combat power, and rapidly exploit what opportunities it creates. Commanders must assume risk to create opportunity and sequence their operations because they cannot defeat enemy forces in a single decisive battle.

2-130. Army space forces support all phases of operations by identifying and exploiting positions of relative advantage, bringing to bear the full complement of Army and joint space capabilities and effects in large-scale combat while mitigating vulnerabilities to space systems.

SECTION IV – OTHER CONSIDERATIONS

MULTINATIONAL OPERATIONS

2-131. Army space forces conduct the planning, coordination, integration, and synchronization of space capabilities and effects across all functions within multinational operations from the land domain. While joint and multinational forces can complete their assigned mission in a D3SOE, these forces are more agile and efficient when using space capabilities to their fullest ability.

2-132. Army space duties and responsibilities support multinational ground forces through the use and exploitation of joint space capabilities. The joint space capabilities that multinational ground forces benefit from include:

- SDA.
- Offensive and Defensive Space Operations.
- PNT.
- Space-based collection
- SATCOM.
- Environmental monitoring.
- Missile warning based on detection of high-energy infrared (heat) events.

2-133. Many space-enabled or space-enhanced tasks and activities are not codified in joint doctrine specifically as space capabilities. Instead, they are combined, derived, or listed as second-order tasks and actions enabled by space capabilities. These include, but are not limited to—

- Information advantage—supported by the information acquired through space capabilities.
- Joint friendly force tracking—supported by PNT and SATCOM (when mission dictates).
- Network transport of data.
- Commercial imagery.
- National Reconnaissance Office overhead systems.
- Tactical exploitation of national capabilities (known as TENCAP) program that uses all joint space capabilities.
- National-to-theater program interfaces.
- Geospatial intelligence.
- Integrated broadcast service.
- Common interactive broadcast.

2-134. Many integrated space operations exist among the many multinational forces. Each space operation is based on its own national priorities, funding, laws, and technology implementation. Sharing capabilities provides increased effectiveness, resilience, and flexibility to space operations and complicates an adversary's decision making. The most frequently used space capabilities pertain to weather, PNT, SATCOM, missile warning, and space situational awareness.

2-135. The multinational force commander understands ground forces rely on space-based capabilities for success in multinational operations. Army space professionals enable and enhance operations when involved in planning and execution. Space planning and coordination with multinational forces occurs with Army space

professionals attached at the corps and division levels. These professionals provide expertise, advice, and planning to the commander on space-related issues that directly affect multinational operations. Space-based capabilities enhance awareness of deliberate interference activities such as attempts to jam or spoof friendly communications.

2-136. Multinational operations present many opportunities. Unified action partners often operate with different authorities to employ key capabilities in space, cyberspace, and the information dimension of an operational environment. Multinational partners bring additional forces to an operation and may possess capabilities U.S. Army forces lack. Army space forces make themselves cognizant of the different authorities and capabilities of unified action partners to leverage opportunities during planning and integration. See FM 3-16 for more on multinational operations.

INFORMATION ADVANTAGE

2-137. Space operations support information advantage by enabling friendly decision making, protecting friendly information systems, and enhancing information warfare. Information acquired through space capabilities is used by every Army warfighting function to accelerate decision making and compress enemy reaction times. All Army and joint space forces proactively work to provide assured access to space capabilities to ensure the flow of information is readily available.

2-138. During competition, crisis, and armed conflict, friendly forces may achieve information dominance due to threat actions. In these times, Army space forces leverage space capabilities to open windows of opportunity and temporarily establish the information advantage for critical operations. The primary space capabilities providing effects used by Soldiers and systems to support information advantage are SATCOM, PNT, space control, and SDA.

2-139. Information acquired through space capabilities and products compiled as part of SDA presents a larger view of the actions occurring in and passing through the space domain. This information can be of great importance to the staff. Commanders and staffs understand joint, partner nation, and threat space systems strengths, weaknesses, and limitations when considering the impacts of information acquired through space capabilities and how this supports information advantage.

2-140. Information acquired through space capabilities contributes to the IPOE and supports information advantage by identifying potential threats and initializing mitigation options available to both friendly and neutral forces in a timely manner. Understanding how a threat uses information to its advantage is just as critical as understanding how Army and joint forces operate. A key to understanding how a threat uses information is knowing what offensive and defensive space capabilities they may have access to, and the likelihood of conducting offensive and defensive space operations. It is equally vital to know what friendly space capabilities may be targeted as part of the enemy offensive and defensive space strategy. Targets may include ground control stations, transmission gateways, data links, cyber-attacks on the satellites' data and links, or direct attack on a satellite.

2-141. Complicating military operations are those operations dependent on the EMS. The EMS is congested and military operations using the EMS are contested. This creates both opportunities and vulnerabilities requiring diligence to ensure operations are not compromised. Military forces need assured access to and use of the EMS, which is a significant driver of information advantage. Army and joint forces use space capabilities to deliver information to all forces across all domains via the EMS. The threat to Army and joint operations from a contested EMS creates potential force-wide vulnerabilities to information which makes contesting space capabilities attractive to threats. A contested EMS may result in a D3SOE and have significant impacts on information flow, thereby eroding information advantage.

2-142. Critical to gaining and maintaining information advantage, Army forces are prepared to defend against threats to space capabilities. Active defense of space capabilities includes the employment of NAVWAR, offensive space operations, and counterattacks to deny the enemy from creating a contested area of operation or position of advantage. Many offensive and defensive space activates are focused on overcoming enemy efforts to target information acquired through space capabilities. Efforts may include electromagnetic jamming, spoofing, meaconing, deception, and denial of service activities; as well as physical destruction or sabotage of ground-based and on-orbit space assets. ***Meaconing*** **is the interception, duplication, and rebroadcasting of navigation signals intended to confuse and disrupt adversary navigation systems.**

TRAINING THE ARMY FOR A D3SOE

2-143. Army space forces prepare for large-scale combat operations by planning, executing, and assessing training under realistic conditions. They advise commanders on training plans in line with the Army Space Training Strategy. The Army Space Training Strategy describes the ends, ways, and means to train for a D3SOE in both operational and institutional organizations. These apply to home station training, combat training center rotations, and professional military education. Wherever possible, units and Soldiers train under the same conditions they would experience in large-scale combat operations, capture observations, develop TTPs, and modify standard operating procedures.

2-144. Commanders leverage available live, virtual, and constructive training environments to train and assess their units under varying conditions. Commanders also use appropriate training aids, devices, simulators, and simulations (known as TADSS) to replicate realistic conditions and effects.

Note. See Army Space Knowledge and Missile Defense Education website at https://askme.army.mil for information on space training and resources. This website is for Common Access Card holders only.

Chapter 3
Army Space Forces

This chapter discusses the C2 of space forces, describes Army space units, and discusses the role of Army space professionals in Army units.

SECTION I – COMMAND AND CONTROL OF SPACE OPERATIONS

UNITED STATES SPACE COMMAND

3-1. The Unified Command Plan establishes U.S. Space Command (USSPACECOM) as a unified combatant command with an AOR surrounding Earth at altitudes equal to or greater than 100 kilometers above mean sea level, an astrographic boundary that is adjacent to every other AOR.

3-2. USSPACECOM is responsible for executing day-to-day, integrated joint space operations to deliver theater and global effects in support of national and CCDR objectives. They coordinate space operational-level planning, integration, and coordination to ensure unity of effort in support of military and national security operations and support to civil authorities. Commander, USSPACECOM (CDRUSSPACECOM) executes taskings for space operations through the Combined Space Operations Center.

3-3. 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, and DOD assets. Along with securing and defending U.S. and, as directed, allied, partner, and commercial critical space operational capabilities, CDRUSSPACECOM has additional responsibilities outlined below. Refer to JP 3-14, Chapter II, for more information on these responsibilities and other C2 considerations.

- Global Sensor Manager.
- Global SATCOM Operations Manager.
- Transregional Missile Defense.
- Space Joint Force Provider.

3-4. Due to the nature of space assets, changes to satellite tasking in support of one theater can affect other theaters. Therefore, day-to-day C2 and satellite control is accomplished from a strategic perspective rather than a theater perspective. CDRUSSPACECOM is responsible for conducting joint space operations and coordinating and conducting space planning through the joint planning process in support of the national military strategy. CDRUSSPACECOM assigns appropriate command relationships for space operations to the component commanders; components maintain this strategic perspective in their space planning and operations.

3-5. Subordinate 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 an order approved by the Secretary of Defense. 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.

3-6. For information on additional space support related to the joint force, see JP 3-14, Appendix A.

ARMY SPACE PROPONENT

3-7. AR 5-22 establishes policies, duties, responsibilities, and relationships applicable to the Army Force Modernization Proponent System. It establishes U.S. Army Space and Missile Defense Command (USASMDC) as the Center of Excellence force modernization proponent with primary duties and responsibilities to provide and integrate doctrine, organization, training, materiel, leadership and education,

personnel, facilities, and policy (DOTMLPF-P) requirements for space and high-altitude capabilities. It also designates the Commanding General (CG), USASMDC as the specified proponent for space and high-altitude capabilities and global ballistic missile defense.

3-8. United States Army Space and Missile Defense Command is the Army force provider designated as:

- The Army Service Component Command (ASCC) to USSPACECOM for space operations.
- The Army representative to identify and advocate for PNT and NAVWAR requirements to the Joint Staff.
- The proponent for Army space and high-altitude operations and global ballistic missile defense.

3-9. CG, USASMDC:

- Exercises operational and administrative control over assigned Army space forces supporting other combatant commands unless otherwise specified.
- Is the personnel developer for Army space operations officers per AR 600-3.
- Is the lead agent for establishing and implementing training and education for Army space forces, executed by the Commandant of Space and Missile Defense.

3-10. The Army space proponent fulfills the following responsibilities:

- Provide Army space transformation solutions.
- Support Army Futures Command experimentation, research & development.
- Conducts mission-related research and development in support of Army strategic, operational, and tactical missions.
- Institutionally train and qualify Army space professionals.
- Ensure space capabilities and effects are optimized to meet the commander's intent.
- Operate and maintain the Army's Space Operations School.
- Oversee institutional level training for new space operations professionals.
- Conduct mission qualification training for Army space systems.
- Educate and train Soldiers at all levels across the total Army on space capabilities and mitigation procedures for operating in a D3SOE.

SECTION II – ARMY SPACE UNITS

3-11. Army space forces consist of designated Army space units employing a number of capabilities under the context of the Army space mission areas and those Army space professionals assigned to other Army units who possess the requisite expertise on the space domain and Army and joint space capabilities.

THE 1ST SPACE BRIGADE

3-12. The 1st Space Brigade is the Army's only space brigade. It consists of a multicomponent brigade headquarters, the 1st Space Battalion (Regular Army), and the 2nd Space Battalion (Army Reserve), and it performs training and readiness oversight of the 117th Space Support Battalion of the Colorado Army National Guard. The 1st Space Brigade provides trained and ready space forces to conduct continuous space support, space situational awareness, and space control planning in support of USSPACECOM and the other combatant commands, U.S. government agencies, and international partners.

3-13. The 1st Space Battalion consists of a space control support company, two space control companies (SCCs), and a missile defense service battery (MDSB). The space control support company mans, trains, and equips seven space control planning teams (SCPTs) to support USSPACECOM. Traditionally each SCPT is regionally aligned to a combatant command (CCMD). The MDSB provides missile defense service augmentation during heightened periods of interest. The two SCCs provide space situational awareness and are presented to USSPACECOM, to be deployed in support of operations, as needed.

3-14. The 2nd Space Battalion consists of three Army space support companies and two SCCs. The space support companies man, train, and equip five each Army space support teams (ARSSTs), who plan, integrate, synchronize and execute space situational awareness and space and technical operations support. The SCCs perform the same function as the SCCs in 1st Space Battalion.

3-15. The 117th Space Support Battalion consists of two space support companies providing six ARSSTs each.

ARMY SPACE SUPPORT TEAMS

3-16. The ARSSTs are low-density, high-demand deployable teams consisting of two Army space operations officers and four enlisted Army space professionals. An ARSST's primary function is to integrate with a unit's staff to provide space planning expertise, capabilities, products, and awareness. ARSSTs exist strictly in the Army National Guard and Army Reserve; as such, planners must account for mobilization timelines when requesting forces.

3-17. When employed, ARSSTs typically work for a unit's organic Space Support Element (SSE) but can be task organized to other special or coordinating staff sections. ARSSTs provide space operations-related support and products to the staff in support of the SSE. In the absence of an SSE, the ARSST assumes the roles and responsibilities of the SSE. ARSSTs may also augment space operations officers at echelon who are not part of an SSE.

3-18. An ARSST integrates space capabilities into Army divisions and corps, joint task forces, Marine Expeditionary Forces, theater sustainment commands, and ASCC headquarters, when requested. ARSSTs provide expertise and produce timely and relevant analysis, significantly contributing to the intelligence and operations processes across the competition continuum. The commander who receives an ARSST may detach one or more members of the team to support another staff section or unit in a dispersed location.

3-19. ARSST members typically retain high-level security clearances. When they require access to IJSTO and special access programs, the gaining command executes the appropriate procedures to grant access.

SPACE CONTROL PLANNING TEAMS

3-20. SCPTs plan, integrate, and synchronize space control effects into the planning and targeting processes of Army and joint force headquarters. They provide expertise on space control capabilities, coordinating effects, timing, and tempo through the competition continuum. SCPTs coordinate for effects at all levels of warfare but primarily at the theater strategic and operational levels. SCPTs use approved, designated communications equipment, mission command systems, tools, and transportation capability provided by the supported command to support planning and targeting. The teams are comprised of two space operations officers and two space professionals—a warrant officer and a noncommissioned officer from the intelligence branch. Refer to ATP 3-14.1 for more on space control. The responsibilities of an SCPT are:

- Support IJSTO planning.
- Provide space support to the Army and joint targeting processes.
- Conduct space control planning and synchronization.
- Coordinate for Army and joint space control effects.

3-21. SCPTs reside in the 1st Space Brigade. The brigade presents the seven SCPTs to USSPACECOM who then deploys them in a supporting relationship with other combatant commands. They are typically geographically aligned to a specific combatant command prior to deployment to build necessary partnerships and gain situational understanding.

SPACE CONTROL PLANNING SECTIONS

3-22. Space Control Planning Sections (SCPSs) reside in the Multi-Domain Task Force (MDTF). The SCPSs support the MDTF commander's objectives or those of the theater in which they are employed. The SCPSs provide an organic space support planning capability and consist of space control personnel. The SCPSs integrates space capabilities and SSA into operations and serves as an advisor to the staff members on adversary, neutral, and friendly space control capabilities and limitations. The SCPS is the conduit between the staff, higher headquarters, and external space support agencies for all space control related activities.

SPACE CONTROL COMPANY

3-23. The SCC is the Army's unit of action for space control. It consists of the company headquarters, an operations section, and three space control platoons. The operations section assists the company commander with crew training, qualification, and site surveys and is prepared to serve as the coordination element for

space control operations as directed by higher headquarters. The platoons operate under the C2 of the company headquarters but may be task organized to other commands, though this is not ideal. Refer to ATP 3-14.1 for more on space control.

3-24. SCCs exist organically in the 1st Space Brigade, MDTFs (within the Multi-Domain Effects Battalion, or MDEB), and in ARSTRUC approved Theater Strike Effects Group formations. As with SCPTs, whom and how each SCC supports depends on the organization to which they belong.

SECTION III – ARMY SPACE PROFESSIONALS

3-25. Army space professionals are those personnel educated on the fundamentals of, and capabilities provided by, the space domain. These professionals assure continuous access to space capabilities and deliver effects supporting offensive, defensive, and stability operations when necessary. Army space professionals include Army space operations officers, and officers and enlisted Soldiers from various branches, and Department of the Army Civilians, who are either assigned to Army space units or serve as members of units and staffs at echelon.

ARMY SPACE OPERATIONS OFFICERS

3-26. Army space operations officers belong to a cohort of officers in the space operations functional area (FA 40) who commissioned into the Army as members of the various Army branches. Army space operations officers complete institutional certification and are assigned to USASMDC; the 1st Space Brigade; the MDTFs; theater armies, corps, and divisions; field artillery brigades; special forces groups; combat training centers; Centers of Excellence and Army University; the Army staff; and various joint and national agencies.

3-27. A space operations officer's primary responsibilities include all expectations for Army officership whether leading space units or serving as staff officers, coupled with expertise in the space domain. A space operations officer builds strong, cohesive teams up, down, and across echelons and leverages the ability to think critically and creatively to solve problems and achieve objectives.

3-28. Most Army space operations officers not assigned to Army space units serve as special staff officers in Army headquarters. Army space operations officers perform the following tasks:

- Lead small teams or command space units effectively.
- Be the subject matter expert on the space domain and the space mission areas.
- Advise commanders and staffs during planning on the capabilities, constraints, limitations, considerations, and effects of space operations and the space domain.
- Participate in, and, in some cases, lead, the operations process. See ADP 5-0.
- Know and understand Troop Leading Procedures, the Army Design Methodology, the Military Decision-Making Process (commonly known as MDMP), Operational Design, and the Joint Planning Process. See FM 5-0 and JP 5-0.
- Maintain the space running estimate (or staff estimate) and write Annex N to the operation order or plan (or Appendix 18 to Annex C for a joint order).
- Enforce appropriate handling of classified materials and information.
- In conjunction with legal counsel, advise commanders on space-related legal authority and rules of engagement. Coordinate with higher echelons to obtain additional necessary authorities.
- Collaborate routinely with staffs and space operations officers at higher and lower echelons and in adjacent units.
- Use software such as the GPS Interference and Navigation Tool (known as GIANT) and Integrated Space Situational Awareness (known as ISSA) to model the OE.
- Plan, coordinate, synchronize, and deconflict space operations.
- Maintain SDA and update the COP as needed.
- Participate in information collection planning and targeting.
- Participate in development of the critical asset and defended asset lists.
- Support and perform Army-related IJSTO duties and responsibilities, as required.
- Request space capabilities and effects supporting the commander's intent to achieve the desired end state.

- Plan and coordinate effective training for a D3SOE for the unit and its subordinate formations, as applicable.
- Plan and coordinate special technical operations (STO) and IJSTO, when applicable.
- Track and report the operational readiness rate for organic and attached space capabilities.
- Coordinate with Joint Integrated Space Teams (known as JISTs) as necessary.
- Coordinate and submit space support requests, when applicable.
- Understand and apply Army and joint doctrine, where applicable.
- Execute assigned tasks, understand the challenges facing the unit, and offer recommendations and develop solutions. Be a team player.

Note. See FM 6-0 for more details on staff roles. See ATP 3-14.3 for techniques.

3-29. Army space professionals typically require access to sensitive compartmented information facilities and dedicated access to appropriate classified networks to plan for space operations and effects throughout the competition continuum regardless of whether the unit is at home station or deployed forward in theater.

ARMY SPACE SUPPORT ELEMENTS

3-30. An Army space support element (SSE) serves as an integral part of Army headquarters. An SSE coordinates directly with other space staffs for space support requests. All SSEs include at least one Army space operations officer (and as many as five) and a complement of intelligence or signal Noncommissioned Officers, depending on the echelon, type of unit, and task organization. (Some headquarters include an Army space operations officer in the STO section.) SSEs are organic to all theater Armies, corps, divisions, ARSOF headquarters, and certain functional brigades (discussed below), typically assigned to the deputy chief of staff, operations (G-3) or S-3. SSEs participate in their units' staff processes to optimize the use of space capabilities, bringing to bear the full range of effects supporting all warfighting functions. See FM 3-0 for discussions of the roles of theater Armies, corps, and divisions in each of the Army strategic contexts.

3-31. The SSE performs most of the tasks outlined in paragraph 3-28 above, along with any other assigned tasks. As a special staff section, the SSE helps commanders and other staff members perform their functional responsibilities. For example, the G-2 is the primary for intelligence operations, so the SSE provides space expertise to the G-2. The SSE maintains contact and collaboration with higher, adjacent, and subordinate unit SSEs, ARSSTs, and SCPTs. SSEs also engage with other teams such as national intelligence support teams and other Service space forces.

3-32. When the number of subordinate echelons or the scope and pace of operations exceeds the capacity of the SSE to provide effective support, the SSE may request augmentation with an ARSST.

3-33. The senior space operations officer from the SSE may be designated as the command's IJSTO chief if there is no space operations officer already assigned. If directed to fill the IJSTO position, that individual manages the billets for the command and maintains oversight of IJSTO planning, requests, exercises, operations, and inspections. The chief ensures all IJSTO security requirements are met. The responsibilities of IJSTO require specific training prior to assumption of these duties.

ARMY SPECIAL OPERATIONS FORCES

3-34. ARSOF conduct operational preparation of the environment in competition and focus on the operational and strategic deep areas during large-scale combat operations. Army space professionals assigned to Special Forces Groups and other ARSOF commands provide space support to ARSOF while coordinating assets used by conventional forces.

FIELD ARTILLERY BRIGADE

3-35. The field artillery brigade's primary tasks are conducting corps-level strike operations and augmenting division level shaping operations. A company grade space operations officer may be assigned under the brigade operations staff officer (S-3) to advise the commander on Army space capabilities and effects. The brigade space operations officer integrates with each staff section as appropriate and supports the operations process with relevant space equities

3-36. The brigade space operations officer conducts operational planning in coordination with the division SSE (and ARSST when attached) and educates the brigade and supported units on space capabilities. Examples of how the brigade space operations officer may support the brigade include, but are not limited to:

- Providing GPS status and accuracy of PNT for planning and execution to support fires and targeting.
- Educate forces on how GPS receivers work and the importance of encryption.
- In collaboration with the intelligence section, support the information collection plan.

Chapter 4

Army Space in the Operations Process

The operations process describes the activities performed by any military unit to accomplish a mission. This chapter discusses how space operations are incorporated into the operations process. It also presents considerations for the steps of intelligence preparation of the operational environment.

SECTION I – OVERVIEW OF THE OPERATIONS PROCESS

4-1. The Army's framework for organizing and putting command and control into action is the *operations process*—the major command and control activities performed during operations: planning, preparing, executing, and continuously assessing the operation (ADP 5-0).

4-2. The commander's role in the operations process is to drive the operations process through the activities of understanding, visualizing, describing, directing, leading, and assessing operations as described in ADP 5-0. The staff's role is to assist commanders with understanding situations, making and implementing decisions, controlling operations, and assessing progress. In addition, the staff assists subordinate units (commanders and staffs) and keeps units and organizations outside the headquarters informed throughout the conduct of operations.

4-3. Army space professionals on staffs ensure they actively participate in functional and integrating cells within the unit's command posts throughout the operations process. They position themselves in command posts where they can most effectively plan and assess current operations. This can be challenging for SSEs, as personnel and time are limited, so the senior Army space operations officer determines the priority based on guidance from the Chief of Staff or Executive Officer. For more on command post organization, see FM 6-0.

PLANNING FOR ARMY SPACE OPERATIONS

4-4. *Planning* is the art and science of understanding a situation, envisioning a desired future, and determining effective ways to bring that future about (ADP 5-0). Planning is one of the four major activities of C2 that occurs during the operations process. Commanders apply the art of command and the science of control to ensure space operations support the concept of operations. Planning and plans help leaders understand the situation and develop solutions to problems; task-organize the force and prioritize efforts; direct, coordinate, and synchronize action; and anticipate events and adapt to changing circumstances. Commanders and staffs leverage all available capabilities to better understand the situation and inform decision making.

> The Army space operations officer ensures space capabilities and effects are fully planned and integrated into operations and advises the commander and staff on the space operational environment.

4-5. Analysis is the process of studying a situation by successively dividing it into parts and addressing each part in turn. Synthesis is thinking about how the parts of a situation work together as a whole rather than in isolation. As a key member in planning, Army space operations officers analyze the situation with respect to the space domain, then synthesize that analysis to make sense of the situation. Through planning, Army space professionals assist leaders in identifying problems and developing solutions to solve or manage those problems.

4-6. Because the space domain casts a wide span of influence on the other domains, Army space operations officers aggressively participate in planning, collaborating early and often with all other staff elements. Army space operations officers understand and adhere to commanders' planning guidance and intent, offering recommendations as appropriate. As the subject matter experts on the space domain, Army space operations officers often interact directly with the commander, chief of staff/executive officer, or G-3/S-3, and they

provide cogent recommendations for solutions, task organization of assigned or attached space forces, and prioritization.

4-7. Some space capabilities require long lead times to properly coordinate and integrate into operations. Army space operations officers anticipate the potential for such capabilities and their effects and begin coordination as early as possible. It is a delicate balance between anticipating realistic future requirements and forecasting too far into the future. Often this coordination continues into execution. Army space professionals collaborate often with their counterparts up and down echelons, in adjacent units, and with joint space forces to streamline this process as much as possible. They adapt quickly to changing conditions and build flexibility into the plan by generating and refining multiple options for effects and evaluating those options realistically during wargaming. They understand where their units fall in the strategic and operational frameworks and how the planning horizon adjusts accordingly.

4-8. When planning, Army space professionals focus on achieving desired effects, not on the mechanisms to deliver the effects. When considering effects in and through the space domain, Army space professionals recognize that the best capability to employ may not be a space capability. Often effects against threat space capabilities originate in the other domains.

4-9. Army space operations officers develop the concept and scheme of space operations, ensuring they nest appropriately within the overall concept of the operation and support the schemes of the warfighting functions as necessary. They consider the impacts of space operations on each warfighting function.

4-10. Army space operations officers know and understand each of the planning methodologies below.

- Army design methodology.
- The military decision-making process.
- Troop leading procedures.
- Rapid decision making and synchronization process.
- Army problem solving.
- Joint planning process.

RUNNING ESTIMATE

4-11. A *running estimate* is the continuous assessment of the current situation used to determine if the current operation is proceeding according to the commander's intent and if planned future operations are supportable (ADP 5-0). The importance of the running estimate (referred to as "staff estimate" in joint doctrine) cannot be overstated. It is the staff officer's foundation for all other activities and includes timely analysis and assessments. Army space operations officers on staffs routinely update their running estimates, especially as conditions change or new information arises, throughout the operations process. Running estimates always include recommendations for current and anticipated decisions affecting employment of space capabilities, impact on friendly space-reliant capabilities, and desired outcomes.

4-12. The space running estimate identifies the means to conduct space effects, tracking, and assessment throughout the battle. The space running estimate provides information to support plans and tactics for the protection of space capabilities and identifies enemy countermeasures. The running estimate also includes the current operational status, location, and priority of Army space systems assigned to the unit and identifies those capable of supporting operations. New facts and assumptions are included in the running estimate as the situation changes and the operation proceeds.

4-13. New facts and assumptions can modify or reshape conclusions and recommendations for the commander in terms of how space capabilities influence and impact the mission. For echelons below division, units rely on the higher command's SSE to provide the space running estimate. Army space professionals do not prepare the space running estimate in isolation but rather in concert with other staff elements. See Appendix B for a sample format for a running estimate.

SPACE SUPPORT REQUEST

4-14. SSEs process and submit space support requests (SSRs) through the appropriate channels when requesting effects from capabilities not organic to their unit. SSRs fall within three categories: preplanned, preplanned on-call, and immediate.

4-15. The CCDR or joint functional space component command (JFSCC) develops and provides a prioritized list of space support requests based on joint force objectives. Examples of typical space support requests include:

- Requests for specific capabilities, such as support to personnel recovery or tailored PNT for a specific mission.
- Requests for space forces, such as deployed space forces.
- Requests for implementation of specific command relationships.

4-16. SSEs add as much detail as possible to the SSR, ensuring to follow-up with the request periodically to track its status. If the SSR is approved, the requested effect is created and delivered. See Appendix C for an example of a space support request.

PREPARING FOR ARMY SPACE OPERATIONS

4-17. *Preparation* consists of those activities performed by units and Soldiers to improve their ability to execute an operation (ADP 5-0). Preparation creates conditions that improve friendly forces' opportunities for success and include activities such as rehearsals, training, and inspections. It requires commander, staff, unit, and Soldier actions to ensure the force is ready to execute operations. Preparation helps the force transition from planning to execution. Preparation normally begins during planning and continues into execution by uncommitted units.

4-18. During preparation, leaders and units improve situational understanding, develop a common understanding of the plan, train and become proficient on critical tasks, task-organize and integrate the force, and ensure forces and resources are positioned.

4-19. Army space professionals on staffs continue analyzing the OE, including gathering data from on-going information collection. They validate any assumptions made during planning and update running estimates and the rest of the staff with facts or new assumptions, recommending any necessary refinements to the plan. They participate in rehearsals, checks, and inspections as required to ensure common understanding of the plan. Army space forces oversee and conduct any additional training (collective and individual) and rehearsals required for critical tasks that may be performed during the operation. SSEs oversee any changes to task organization of space forces and ensure proper reception and integration of new forces into the unit. They also ensure assigned or attached space forces and requisite sustainment and networks are in the right places at the right times with the right resources. See ADP 5-0 for more preparation activities.

EXECUTING ARMY SPACE OPERATIONS

4-20. *Execution* is the act of putting a plan into action by applying combat power to accomplish the mission and adjusting operations based on changes in the situation (ADP 5-0). In execution, commanders, staffs, and subordinate commanders focus their efforts on translating decisions into actions. They direct action to apply combat power at decisive points and times to achieve objectives and accomplish missions. Inherent in execution is deciding whether to execute planned actions.

4-21. During execution, Army space forces fight the enemy, adapting to rapidly changing conditions. They seek to seize and retain the initiative wherever possible; build and maintain momentum or set conditions for the rest of the force to do so; and exploit success while consolidating gains to enable freedom of action in all domains. They look for opportunities on which to capitalize success and exploit threat vulnerabilities without desynchronizing the operation. Army space professionals on staffs assess battle damage and effects, providing recommendations for decisions to employ or commit additional space capabilities or redirect current forces to other efforts.

4-22. While conducting operations, staff sections focus on how their section may influence the battle. They attend all applicable boards, working groups, and planning teams necessary to effectively support operations. Space operations officers are proactive and adaptive to find solutions to expected and unexpected problems. They provide expertise in all space capabilities and are involved in current and future operations.

ASSESSING SPACE OPERATIONS

4-23. *Assessment* is the determination of the progress toward accomplishing a task, creating a condition, or achieving an objective (JP 3-0). Assessment is a continuous activity of the operations process that supports

decision making by ascertaining progress of the operation for the purpose of developing and refining plans and for making operations more effective.

4-24. Assessment precedes and guides the other activities of the operations process. During planning, assessment focuses on understanding the OE and building an assessment plan. During preparation, the focus of assessment switches to discerning changes in the situation and the force's readiness to execute operations. During execution, assessment involves deliberately comparing forecasted outcomes to actual events while using indicators to judge operational progress towards success. Assessment during execution helps commanders determine whether changes in the operation are necessary to take advantage of opportunities or to counter unexpected threats.

4-25. Assessment consists of monitoring the current situation to collect relevant information; evaluating progress toward attaining end state conditions, achieving objectives, and performing tasks; and recommending or directing action for improvement. *Monitoring* is continuous observation of those conditions relevant to the current operation (ADP 5-0). *Evaluating* is using indicators to judge progress toward desired conditions and determining why the current degree of progress exists (ADP 5-0). See FM 5-0 for more on the assessment process.

4-26. A *measure of performance* (also known as MOP) is an indicator used to measure a friendly action that is tied to measuring task accomplishment (JP 5-0). A *measure of effectiveness* (MOE) is an indicator used to measure a current system state, with change indicated by comparing multiple observations over time (JP 5-0). A MOE is an identifiable and measurable event or action, which tells the commander whether the action taken had the desired effect.

4-27. Space operations officers continually assess operations. A measure of performance confirms or denies a task has been properly performed and helps answer the question "Are we doing things right?" whereas a MOE helps measure changes in conditions and answer the question "Are we doing the right things?" They are tailored to each operation or effect.

- Examples of measure of performances include the following:
  - Space assets deployed and operating.
  - Nonlethal fires employed against a target.
  - Missile warning alerts disseminated as required.
  - Emissions control procedures disseminated and enforced.
  - NAVWAR assets employed and operating.
- Examples of MOEs include the following:
  - Threat networks or jammers defeated.
  - Number of times effectively jammed.
  - Number of precision-guided munitions successfully employed.
  - Reduction in network outages or disruptions.
  - Reduction in casualties from threat missile systems.
  - Number of reports of EMI.
  - Reduction/elimination of adversary fires on friendly C2 nodes.

SECTION II – INTELLIGENCE PREPARATION OF THE OPERATIONAL ENVIRONMENT

4-28. *Intelligence preparation of the operational environment* is the systematic process of analyzing the mission variables of enemy, terrain, weather, and civil considerations in an area of interest to determine their effect on operations (FM 2-0). IPOE allows commanders and staffs to take a holistic approach to analyzing the OE.

4-29. Joint organizations conduct *joint intelligence preparation of the operational environmen*t (JIPOE), the analytical process used by joint intelligence organizations to produce intelligence estimates and other intelligence products in support of the JFC's decision-making process. (JP 2-0). This manual discusses IPOE as an Army process, but many of the same considerations can be applied to joint intelligence preparation of the environment. See the *Joint Guide for Joint Intelligence Preparation of the Operational Environment* for more on joint intelligence preparation of the environment.

4-30. Throughout the operations process, the commander and staff continually collect information and analyze the operational variables to provide increased situational understanding. IPOE results in intelligence products that are used during the military decision-making process to assist in developing friendly courses of action (COAs) and decision points for the commander. Additionally, the conclusions reached and the products developed during IPOE, which are included in the intelligence estimate, are critical to planning information collection and targeting. The G-2/S-2 leads the staff effort for IPOE.

4-31. Army space professionals, particularly Army space operations officers on staffs, analyze the space OE to provide timely and relevant input to IPOE. As the subject matter experts on the space domain, Army space professionals possess the knowledge and insight of the space OE to assist the G-2/S-2 and the rest of the staff in understanding environmental and threat effects on operations. See ATP 2-01.3 for a detailed guide for IPOE.

4-32. The four steps of IPOE follow. While planners execute these steps in sequence, they conduct IPOE continuously. Continuous analysis and assessment are necessary to maintain situational understanding of an OE in constant flux.

- Define the operational environment.
- Describe environmental effects on operations.
- Evaluate the threat.
- Determine threat courses of action.

DEFINE THE OPERATIONAL ENVIRONMENT

4-33. Army space forces study the OE to determine the limits of the commander's AO and AOI. They determine what portions of the space domain should be included in the AOI, even when those areas may not be contiguous with the AO. The commander's AOI may be divided to reflect a space AOI, an EMS AOI, or some combination thereof. Space forces do this to then identify significant characteristics of the AO and AOI for further analysis using the mission variables as a guide. They then identify information gaps and develop assumptions to aid in planning against those gaps. Finally, they submit any necessary requests for information and information collection to acquire the information needed to complete IPOE.

DESCRIBE ENVIRONMENTAL EFFECTS ON OPERATIONS

4-34. In this step, Army space forces describe how the threat can affect friendly operations and how terrain, weather, and civilian considerations can affect friendly and threat operations. They contribute to developing the threat overlay and threat description table, reflecting all threat space and counterspace capabilities. They analyze the military aspects of terrain, weather (terrestrial and space), and civil considerations to describe their impacts on both friendly and threat forces. Army space professionals account for all effects not just in the space domain but in the other domains as well. More importantly, they articulate to the commander and staff how and why the effects matter. ATP 2-01.3 outlines several techniques for analyzing the military aspects of terrain, weather, and civilian considerations.

TERRAIN CONSIDERATIONS

4-35. Army space professionals analyze and evaluate the effects of the military aspects of terrain (observation and fields of fire; avenues of approach; key terrain; obstacles; cover and concealment) in the AO and AOI to determine, at a minimum, for both friendly and threat forces:

- Dilution of precision for space-based PNT.
- Mobility corridors for assigned or attached space forces.
- Line of sight, both terrestrially and into space, and look angles.
- Communications dead space.
- Lines of communication, especially for space forces requiring shore power or material handling equipment.
- Urban infrastructure and networks.
- Sources of EMI. These can be natural or man-made.
- Covered and concealed locations for space forces and C2 nodes. This includes concealment from space-based collection assets.

WEATHER CONSIDERATIONS

4-36. Army space professionals analyze and evaluate the effects of the military aspects of terrestrial weather (visibility, wind, precipitation, cloud cover, temperature, humidity, and atmospheric pressure) in the AO and AOI to determine, at a minimum, for both friendly and threat forces:

- Dilution of precision for space-based PNT.
- Trafficability for assigned or attached space forces.
- Impacts on space-based capabilities, missile warning, and SATCOM and sources of EMI.
- Restrictive conditions for operating equipment based on winds, temperature, and humidity.

4-37. Army space professionals analyze and evaluate the effects of space weather in the AOI to determine, at a minimum, for both friendly and threat forces:

- Dilution of precision for space-based PNT.
- Impacts on space-based capabilities, missile warning, SATCOM, and terrestrial communications due to solar weather and fluctuations in the earth's magnetic field.

CIVIL CONSIDERATIONS

4-38. Civil considerations assist commanders in understanding the social, political, and cultural variables within the AO and their effects on the mission. Army space forces consider the operational variables (when appropriate) and the characteristics of civil considerations to determine, at a minimum:

- Power grids, media, and network architectures.
- Reliance of the economy on space-based PNT.
- Availability of and access to commercial SATCOM and space-based imagery.
- Sources of EMI.
- Civil-military relationships.

EVALUATE THE THREAT

4-39. In this step, Army space forces determine threat force space and counterspace capabilities and the doctrinal principles and TTP threat forces prefer to employ. They identify threat characteristics (see ATP 2-01.3); create or refine threat models, to include identifying high-value targets; and identify threat capabilities. A *high-value target* is a target the enemy requires for the successful completion of the mission (JP 3-60).

4-40. From this evaluation, Army space forces develop a threat template and capability statement reflecting how the threat prefers to use its capabilities to perform the functions required to accomplish its objectives. They may produce their own space threat template using modeling software or other means, but the overall threat template and statement produced by the G-2/S-2 must include those aspects of threat space capabilities that will contribute to the threat's success. The template and statement are developed irrespective of environmental effects.

DETERMINE THREAT COURSES OF ACTION

4-41. Step 4 involves developing threat courses of action and the resulting event template and matrix. Army space forces together with G2 personnel determine threat COAs while accounting for environmental effects and produce a corresponding situation template and COA statement. The situation template and COA statement together outline how the threat will achieve its objectives. Army space professionals use these products to depict how the threat will use its space capabilities and feeds that analysis into the overall situation template and COA statement.

4-42. From the threat COAs, the staff develops an event template and matrix to drive information collection and decision making. These two products inform the rest of planning, as they illustrate the areas where activity, or lack thereof, indicate which COA the threat has adopted. From this, the staff can develop and wargame friendly COAs that provide flexibility and, during execution, enable the commander to make timely decisions.

Appendix A

Annex N, Space Operations Template

The SSE is responsible for preparing Annex N–Space Operations to a base plan or order. This appendix provides a format for Annex N in Army plans and orders. The format for the annex can be modified to meet the requirements of the base order and operations.

A-1. For Army plans and orders, Annex N is the primary location for space operations, though space operations information may be found in other annexes and appendices. For example, SATCOM is normally covered in Annex H by the G-6; and intelligence, surveillance, and reconnaissance operations are normally covered in Annex L by the G-3 in conjunction with the G-2. While the G-2 is responsible for producing a space threat portion in the intelligence estimate to Annex B, the SSE may contribute to this product by providing analysis of space weather or the space order of battle. Commanders and staffs use Annex N to describe how space operations support the concept of operations described in the base plan or order. Note that for joint plans and orders, CJCSM 3130.03B establishes Appendix 18 to Annex C, "Space Operations." Annex N for joint plans and orders is for "Assessments."

A-2. Annex N uses the standard five-paragraph operation order (OPORD) format and contains the information indicated in figure A-1 on pages 58 through 62. All references in the content, such as Appendix 2–Operation Overlay to Annex C–Operations refer to the base plan or order. Italicized text is recommendations or amplifying information.

Note: FM 5-0 is the source document for Army plans and orders and specifies the use of Annex N – Space Operations. It takes precedence over this template if any discrepancies exist. CJCSM 3130.03B designates "Space Operations" as Appendix 18 to Annex C for joint plans and orders. Refer to the CJCSM for joint plans and orders.

[CLASSIFICATION]

Place the classification at the top and bottom of every page of the attachments. Place the classification marking at the front of each paragraph and subparagraph in parentheses. Refer to AR 380-5 for classification and release marking instructions.

Copy ## of ## copies
Issuing headquarters
Place of issue
Date-time group of signature
Message reference number

Include heading if attachment is distributed separately from the base order or higher-level attachment.

ANNEX N (SPACE OPERATIONS) TO OPERATION PLAN (OPLAN)/OPERATION ORDER (OPORD) [number] [(code name)]— [issuing headquarters] [(classification of title)]

(U) References: *List documents essential to understanding the attachment.*

a. *List maps and charts first. Map entries include series number, country, sheet names, or numbers, edition, and scale.*

b. *List other references in subparagraphs labeled as shown.*

c. *Doctrinal references for space operations include FM 3-14, FM 6-0, JP 3-14, and U.S. National Space Policy.*

(U) Time zone used throughout the Order: *Write the time zone established in the base plan or order.*

(U) Task Organization*: Describe the overall general approach Army space operations will use to support mission requirement, the likelihood of operating in a denied, degraded, and disrupted space operational environment, the impact on equipment and to the mission, risk mitigation actions, and how to counter enemy actions to place friendly forces in this environment. Refer to Annex A (Task Organization) if long or complicated.*

1. (U) Situation. *Include information affecting space operations that paragraph 1 of the OPLAN or OPORD does not cover or that needs expansion.*

a. (U) Area of Interest. *Describe the area of interest which includes the area of influence in all five domains and information aspects as it relates to space operations. Refer to Annex B (Intelligence) as required.*

b. (U) Area of Operations. *Refer to Appendix 2 (Operation Overlay) to Annex C (Operations)*.

(1) (U) Terrain. *Describe the aspects of terrain that impact space operations such as terrain masking and obscura. Refer to Annex B (Intelligence) as required.*

(2) (U) Weather. *Describe the aspects of terrestrial and space weather that impact space operations. Refer to Annex B (Intelligence) as required.*

c. (U) Enemy Forces. *List known locations and activities of enemy space capable assets and units. List enemy space capabilities that can impact friendly operations. State expected enemy courses of action and employment of enemy and commercial space assets. Refer to Annex B (Intelligence) as required.*

d. (U) Friendly Forces. *Outline the higher headquarters' plan for space operations and space support teams including but not limited to space support elements and Army space support teams. List designation, location, and outline of plans of higher, adjacent, and other space operations-related assets that support or impact the issuing headquarters or require coordination and additional support.*

[page number]
[CLASSIFICATION]

Figure A-1. Sample Annex N–Space Operations format

[CLASSIFICATION]

ANNEX N–SPACE OPERATIONS TO OPLAN/OPORD [number] [(code name)]— [issuing headquarters] [(classification of title)]

(2) (U) Higher Headquarters One Level Up. *Identify the higher headquarters space mission, commander's intent, and concept of operations one echelon above.*

(3) (U) Missions of Adjacent Units. *Identify and state the missions of adjacent units and other units whose actions have a significant impact on the issuing headquarters.*

e. (U) Interagency, Intergovernmental, and Nongovernmental Organizations. *Identify and describe other organizations in the area of operations that may impact the conduct of space operations or implementation of space-specific equipment, tactics, and capabilities. Consider all multinational, civil, and nongovernmental organizations such as civilian relief agencies and other customers and providers of space-based capabilities. Refer to Annex V (Interagency Coordination) as required.*

f. (U) Civil Considerations. *Describe the aspects of the civil situation that impact space operations. Refer to Annex B (Intelligence) and Annex K (Civil Affairs Operations) as required.*

g. (U) Assumptions. *List space operations-specific assumptions that support the annex development.*

2. (U) Mission. *State the mission of space operations in support of the base plan or order.*

3. (U) Execution.

a. (U) Scheme of Space Operations. *Describe how space capabilities support the commander's intent and concept of operations. Establish the priorities of space support to units for each phase of the operation. For example, electromagnetic interference resolution and defended asset list. Also address unique space dependencies or vulnerabilities related to unit systems and capabilities. Refer to Annex C (Operations) as required.*

(1) (U) Description. *Describe how space capabilities and services support the operations. Emphasize the aspects of the Base plan that will require/affect space capabilities and services. Consider requesting additional Army space capabilities and the deployment timelines associated with those assets.*

(2) (U) Employment. *If operations are phased, discuss the employment of space assets during each phase. Include discussion of priorities of access, usage, and capabilities in each phase.*

b. (U) Tasks. *Identify space tasks assigned to specific subordinate units, supporting command, or agency that provides support to the plan. Refer to any tasks in base order. Provide a concise statement of the task with sufficient detail to ensure all elements essential to the operational scheme are described properly. If the operation is phased, discuss the tasks of both supported and supporting commands/agencies during each phase. Identify space capabilities required to support the OPLAN, including the following specific areas as applicable:*

(1) (U) Space Situational Awareness. *Address all capabilities and effects related to space situational awareness [understanding] requirements.*

(2) (U) Positioning, Navigation, and Timing. *Provide navigational capabilities that would aid the transit of ships, aircraft, personnel, or ground vehicles and determine the course and distance traveled or position location. Provide Global Positioning System (GPS) accuracy to support GPS-aided munitions.*

(3) (U) Space Control. *Provide information on space- capabilities performed by space forces, air assets, or surface assets that ensure friendly forces and deny enemy forces the unrestricted use of space and space capabilities. Identify targetable enemy assets and limitations of targeting. Address all capabilities, effects, and limitations, related to offensive or defensive space operations and navigation warfare requirements. Coordinate all plans and activities with cyberspace and electromagnetic warfare to ensure complimentary, not redundant operations, including:*

[page number]
[CLASSIFICATION]

Figure A-1. Sample Annex N–Space Operations format (continued)

[CLASSIFICATION]

ANNEX N–SPACE OPERATIONS TO OPLAN/OPORD [number] [(code name)]— [issuing headquarters] [(classification of title)]

(a) (U) Defensive Space Operations. *Capabilities and effects related to defensive space operations.*

(b) (U) Offensive Space Operations. *Capabilities and effects related to offensive space operations.*

(c) (U) Navigation Warfare. *Capabilities and effects related to navigation warfare.*

(4) (U) Satellite Communication. *Describe the space operations communications plan. Ensure defensive space priorities for satellite communication links are established and coordinated based on operational priorities. Refer to Annex H (Signal) as required.*

(5) (U) Theater Missile Warning. *Provide information on the notification of enemy ballistic missile or space-weapon attacks evaluated from available sensor and sources and the possible effect on the operational area. Provide notification of friendly ballistic missile launches and the impacts on the operational areas that would require early warning of affected friendly forces and an estimated point of impact for each launch Establish provisions, in coordination with the air defense artillery officer, to disseminate information quickly throughout the operational areas. Refer to Annex B (Intelligence), Annex D (Fires), and Annex E (Protection) as required.*

(6) (U) Remote Sensing/Environmental Monitoring. *Identify and list meteorological, oceanographic, geodetic, and other environmental support information provided by space capabilities which affect space, air, surface, or subsurface activities and assets. Refer to Annex G (Engineer) as required.*

(7) (U) Information Collection. *Provide information pertaining to friendly and enemy forces in or external to the operational areas that would aid in operations and force positioning. Refer to Annex L (Information Collection) as required.*

(8) (U) Nuclear Detonation. *Provide information on the notification of detected nuclear detonations that might affect the operation and require evaluation as to yield and location. Refer to Annex B (Intelligence) as required.*

(9) (U) Special Technical Operations. *Provide information on the organization and synchronization of the integrated Army and integrated joint special technical operations and alternate compensatory control measures plans in support of the commander's objectives. Refer to Annex S (Special Technical Operations) as required*.

(10) (U) Command and Control. *Provide information and an assessment on friendly space reliance upon satellite communications, missile warning, and network architectures. Determine how organic unit systems and equipment rely upon these communications paths (architectures).*

(11) (U) Cyberspace Electromagnetic Activities. *Integrate cyberspace electromagnetic activities to optimally synchronize their effects. Refer to Annex C (Operations) as required.*

c. (U) Tasks to Subordinate Units. List space tasks assigned to specific subordinate units not contained in the base plan or order. Refer to any tasks in base order.

d. (U) Coordinating Instructions. *List only instructions applicable to two or more subordinate units not covered in the base plan or order. Document coordination and reachback support requests in accordance with planning guidance such as "Space Coordinating Plans" and other directives for the area of responsibility; include unique equipment sustainment and technical points of contact.*

4. (U) Sustainment. *Identify priorities of sustainment for space operations key tasks and specify additional instructions as required. Refer to Annex F (Sustainment) as required.*

[page number]
[CLASSIFICATION]

Figure A-1. Sample Annex N–Space Operations format (continued)

[CLASSIFICATION]

ANNEX N–SPACE OPERATIONS TO OPLAN/OPORD [number] [(code name)]— [issuing headquarters] [(classification of title)]

a. (U) Logistics. *Identify unique sustainment requirements, procedures, and guidance to support space operations teams and operations. Specify procedures for specialized technical logistics support from external organizations as necessary. Use subparagraphs to identify priorities and specific instructions for space operations logistic support. Refer to Annex F (Sustainment) and Annex P (Host-Nation Support) as required.*

b. (U) Personnel. *Use subparagraphs to identify priorities and specific instructions for human resources support, financial management, legal support, and religious support. Refer to Annex F (Sustainment) as required.*

c. (U) Health Service Support. *Identify availability, priorities, and instructions for medical care. Refer to Annex F (Sustainment) as required*.

5. (U) Command and Signal.

a. (U) Command.

(1) (U) Location of the Commander and Key Leaders. *State the location of the commander and key space leaders such as the Combined Space Operations Center, electromagnetic warfare officers, and other key reachback leaders.*

(2) (U) Succession of Command. *State the succession of command if not covered in the unit's standard operating procedures.*

(3) (U) Command Posts. *Describe the employment of space-related command and control, and functional chains including their location and contact information.* Describe the employment of command posts (CPs), including the location of each CP and its time of opening and closing, as appropriate. State the primary controlling CP for specific tasks or phases of the operation (for example, "The division tactical CP will control the air assault").

(4) (U) Liaison Requirements. *State the space liaison requirements not covered in the unit's standard operating procedures, such as air component coordination element or multinational space officers.*

b. (U) Signal.

(1) Reports. *List space related reports not covered in standard operating procedures. Refer to any concept of operations or guidance and Annex R (Reports) as required.*

(2) Communications. *Address any space-specific communications requirements such as secure chat communications applications. These often require a lengthy approval process to tunnel through existing networks and should be specified well in advance. Describe the concept of signal support, including location and movement of key signal nodes and critical electromagnetic spectrum considerations throughout the operation. State the primary, alternate, contingency, and emergency (PACE) communications plan. Refer to Annex H (Signal) as required.*

ACKNOWLEDGE: *Include only if attachment is distributed separately from the base order*.

[Commander's last name]
[Commander's rank]

The commander or authorized representative signs the original copy of attachment. If the representative signs the original, add the phrase "For the Commander." The signed copy is the historical copy and remains in the headquarters' files.

[page number]
[CLASSIFICATION]

Figure A-1. Sample Annex N–Space Operations format (continued)

[CLASSIFICATION]

ANNEX N–SPACE OPERATIONS TO OPLAN/OPORD [number] [(code name)]— [issuing headquarters] [(classification of title)]

OFFICIAL:

[Authenticator's name]
[Authenticator's position]

Use only if the commander does not sign the original attachment. If the commander signs the original, no further authentication is required. If the commander does not sign, the signature of the preparing staff officer requires authentication, and only the last name and rank of the commander appear in the signature block.

ATTACHMENTS: *List lower-level attachments (appendices, tabs, and exhibits).*

DISTRIBUTION: *Show only if distributed separately from the base order or higher-level attachment.*

[page number]
[CLASSIFICATION]

Figure A-1. Sample Annex N–Space Operations format (continued)

Appendix B

Space Running Estimate

This appendix provides a format for the space running estimate. The format for the running estimate can be modified to meet the requirements of planning and operations.

B-1. The information maintained within the space running estimate supports the unit's ability to perform C2, information collection, target development, targeting, movement and maneuver, and battle damage assessment. Examples of information tracked within the space running estimate include but is not limited to:

- Type, quantity, status, intentions, tactics, and known or suspected locations of threat GPS and SATCOM jammers. Threat PNT receiver system type and quantity and their reliance for fires, maneuver, and communications. This information supports the G-2's ability to develop and maintain, the enemy order of battle which sets the conditions for the development, refinement, and assessment of the information collection plan and the development of lethal and non-lethal targeting options for the commander.
- Ongoing or anticipated areas impacted by GPS jammers and the corresponding effects on GPS-enabled equipment such as:
  - FFT devices, radios, and unmanned aerial systems.
  - GPS-aided precision guided munitions.
  - GPS-aided target acquisition systems.
- Ongoing or anticipated areas impacted by SATCOM jammers and the corresponding effects on SATCOM and SATCOM-enabled equipment such as:
  - Network Integration Technology Enhancement.
  - Joint Battle Command-Platform.
  - Command post of the future.
  - Force XXI battle command, brigade and below.
  - U.S. Marine Corps joint capabilities release.
  - FFT.
  - Electromagnetic Warfare Planning and Management Tool.
  - Command Post Computing Environment.
  - Advanced Field Artillery Tactical Data System.
- Ongoing or predicted impacts of terrestrial and space weather effects as well as intentional EMI on GPS, SATCOM, space-based surveillance and reconnaissance, and missile warning system platforms and architectures.
- Satellite reconnaissance advanced notice reports provide predicted overflight times of enemy satellites by type and sensor over friendly AO to the staff.
- Predicted periods when GPS will be degraded at a designated location and time. This information assists in the impacts on GPS guidance accuracies and the risk assessment associated when employing GPS aided munitions. This information can also identify the need to coordinate alternative navigation or the ensuring of other GNSS signals.
- Assessments of the adversary's reliance on organic, commercial, or third-party space capabilities such as SATCOM, space-based surveillance and reconnaissance, GNSS, and environmental monitoring.
- Battle damage assessment from attacks against threat use of the space domain. This supports follow-on requirements for target reengagement options for the commander and ongoing staff assessment efforts.
- Friendly, neutral, and enemy space order of battle (in coordination with the G-2 staff).

B-2. Examples of how portions of the space running estimate may support other warfighting functions and their respective staff estimates include, but are not limited to:

- The G-2 intelligence estimate for:
  - Space intelligence.
  - Threat order of battle (type, quantity, vulnerabilities, disposition and location, tactics, intent of jammers).

  - Information collection issues.
  - Current and predicted enemy actions against U.S. space capabilities (such as threat jamming operations).
  - Ongoing manmade or naturally occurring impacts on GPS, SATCOM, or national space-based surveillance and reconnaissance platforms.
- The G-2 weather estimate/staff weather officer for terrestrial and space weather and its impacts on operations.
- The G-3 operations estimate to maintain awareness of threat activities designed to deny, degrade, or disrupt space-enabled C2 systems.
- The G-3 protection estimate and how degradation of space capabilities influences or impacts protection efforts such as the air and missile defense cell for missile warning and space-based infrared sensor information.
- The G-3 fires estimate and the use of GPS-aided munitions, employment of unmanned aerial systems for reconnaissance, surveillance, and or attack missions, employment of GPS-enabled field artillery firing platforms, nonlethal fires, and impacts on GPS-enabled target acquisition systems. This estimate also supports input to the attack guidance matrix and the target synchronization matrix. It also depicts the capability of Army space operations to provide effects through the space domain to meet operational fires requirements.
- The G-6 signal estimate includes degradation effects on C2 systems and how these influences or impacts SATCOM and GPS. The signal estimate includes:
  - Defensive space operations for SATCOM.
  - D3SOE effects as they pertain to spectrum management operations.
  - NAVWAR considerations.
  - Space domain equities represented within the joint restricted frequency list.
  - Status and trends noted from joint spectrum interference resolution reporting.
  - Figure A-1. Sample Annex N–Space Operations format (continued)
- See figure B-1 on page 64 for a sample space running estimate.

1. SITUATION AND CONSIDERATIONS.
    a. Area of Interest. *Identify and describe those factors of the area of interest that affect space operations.*
    b. Characteristics of the area of operations.
    (1) Terrain. *State how terrain affects space capabilities.*
    (2) Weather. *State how weather affects space capabilities.*
    (3) Enemy Forces. *Describe enemy disposition, composition, strength, and systems within the space domain. Describe enemy capabilities and possible courses of action (COAs) and their effects on space operations.*
    (4) Friendly Forces. *List current space forces in terms of equipment, personnel, and systems. Identify additional resources available located at higher echelon, adjacent, or other units. List those capabilities from other military and civilian partners that may be available to provide support. Compare requirements to current capabilities and suggest solutions for satisfying discrepancies.*
    (5) Civilian Considerations. *Describe civil considerations that may affect the space domain, including possible support needed by civil authorities and possible interference from civil aspects.*
    c. Facts and Assumptions. *List all facts and assumptions that affect space operations.*
2. MISSION. *Show the restated mission resulting from mission analysis.*
3. COURSES OF ACTION.
    a. *List friendly COAs that were wargamed.*
    b. *List enemy actions or COAs that were templated that impact space operations.*
    c. *List the evaluation criteria identified during COA analysis. All staffs use the same criteria.*
4. ANALYSIS. *Analyze each COA using the evaluation criteria from COA analysis. Review enemy actions that impact space operations as they relate to COAs. Identify issues, risks, and deficiencies these enemy actions may create with respect to space operations.*
5. COMPARISON. *Compare COAs. Rank order COAs for each key consideration. Use a decision matrix to aid the comparison process.*
6. RECOMMENDATIONS AND CONCLUSIONS.
    a. *Recommend the most supportable COAs from the space perspective.*
    b. *Prioritize and list issues, deficiencies, and risks and provide recommendations on how to mitigate them.*

Figure B-1. Sample space running estimate

This page intentionally left blank.

Appendix C

Space Support Request

The space operations officer is responsible for submitting the space support request for their command and subordinates. A space support request can be initiated at any level of command and sent to the next higher command. Typically, a space support request is routed from units below the division level to the division. From the division it is forwarded to the Corps, JFC or joint functional space component command (if established), and Combined Space Operations Center in that order.

C-1. The CFSCC Form 66 is the Space Support Request (SSR) and Request For Information (RFI) process at the Combine Space Operations Center (CSpOC). The Space Support Request is the primary method to integrate space capability into the GCCs. However, space integration happens during the different collaboration of Joint Space Working Groups (JSWG), etc.

C-2. The Request For Information is the primary method to request information that could turn into a scheduled intelligence production. The CSpOC processes two types of RFIs: The first type of RFI requests; intelligence products regarding enemy order of battle or enemy capabilities known as “Red RFI.” The second type requests information about friendly capabilities or “Blue RFI.”

C-3. All SSRs and Blue RFIs can be submitted to CSpOC via the CFSCC Form 66 process to their SIPR org box. If submitting a Red RFI, first coordinate with the local intelligence support team. If unable to find the information, submit an RFI to the CSpOC ISRD Unit Support Team via their SIPR SharePoint site.

C-4. Each echelon receiving the SSR reviews it and determines if the request can be filled at that level based on asset availability and priority of support. Requested effects are then evaluated to determine operational conflicts and unintentional effects. Once coordinated and deconflicted, the space support request is integrated and synchronized across the AO.

C-5. SSRs can be preplanned, preplanned on-call, or immediate. Preplanned and preplanned on-call space support is coordinated, and resources allocated much the same as close air support, whereas immediate space support is subject to resources available. All space support requests must be as detailed as possible for the desired effect.

C-6. Once the SSR has been validated and approved, the requestor is notified, and the capability or effect is delivered. The requestor then provides a battle damage assessment or effects report for SA and follow on operations.

C-7. Non-Kinetic Effects Request Forms (NERF) and Electromagnetic Attack Request Forms (EARF) are typically used to request effects that are synchronized in time and tempo to support operations. See Figure C-1 on page 68 for a notional Electromagnetic Attack Request Form (EARF).

Electromagnetic Attack Request Form (EARF)	
Requesting Major Supported Command:	
Requesting Unit:	
Contact Information: This is for the person who will be responsible for verifying the EARF has been approved before the mission starts and to relay the information to the executing unit.	
Joint Tactical Air Strike Request (JTAR) Number: Enter the JTAR number that will be submitted with this EARF.	
Concept of Operations (CONOPS): Describe the CONOPS. This will include the objective, forces used, timeline of the mission, and coordination efforts required for mission success. Relate the impact of mission success to specific objectives for the integrated tasking order.	
Electromagnetic Attack (EA) CONOPS: Define the desired effect(s) and timeline.	
Other Required Capabilities: Specify any capabilities required to execute the CONOPS, such as direction finding or exploitation.	
Jam Control Authority: **Jam Initiate Authority:** **CEASE BUZZER (Communications) Procedures:** **CEASE MUSIC (Radar) Procedures:** This will be in accordance with theater special instructions. Provide a communication plan between the jamming control authority and EA asset. Very high/ultrahigh frequency is the primary means to talk to a supporting aircraft. If unable to establish communications, consider using another asset to relay information. Some aircraft may be internet relay chat or satellite communications capable.	
Friendly Frequency Use for Operation:	
Target System(s) to be Jammed/Denied:	Target requested (list the type and frequency, if known). Intelligence assessment (this is required for each request). Do not copy and paste frequencies from one day to the next without intelligence validation and assessment.
Target Location: Point, linear, or rectangular target grids.	
Jamming date-time groups: From and To, in Zulu Time (preferred).	
Type of EA Requested: Preplanned and scheduled on-call.	

Figure C-1. Sample Electromagnetic Attack Request Form (EARF)

Source Notes

Sources are listed by number in the order they appear.

1. Figure 1-1. The electromagnetic spectrum, from Figure I-1in JP 3-85.
2. Figure 2-1. Army strategic contexts and operational categories from Figure 1-2 in FM 4-0
3. Figure 2-2. Notional corps deep, close, rear areas with contiguous divisions, from Figure 3-5 in FM 3-0.
4. Figure 2-5. The electromagnetic spectrum, from Figure 1-3 in FM 3-12.
5. Figure 2-6. Electromagnetic warfare taxonomy, from Figure 2-3 in FM 3-12.

This page intentionally left blank.

Glossary

The glossary lists acronyms and abbreviations and terms with Army or joint definitions, and other selected terms. Where Army and joint definitions are different, (Army) follows the term. Terms for which FM 3-14 is the proponent (authority) manual are marked with an asterisk (*). The proponent manual for other terms is listed in parentheses after the definition.

SECTION I – ACRONYMS AND ABBREVIATIONS

ADP	Army Doctrine Publication
AOI	area of interest
AO	area of operations
AOR	area of responsibility
AR	Army regulation
ARSOF	Army Special Operations Forces
ARSST	Army space support team
ASCC	Army Service component command
ATP	Army Techniques Publication
C2	command and control
CCDR	combatant commander
CDRUSSPACECOM	Commander, U.S. Space Command
COA	course of action
COP	common operational picture
D3SOE	denied, degraded, and disrupted space operational environment
DOD	Department of Defense
EHF	Extremely high frequency
EME	electromagnetic environment
EMI	electromagnetic interference
EMOE	electromagnetic operational environment
EMS	electromagnetic spectrum
FFT	friendly force tracking
FM	field manual
G-2	assistant chief of staff, intelligence
G-3	assistant chief of staff, operations
G-6	assistant chief of staff, signal
GNSS	global navigation satellite system
GPS	Global Positioning System
IJSTO	integrated joint special technical operations
IPOE	intelligence preparation of the operational environment
JFC	joint force commander
JP	joint publication
JTF	joint task force
Km	kilometers
MDEB	Multi-Domain Effects Battalion
MDTF	Multi-Domain Task Force

MOE	measure of effectiveness
NAVWAR	navigation warfare
OE	operational environment
OPLAN	operation plan
OPORD	operation order
PNT	positioning, navigation, and timing
SA	situational awareness
SATCOM	satellite communications
SCC	space control company
SCPS	space control planning section
SCPT	space control planning team
SDA	space domain awareness
SSA	space situational awareness
SSE	space support element
SSR	space support request
UHF	ultra high frequency
USSF	United States Space Force
U.S.	United States
USSPACECOM	United States Space Command

SECTION II – TERMS

adversary

(DOD) A party acknowledged as potentially hostile to a friendly party and against which the use of force may be envisaged. (JP 3-0)

agility

(Army) The ability to move forces and adjust their dispositions and activities more rapidly than the enemy. (FM 3-0)

aimpoint

(DOD) A point associated with a target and assigned for a specific weapon impact. (JP 3-60)

antiaccess

(DOD) Action, activity, or capability, usually long-range, designed to prevent an advancing enemy force from entering an operational area. (JP 3-0)

area denial

(DOD) Action, activity, or capability, usually short-range, designed to limit an enemy force's freedom of action within an operational area. (JP 3-0)

area of influence

(DOD) An area inclusive of and extending beyond an operational area wherein a commander is capable of direct influence by maneuver, fire support, and information normally under the commander's command or control. (JP 3-0)

area of interest

(DOD) That area of concern to the commander, including the area of influence, areas adjacent to it, and extending into enemy territory. (JP 3-0) Also called AOI.

area of operations

(DOD) An operational area defined by a commander for the land or maritime force commander to accomplish their missions and protect their forces. (JP 3-0) Also called AO.

assessment

(DOD) The determination of the progress toward accomplishing a task, creating a condition, or achieving an objective. (JP 3-0)

***Army space professionals**

(Army) Members of a specialized cadre of Army personnel who are trained in and dedicated to performing space operations.

close operations

(Army) Tactical actions of subordinate maneuver forces and the forces providing immediate support to them, whose purpose is to employ maneuver and fires to close with and destroy enemy forces. (FM 3-0)

combat power

(Army) The total means of destructive and disruptive force that a military unit/formation can apply against an enemy at a given time. (JP 3-0)

combined arms

(Army) The synchronized and simultaneous application of arms to achieve an effect greater than if each arm was used separately or sequentially. (ADP 3-0)

command and control warfighting function

(Army) The related tasks and a system that enable commanders to synchronize and converge all elements of power. (ADP 3-0)

common operational picture

(Army) A display of relevant information within a commander's area of interest tailored to the user's requirements and based on common data and information shared by more than one command. (ADP 6-0)

consolidate gains

(Army) Activities to make enduring any temporary operational success and to set the conditions for a sustainable security environment, allowing for a transition of control to other legitimate authorities. (ADP 3-0)

convergence

(Army) An outcome created by the concerted employment of capabilities from multiple domains and echelons against combinations of decisive points in any domain to create effects against a system, formation, decision maker, or in a specific geographic area. (FM 3-0)

core competency

(Army) An essential and enduring capability that a branch or an organization provides to Army operations. (ADP 1-01)

deep operations

(Army) Tactical actions against enemy forces, typically out of direct contact with friendly forces, intended to shape future close operations and protect rear operations. (FM 3-0)

defensive operation

(Army) An operation to defeat an enemy attack, gain time, economize forces, and develop conditions favorable for offensive or stability operations. (ADP 3-0)

defensive space operations

(DOD) Actions taken to preserve friendly freedom of action in space. (JP 3-14)

***denied, degraded, and disrupted space operational environment**

(Army) A composite of those conditions and influences in which space-enabled capabilities have been impaired by hostile threats or non-hostile means. Also called D3SOE.

electromagnetic environment

(DOD) The resulting product of the power and time distribution, in various frequency ranges, of the radiated or conducted electromagnetic emission levels encountered by a military force, system, or platform when performing its assigned mission in its intended operational environment. (JP 3-85)

electromagnetic interference

(DOD) Any electromagnetic disturbance, induced intentionally or unintentionally, that interrupts, obstructs, or otherwise degrades or limits the effective performance of electromagnetic spectrum-dependent systems and electrical equipment. (JP 3-85) Also called EMI.

enemy

(Army) A party identified as hostile against which the use of force is authorized. (ADP 3-0)

evaluating

(Army) Using indicators to judge progress toward desired conditions and determining why the current degree of progress exists. (ADP 5-0)

execution

(Army) The act of putting a plan into action by applying combat power to accomplish the mission and adjusting operations based on changes in the situation. (ADP 5-0)

fires warfighting function

(Army) The related tasks and systems that create and converge effects in all domains against the adversary or enemy to enable operations across the range of military operations. (ADP 3-0)

force tailoring

(Army) The process of determining the right mix of forces and the sequence of their deployment in support of a JFC. (ADP 3-0)

friendly force tracking

(DOD) The process of fixing, observing, and reporting the location and movement of friendly forces. (JP 3-09) Also called FFT.

high-value target

(DOD) A target the enemy requires for the successful completion of the mission. (JP 3-60)

hostile environment

(DOD) An operational environment where the freedom of movement is contested. (JP 3-0)

information collection

(Army) An activity that synchronizes and integrates the planning and employment of sensors and assets as well as the processing, exploitation, and dissemination systems in direct support of current and future operations. (FM 3-55)

intelligence preparation of the operational environment

(Army) The systematic process of analyzing the mission variables of enemy, terrain, weather, and civil considerations in an area of interest to determine their effect on operations. (FM 2-0)

intelligence warfighting function

(Army) The related tasks and systems that facilitate understanding the enemy, terrain, weather, civil considerations, and other significant aspects of the operational environment. (ADP 3-0)

joint intelligence preparation of the operational environment

(DOD) The analytical process used by joint intelligence organizations to produce intelligence estimates and other intelligence products in support of the JFC's decision-making process. (JP 2-0)

large-scale combat operations

(Army) Extensive joint combat operations in terms of scope and size of forces committed, conducted as a campaign aimed at achieving operational and strategic objectives. (ADP 3-0)

leadership

(Army) The activity of influencing people by providing purpose, direction, and motivation to accomplish the mission and improve the organization. (ADP 6-22)

levels of warfare

(Army) A framework for defining and clarifying the relationship among national objectives, the operational approach, and tactical tasks. (ADP 1-01)

***meaconing**

(Army) The interception, duplication, and rebroadcasting of navigation signals intended to confuse and disrupt adversary navigation systems.

measure of effectiveness

(DOD) An indicator used to measure a current system state, with change indicated by comparing multiple observations over time. (JP 5-0)

measure of performance

(DOD) An indicator used to measure a friendly action that is tied to measuring task accomplishment. (JP 5-0)

mission variables

(Army) The categories of specific information needed to conduct operations. (ADP 1-01)

mobility

(DOD) A quality or capability of military forces which permits them to move from place to place while retaining the ability to fulfill their primary mission. (JP 3-36)

monitoring

(Army) Continuous observation of those conditions relevant to the current operation. (ADP 5-0)

movement and maneuver warfighting function

(Army) The related tasks and systems that move and employ forces to achieve a position of relative advantage over the enemy and other threats. (ADP 3-0)

multidomain operations

(Army) The combined arms employment of joint and Army capabilities to create and exploit relative advantages to achieve objectives, defeat enemy forces, and consolidate gains on behalf of JFCs. (FM 3-0)

national strategic level of warfare

(DOD) The level of warfare at which the U.S. government formulates policy goals and ways to achieve them by synchronizing action across government and unified action partners and employing the instruments of national power. (FM 3-0)

navigation warfare

(DOD) Actions that maintain friendly use of positioning, navigation, and timing information while denying the same to the adversary. (JP 3-14)

offensive operation

(Army) An operation to defeat or destroy enemy forces and gain control of terrain, resources, and population centers. (ADP 3-0)

offensive space operations

(DOD) Actions taken to deny an adversary freedom of action in space. (JP 3-14)

operational approach

(DOD) A broad description of the mission, operational concepts, tasks, and actions required to accomplish the mission. (JP 5-0)

operational art

(DOD) The cognitive approach by commanders and staffs--supported by their skill, knowledge, experience, creativity, and judgment--to develop strategies, campaigns, and operations to organize and employ military forces by integrating ends, ways, and means. (JP 3-0)

operational environment

(DOD) The aggregate of the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander. (JP 3-0) Also called OE.

operational framework

(Army) A cognitive tool used to assist commanders and staffs in clearly visualizing and describing the application of combat power in time, space, purpose, and resources in the concept of operations. (ADP 1-01)

operational level of warfare

(DOD) The level of warfare in which campaigns and operations are planned, conducted, and sustained to achieve operational objectives to support achievement of strategic objectives. (JP 3-0)

operational variables

(Army) A comprehensive set of information categories used to define an operational environment. (ADP 1-01)

operations process

(Army) The major command and control activities performed during operations: planning, preparing, executing, and continuously assessing the operation. (ADP 5-0)

permissive environment

(DOD) Uncontested conditions in which joint forces have freedom of movement. (JP 3-0)

planning

(Army) The art and science of understanding a situation, envisioning a desired future, and laying out effective ways of bringing that future about. (ADP 5-0)

preparation

(Army) Those activities performed by units and Soldiers to improve their ability to execute an operation. (ADP 5-0)

protection warfighting function

(Army) The related tasks, systems, and methods that prevent or mitigate detection, threat effects, and hazards to preserve combat power and enable freedom of action. (FM 3-0)

rear operations

(Army) Tactical actions behind major subordinate maneuver forces that facilitate movement, extend operational reach, and maintain desired tempo. (ADP 3-0)

risk management

(DOD) The process to identify, assess, and control risks and make decisions that balance risk cost with mission benefits. (JP 3-0) Also called RM.

running estimate

(Army) The continuous assessment of the current situation used to determine if the current operation is proceeding according to the commander’s intent and if planned future operations are supportable. (ADP 5-0)

space control

(Army) An operation by which Army forces ensure freedom of action in and through the space domain for the United States and its mission partners while denying the same to an adversary. (ATP 3-14.1)

space domain

(DOD) The area above the altitude where atmospheric effects on airborne objects become negligible. (JP 3-14)

space domain awareness

(DOD) The timely, relevant, and actionable understanding of the operational environment that allows military forces to plan, integrate, execute, and assess space operations. (JP 3-14)

space environment

(DOD) The environment corresponding to the space domain, where electromagnetic radiation, charged particles, and electric and magnetic fields are the dominant physical influences, and that encompasses the Earth's ionosphere and magnetosphere, interplanetary space, and the solar atmosphere. (JP 3-59)

space forces

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

space operations

(DOD) The employment of space forces in, to, or from space to achieve objectives. (JP 3-14)

space situational awareness

(DoD) The requisite foundational, current, and predictive knowledge and characterization of space orbital objects and the space domain. (JP 3-14)

space superiority

(DOD) the degree of control in the space domain of one force over another that permits freedom of access and action without prohibitive interference. (JP 3-14)

space weather

(DOD) The conditions and phenomena in space and specifically in the near-Earth environment that may affect space assets or space operations. (JP 3-59)

stability operation

(Army) An operation conducted outside the United States in coordination with other instruments of national power to establish or maintain a secure environment and provide essential governmental services, emergency infrastructure reconstruction, and humanitarian relief. (ADP 3-0)

survivability

(Army) A quality or capability of military forces which permits them to avoid or withstand hostile actions or environmental conditions while retaining the ability to fulfill their primary mission. (ATP 3-37.34)

sustainment warfighting function

(Army) The related tasks and systems that provide support and services to ensure freedom of action, extend operational reach, and prolong endurance. (ADP 3-0)

synchronization

(DOD) The arrangement of military actions in time, space, and purpose to produce maximum relative combat power at a decisive place and time. (JP 2-0)

tactical exploitation of national capabilities

(DOD) Congressionally mandated program to improve the combat effectiveness of the Services through more effective military use of national programs. (JP 2-0)

tactical level of warfare

(DOD) The level of warfare at which battles and engagements are planned and executed to achieve military objectives assigned to tactical units or task forces. (JP 3-0)

theater strategic level of warfare

(Army) The level of warfare at which combatant commanders synchronize with unified action partners and employ all elements of national power to fulfill policy aims within the assigned theater in support of the national strategy. (FM 3-0)

threat

(Army) Any combination of actors, entities, or forces that have the capability and intent to harm United States forces, United States national interests, or the homeland. (ADP 3-0)

vulnerability

(DOD) The characteristics of a system that cause it to be incapable of performing a designated function or mission when subjected to a specific threat action. (JP 3-60)

References

All websites were accessed on 10 April 2025.

REQUIRED PUBLICATIONS

These documents must be available to intended users of this publication.

DOD Dictionary of Military and Associated Terms. 15 December 2025.

FM 1-02.1. *Operational Terms.* 28 February 2024.

FM 1-02.2. *Military Symbols.* 23 January 2025.

RELATED PUBLICATIONS

These documents are cited in this publication.

JOINT AND DEPARTMENT OF DEFENSE PUBLICATIONS

CJCS Directives library are available online at https://www.jcs.mil/Library/. Most DOD Directives and Instructions are located on the DOD Issuance webpage located at: https://www.esd.whs.mil/DD/. Most joint publications are available online from the Joint Doctrine Education and Training Electronic Information System (JDEIS) webpage at: https://jdeis.js.mil/jdeis/.

CJCSI 3121.01B. *Standing Rules of Engagement/Standing Rules for the Use of Force for US Forces.*13 June 2005.

CJCSM 3130.03B. *Planning and Execution Formats and Guidance*. 14 June 2024.

DODD 3100.10. *Space Policy.* 30 August 2022.

DODI O-3115.07. *Signals Intelligence (SIGINT)*. 15 September 2008.

JP 2-0. *Joint Intelligence*. 26 May 2022.

JP 3-0. *Joint Campaigns and Operations*. 18 June 2022.

JP 3-03. *Joint Interdiction.* 26 May 2022.

JP 3-09. *Joint Fires*. 24 July 2025.

JP 3-14. *Joint Space Operations*. 23 August 2023.

JP 3-36. *Joint Air Mobility and Sealift Operations*. 4 January 2021.

JP 3-59. *Meteorological and Oceanographic Operations*. 25 November 2024.

JP 3-60. *Joint Targeting*. 20 September 2024.

JP 3-85. *Joint Electromagnetic Spectrum Operations*. 22 May 2020.

JP 5-0. *Joint Planning*. 1 July 2025.

ARMY PUBLICATIONS

Most Army doctrinal publications are available online: https://armypubs.army.mil/.

ADP 1-01. *Doctrine Primer*. 31 July 2019.

ADP 2-0. *Intelligence.* 31 July 2019.

ADP 3-0. *Operations*. 21 March 2025.

ADP 3-07. *Stability*. 31 July 2019.

ADP 3-19. *Fires*. 31 July 2019.

ADP 3-37. *Protection*. 10 January 2024.

ADP 3-90. *Offense and Defense*. 31 July 2019.

ADP 4-0. *Sustainment*. 31 July 2019.

ADP 5-0. *The Operations Process*. 31 July 2019.

ADP 6-0. *Mission Command: Command and Control of Army Forces*. 31 July 2019.

ADP 6-22. *Army Leadership and the Profession*. 31 July 2019.

AR 5-22. *The Army Force Modernization Proponent and Integration System*. 13 June 2023.

AR 380-5. *Army Information Security Program*. 25 March 2022.

AR 600-3. *The Army Personnel Development System*. 7 February 2025.

AR 900-1. *Department of the Army Space Policy*. 21 April 2017.

ATP 2-01.3. *Intelligence Preparation of the Operational Environment*. 1 March 2019.

ATP 3-14.1. (U) *Army Space Control Operations (S).* 18 December 2025.

ATP 3-14.3. *Techniques for Army Space Forces.* 15 February 2018.

ATP 3-37.34/MCTP 3-34C. *Survivability Operations*. 16 April 2018.

ATP 3-72/MCRP 10-10E.9/NTTP 3-72.1/AFTTP 3-2.65. (U) *Operations in a Nuclear Environment.* 7 March 2022

FM 2-0. *Intelligence*. 1 October 2023.

FM 3-0. *Operations*. 21 March 2025.

FM 3-12. *Cyberspace and Electromagnetic Warfare Operations*. 17 September 2025.

FM 3-16. *The Army in Multinational Operations*. 15 July 2024.

FM 3-27. *Army Global Missile Defense Operations*. 11 August 2023.

FM 3-55. *Information Collection.* 3 May 2013.

FM 4-0. *Sustainment Operations. 14 August 2024.*

FM 5-0. *Planning and Orders Production*. 4 November 2024.

FM 6-0. *Commander and Staff Organization and Operations*. 16 May 2022.

FM 6-02. *Signal Support to Operations*. 13 September 2019.

FM 6-27/MCTP 11-10C. *The Commander's Handbook on the Law of Land Warfare*. 7 August 2019.

WEBSITES

Army Space Knowledge and Missile Defense Education. https://askme.army.mil

National Security Strategy, October 2022. https://history.defense.gov/Historical-Sources/National-Security-Strategy/

PRESCRIBED FORMS

This section contains no entries.

REFERENCED FORMS

Unless otherwise indicated, Department of the Army forms are available on the Army Publishing Directorate (APD) website at https://armypubs.army.mil.

DA Form 2028. *Recommended Changes to Publications and Blank Forms.*

Index

Entries are by paragraph number.

Entries are by page number.

FM 3-14

25 February 2026

By Order of the Secretary of the Army:

RANDY A. GEORGE
General, United States Army
Chief of Staff

Official:

MARK F. AVERILL
Administrative Assistant
to the Secretary of the Army
2605500

DISTRIBUTION:
Active Army, Army National Guard, and United States Army Reserve. Distributed in electronic media only(EMO).

This page intentionally left blank.

This page intentionally left blank.

PIN:082461-000