Chapter 8

Joint Space Mission Areas

Maj Christopher J. King, USAF; and MAJ Kenneth G. Kemmerly, USA

Adm Alfred Thayer Mahan saw the earth's oceans as a medium for force projection and commerce which begged the development of strategy, policies, and doctrine to ensure their effective use. Similarly, the use of and dependence on space by the US military necessitates the development of effective policies and doctrine to ensure its proper employment.[1] This chapter provides the reader with a general understanding of the underpinning doctrinal concepts of US military space operations captured in Joint Publication (JP) 3-14, *Space Operations*; Air Force Doctrine Document (AFDD) 2-2, *Space Operations*; AFDD 2-2.1, *Counterspace Operations*; Army Field Manual (FM) 3-14, *Space Support to Army Operations*.

JP 3-14 states that "this publication establishes a framework for the use of space capabilities and the integration of space operations into joint military operations."[2] Therefore, this chapter also intends to provide an understanding of these concepts in order to facilitate the successful integration of space into joint operations so space becomes a significant force multiplier to the war fighter.[3] To achieve true joint integration, it is necessary to view space operations within the construct of joint space mission areas, which are divided into four categories: space control, space force enhancement, space support, and space force application.

Space Control

As noted, Mahan sought to develop strategies and doctrine for the use of a medium that, when used effectively, theoretically provides a nation an advantage in economic and military terms. If a nation wants to enjoy the use of a medium, it must control it because, as Jim Oberg points out, "the history of mankind has proven time and again that anything that enhances the power of an individual or group—be it political, economic, or military strength—will be coveted by others."[4] Thus, Mahan advocated the principle of "sea control" for the unfettered use of the oceans for a nation's purposes. An application of this principle to space attempts to achieve the same result.

Space control operations provide freedom of action in space for friendly forces and, when directed, deny it to an adversary. Space control also includes the protection of the space systems belonging to the United States and its allies and the negation of adversary space systems. Oberg stresses the need for protection by emphasizing that "a basic tenet of space control is a requirement that all elements of space power, whether orbital or terrestrial be protected."[5] Space control operations encompass all elements of the space defense mission. Space control may include some or all activities conducted by land, sea, air, space, and/or special operations forces. FM 3-14 states it succinctly: "Space control is used to deny communications and propaganda tools, such as TV and radio, to adversary leadership. Space surveillance systems monitor the status of enemy and commercial satellite operations to determine potential threat to friendly forces."[6]

To gain space superiority, space forces must have surveillance of space and terrestrial areas of interest (AOI) that may impact space activities; protect the ability to use space; prevent adversaries from exploiting US, allied, or neutral space services; and negate the ability of adversaries to exploit space capabilities. These forces are applied against space systems or facilities identified through the targeting process. Space control operations provide freedom of action in space for friendly forces and, when directed, deny the same freedom to the adversary. They include offensive and defensive operations by friendly forces to gain and maintain space superiority and situational awareness of events that impact space operations. In particular, space control operations are comprised of several types of missions, including surveillance of space, protection, prevention, and negation functions. These operations change in nature and intensity as the type of military operation changes. Prevention efforts can range from deterrence or diplomacy to military action. If prevention efforts fail, protection and negation functions may be performed to achieve space superiority. Negation focuses on denying an adversary's effective use of space. Prevention, protection, and negation efforts all rely on the ongoing surveillance of space and Earth to make informed decisions and to evaluate the effectiveness of their efforts.

Surveillance of Space

Situational awareness is fundamental to the ability to conduct the space control mission. It requires robust space surveillance for continual awareness of orbiting objects; real-time search and targeting-quality information; threat detection, identification, and location; predictive intelligence analysis of foreign space capability and intent in a geopolitical context; and a global reporting capability for friendly space systems. Space surveillance is conducted to detect, identify, assess, and track space objects and events to support space operations. Space surveillance is also critical to space support operations, such as placing satellites in orbit. Further, space situational awareness data can be used to support terrestrially based operations, such as reconnaissance avoidance and missile defense.

Protection

Active and passive defensive measures ensure that US and friendly space systems perform as designed by overcoming an adversary's attempts to negate friendly (US and allies) exploitation of space or to minimize adverse effects if the US or its allies attempt negation of the adversary's ability to use space. Such measures also provide some protection from space environmental factors. Protection measures must be consistent with the criticality of the mission's contribution to the war fighter and are applied to each component of the space system, including launch, to ensure that no weak links exist. Means of protection include, but are not limited to, ground facility protection (security; covert facilities; camouflage, concealment, and deception; and mobility), alternate nodes, spare satellites, link encryption, increased signal strength, adaptable waveforms, satellite radiation hardening, and space debris protection measures. The system of protection measures should provide unambiguous indications of whether a satellite is under attack or in a severe space weather environment when any satellite anomaly or failure occurs. Some attack indications could be so subtle or dispersed that, when indications are considered individually, an attack is not detectable. At a

minimum, a common fusion point for possible indications from all US government satellites should be provided to allow centralized analysis.

Prevention

Prevention measures are designed to preclude an adversary's hostile use of US or third-party space systems and services. Prevention can include military, diplomatic, political, and economic measures as appropriate.

Negation

Negation measures aim to deceive, disrupt, deny, degrade, or destroy an adversary's space capabilities. Negation can include action against the ground, link, or space segments of an adversary's space system.

Deception. Deception measures are designed to mislead the adversary by manipulation, distortion, or falsification of evidence to induce the adversary to react in a manner prejudicial to its interests.

Disruption. Disruption results in the temporary impairment (diminished value or strength) of the utility of space systems, usually without physical damage to the space system. These operations include the delaying of critical, perishable operational data to an adversary.

Denial. Denial seeks the temporary elimination (total removal) of the utility of an adversary's space systems, usually without physical damage. This objective can be accomplished by such measures as interrupting electrical power to the space ground nodes or computer centers where data and information are processed and stored. For example, denying US adversaries position navigation information could significantly inhibit their operations.

Degradation. Permanent partial or total impairment of the utility of space systems, usually with physical damage, is the goal of degradation. This option includes attacking the ground, control, or space segment of any targeted space system. All military options, including special operations, conventional warfare, and information warfare, are available for use against space targets.

Destruction. Destruction seeks the permanent elimination of the utility of space systems. This option includes attack of critical ground nodes; destruction of uplink and downlink facilities, electrical power stations, and telecommunications facilities; and attacks against mobile space elements and on-orbit space assets.

Space Force Enhancement

Force enhancement operations multiply joint force effectiveness by enhancing battlespace awareness and providing needed war-fighter support. There are five force enhancement functions: (1) intelligence, surveillance, reconnaissance (ISR); (2) integrated tactical warning and attack assessment (ITW/AA); (3) environmental monitoring; (4) communications; and (5) position, velocity, time, and navigation. They provide significant advantages by reducing the confusion inherent in combat situations. They also improve the lethality of air, land, sea, space, and special operations forces. Force enhancement functions are also often provided by agencies such as the National

Reconnaissance Office (NRO), National Security Agency (NSA), National Geospatial-Intelligence Agency (NGA), National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), commercial organizations, and consortiums. Missions are discussed below.

Intelligence, Surveillance, and Reconnaissance

Monitoring terrestrial (air, land, and sea) AOIs from space helps reveal location, disposition, and intention at the tactical, operational, and strategic levels of war. Such information provides warning of attack, operational combat assessment, tactical battle damage assessment (BDA), and feedback on how well US forces are affecting the adversary's understanding of the battlespace. ISR support is requested through established collection-management channels within the intelligence community. Dissemination down to the user/war-fighter level must be timely and assured.

Integrated Tactical Warning and Attack Assessment

Satellite- and ground-based systems are crucial for providing timely detection and communicating warning of an adversary's use of ballistic missiles or nuclear detonations to US strategic forces, tactically deployed forces, and allies. ITW/AA is a composite term in satellite and missile surveillance. Tactical warning is a notification to operational command centers that a specific threat event is occurring. The component elements that describe threat events are: (1) country of origin—country or countries initiating hostilities; (2) event type and size—identification of the type of event and determination of the size or number of weapons; (3) country under attack—determined by observing trajectory of an object and predicting its impact point; and (4) event time—time the hostile event occurred. Attack assessment is an evaluation of information to determine the potential or actual nature and objectives of an attack for the purpose of providing information for timely decisions.

Environmental Monitoring

Space forces provide data on meteorological, oceanographic, and space environmental factors that might affect operations in other battlespace dimensions. Additionally, space forces provide forecasts, alerts, and warnings of conditions in space. Imagery capabilities such as multispectral imagery can provide joint force planners with current information on surface conditions such as surface trafficability, beach conditions, vegetation, and land use. Knowledge of these factors allows forces to avoid adverse environmental conditions (such as poor surface conditions or severe weather), while taking advantage of other conditions to enhance operations. Such monitoring also supports intelligence preparation of the battlespace by providing the commander with information needed to identify and assess potential adversary courses of action.

Communications

Space-based communications offers many unique advantages that allow the joint force commander (JFC) and subordinate commanders to shape the battlespace. Using military satellite communications and, in some cases, civil, commercial, and international systems, the JFC and subordinate commanders can execute reachback operations, draw from planning support databases in the continental United States, sustain

the two-way flow of data, and disseminate plans, orders, and force status over long distances, thereby increasing command and control (C2) effectiveness, especially in areas with limited or no communications infrastructure. Satellite communications provide critical connectivity for maneuver forces whose rapid movement and nonlinear deployments take them beyond inherent line-of-sight (LOS) communication networks.

Position, Velocity, Time, and Navigation

Space forces provide precise, reliable position and timing information that permits joint forces to more effectively plan, train, coordinate, and execute operations. Space-based blue force tracking will improve C2 of assets and provide enhanced situational awareness while decreasing the chances of fratricide.

The Navstar GPS provides the primary space-based source for US and allied position, velocity, and timing requirements.[7] Certain ground-based systems, primarily allied equipment, also utilize similar information from the Russian GLONASS satellite constellation. This information enables precise location, velocity, and timing for such uses as navigation of terrestrial forces, combat identification, and target weaponeering for some precision munitions. However, GPS information does have limitations. Like communications satellite uplinks and downlinks, a GPS signal is also susceptible to hostile jamming and spoofing. Additionally, satellite information is only as accurate as the information uploaded to satellites. As such, errors in position, timing, and velocity can be induced into the downlinked information by uploading erroneous information to the satellite. Current satellite systems require continual monitoring and routine uploading of information in order to ensure accurate terrestrial position, velocity, and timing.

Space Support

Space support operations consist of operations that launch, deploy, augment, maintain, sustain, replenish, deorbit, and recover space forces, including the C2 network configuration for space operations. Specific functions consist of spacelift, satellite operations, rendezvous and proximity operations, and reconstitution of space forces.

Spacelift

Spacelift is the ability to deliver satellites, payloads, and material into space. Spacelift operations are conducted to deploy, sustain, or augment satellite constellations supporting US military operations. During periods of increased tension or conflict, a spacelift objective is to launch and deploy new or replacement space assets and capabilities necessary to maintain, augment, or add to the operational capability of space systems to achieve national security objectives. This requires responsive, affordable launch capabilities.

Satellite Operations

Satellite operations are conducted to maneuver, configure, and sustain on-orbit forces and to activate on-orbit spares. Military satellite operations are executed through a host of dedicated and common-user networks. The Air Force operates the Air Force Satellite Control Network (AFSCN) for common-use satellite operations. The Naval Satellite Control Network provides satellite operations of communications, oceanographic,

and research satellites and packages in support of all joint war fighters. Several systems utilize dedicated antennas for both mission data retrieval and routine satellite telemetry, tracking, and commanding (TT&C). The various networks combined ensure total C2 of space resources.

Rendezvous and Proximity Operations

Rendezvous refers to those operations that intentionally bring two resident space objects operationally close together. *Proximity* refers to on-orbit operations that deliberately and necessarily place and maintain a space object within a close distance of another space object for some specific purpose.

Rendezvous and proximity operations (RPO) can be used for on-orbit activities such as assembly and servicing and include the capability to support a wider range of future US space capabilities. All RPO activities must be coordinated to reduce on-orbit collision risks and to ensure flight safety procedures are in place.

Reconstitution of Space Forces

Reconstitution refers to plans and operations for replenishing space forces in the event of loss of space assets. This could include repositioning and reconfiguring surviving assets, augmentation by civil and commercial capabilities, and replacement of lost assets.

Space Force Application

The application of space force would consist of attacks against terrestrial-based targets carried out by military weapons systems operating in or through space. The force application mission area includes ballistic missile defense and force projection. In accordance with current US space policy, there are no force application assets operating in space. However, there are many strategists arguing for a reversal of this policy. See Dr. Everett C. Dolman's book *Astropolitik* for an in-depth discussion and argument on the subject of placing force application assets in space.

Space operations will continue to grow in importance due to the enabling capabilities they provide to the JFC and will continue to become more integrated into the overall military mission. A thorough understanding of the four mission areas of space operations will greatly contribute to mission success for all joint operations.

Notes

1. Everett C. Dolman, *Astropolitik: Classical Geopolitics in the Space Age* (New York: Frank Cass Publishers, 2002), 32.
2. JP 3-14, *Space Operations*, 6 January 2009, xiv.
3. Ibid, I-1.
4. James E. Oberg, *Space Power Theory* (Washington, DC: Government Printing Office, 1999), 137.
5. Ibid., 13.
6. FM 3-14, *Space Support to Army Operations*, 18 May 2005, 3-7.
7. Air Force Space Command, "Global Positioning System Constellation Status," http://gps.afspc.af.mil/gps/ (accessed 17 April 2009).