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## The Application of Space to Military and Naval Operations

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Commander Thomas G. Seigel, U.S. Navy

**E**VERY OFFICER IS FAMILIAR WITH AT LEAST some aspects of the "Space Age," whether from our popular culture's fascination with space or from what space systems actually provide deployed forces on a daily basis with respect to weather, navigation, communications, and intelligence. What is probably missing from a professional officer's understanding of space, however, is a unifying concept, a strategic and operational-level understanding as to what space-based systems can and cannot provide in war.

To develop an organizing principle for the application of space to waging war, it would be useful to adapt the currently accepted mission of "sea control" to space. Thus, taking the definition of sea control as "the ability to use the sea where, when, and how desired," and applying it to the newest theater of military and naval operations, space, we may extrapolate to define "space control" as "the ability to use space where, when, and how desired in order to support or conduct military or naval operations."

There are two complementary functions, or roles, subsumed in this overarching concept of space control: "space use" and "space denial." Extrapolating again from naval terminology, these new terms have the following meanings: "space use" is the ability to employ space as desired to support or conduct one's own military or naval operations; "space denial" is the ability to prevent the enemy from using space to his own advantage.

With these concepts in mind, possible space use and denial functions can be enumerated easily. For *space use* there are currently seven.

- Combat
- Intelligence (including intelligence preparation of the battlefield, reconnaissance, and targeting)

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- Communications
- Navigation
- Weather
- Battle Damage Assessment
- Missile Launch Detection and Warning

The first function, combat itself (the other six being combat-support roles), involves both attacks from space to earth (a future possibility) and antisatellite operations (a current capability). As weapons are placed in space or as terrestrial, sea, or aircraft-based antisatellite weapons are fielded, space will become another medium in which combat will occur or through which it will be propagated. When it does, space will be, in essence, a "mature" medium for warfare, just as land, sea, and, most recently, air have been. Like them, space will have its attendant strategies and doctrines, evolutionary and revolutionary.

The second space control function, space denial, is the converse of the first. Options for space denial may be considered to be bounded by the opportunities available to attack or otherwise negate either the space-based or terrestrial portion of an opposing space system. Using the terms "hard kill" (physical destruction) and "soft kill" (impairment of combat effectiveness by whatever means), we may list the following possible tactics.

- **Satellite as target:**

*Hard kill*—Antisatellite (ASAT) systems including direct-ascent ASAT missile, anti-ballistic-missile missiles with ASAT capability, co-orbital ASAT, laser, directed-energy weapons, electro-magnetic impulse, etc.

*Soft kill*—Electronic warfare; deception and concealment.

- **Satellite-related sites as targets:**

*Hard kill*—Attacks on ground sites.

*Soft kill*—Electronic warfare (including anticomputer options), political pressure, economic pressure, deception and concealment.

Antisatellite attack is what normally comes to mind when denying the use of space to an enemy is discussed. However, the options of space denial, broadly conceived, are more varied and allow a greater degree of flexibility than do ASAT operations alone. A course of action may be selected that is tuned both to the political environment of an emerging situation and the military outcomes desired.

If a satellite is the intended target, and a strong political statement through assured permanent destruction of that satellite is desired, then a hard-kill solution would be indicated. Currently, the only proven, operational ASAT capability resides in the Russian co-orbital system. The United States developed a homing ASAT missile, launchable from a specially configured F-15; after initial successful tests, however, it was discontinued as a result of congressional action. It is likely that the worldwide development of hard-kill ASAT weapons will continue,

although at a slow pace, and that various approaches will be explored, including laser, directed-energy sources, and kinetic-kill devices. For the near term, the Commonwealth of Independent States, especially Russia, and the United States will likely remain the only countries with the technical base and desire to develop such hard-kill weapons.

Other countries will presumably desire a hard-kill ASAT weapon, but they will find the soft-kill alternative more readily (if not currently) available, because of the simpler technological and industrial base it requires. If hard kill is either not feasible or not desirable (because of the political implications such an overt act may have), it is possible to negate satellites by electronic warfare (EW). In fact, unless satellites have been fitted with specific countermeasures, EW is perhaps the easiest means of putting them out of action. Electronic warfare provides four methods to counter a satellite: meaconing, interference, jamming, and intrusion (known collectively as MIJI).<sup>\*</sup> While jamming is effective and is probably the simplest of these four methods to employ (and perhaps the easiest for the satellite's operators to detect and verify), the remaining MIJI options offer many possibilities for intentionally manipulating satellites or their data to the detriment of an enemy, and not necessarily with his knowledge. They present an opportunity to develop an entirely new area for deception operations.

The second major option for space denial is concerned with the terrestrial side of any space system. All space systems are supported by a variety of essential facilities, which include launch and control sites, communications facilities, and tracking assets. These facilities are possible targets for efforts to negate or degrade the usefulness of a space system, and they can be affected through either hard or soft-kill techniques.

If the actual destruction of the land portion of a space system is intended, politics are certainly a major consideration in the calculus of this decision. Depending upon the target and the method to be employed, the political cost of such an overt act may be prohibitive. In fact, it is possible that the portion of a satellite's terrestrial system to be targeted may be located not in the enemy's country but in the territory of a third party. Additionally, this facility may be owned by an international corporation or consortium that may have substantial international legal standing. This circumstance will become even more likely as more countries join consortia in order to pool resources for commercial space ventures (which may have inherent military applicability). An additional consideration in attacking a space-related terrestrial target is the means to be employed. Direct attack by easily identifiable military forces (such as aircraft or cruise missiles) may not be desirable; other direct options do exist, however, such as

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<sup>\*</sup> "Meaconing" is the deliberate confusion of navigation (especially air) by rebroadcasting radio beacon signals. See *Department of Defense Dictionary of Military and Associated Terms*, JCS Pub 1-02 (Washington: U.S. Govt. Print. Off., 1 December 1989).

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insurgent, surrogate, or special operations forces. Each of these alternatives provides a degree of deniability that may be desirable.

There are other electronic, political, and economic approaches to space denial that are more attractive politically than the foregoing. They may even be useful for preventing conflict; by displaying resolve or by demonstrating the vulnerability of a potential opponent (especially one dependent on space systems), they may persuade an adversary to use means other than warfare. Soft-kill space denial avoids the need to rebuild a facility completely after the conflict is resolved, but it does not preclude resort to permanent destruction if the problem escalates.

The future will see a struggle for space control analogous to that in the twentieth century for air supremacy and the struggle for sea control that has been waged since the time of the ancient Greeks. In both cases, control of these mediums allowed the victor to "shape" the battlefield. Space has already served U.S. forces in conflicts of recent decades, but public acknowledgement of this fact has come only since Operations Desert Shield and Storm. What must also be recognized is that since American forces are heavily space-dependent, to retain the use of space must be a paramount consideration for U.S. planners in any future contingency. For the foreseeable future, conflicts will pit space-dependent U.S. forces against adversaries that have limited need for the medium. This asymmetry represents a potential Achilles' heel that could be exploited by a "space-smart" enemy; it would not be very difficult to do.

What is certain is that space, as a new medium or theater of military operations, is here to stay. If we are to prevail in this new environment, space control must become as commonplace to our professional mentality as the concepts of sea control and air supremacy. Failure to assimilate it may be disastrous, or at least seriously impede us, if we face an enemy who chooses to exploit our vulnerabilities. Space control will be as critical to future victories as air and sea control have been up to the present.

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[Robert E. Lee is] too cautious & weak under grave responsibility . . . wanting in moral firmness when pressed by heavy responsibility & is likely to be timid & irresolute in action.

General George B. McClellan  
Peninsula campaign, April 1862