China's Military Role in Space

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As the United States tries to square its commitments in Asia with declining budgetary resources, it is essential American decision makers tread carefully with regard to its space capabilities. These global assets are the backbone that allows the US military to fight in the manner to which it is accustomed. Consequently, in the event of a conflict involving the People's Republic of China (PRC), they are likely to be a primary target.

Over the past two decades, the PRC has paid careful attention to how other nations, but especially the United States, fight their wars. Space has consistently been part of the People's Liberation Army's (PLA) thinking about future conflict. At the same time, the PRC has grown from a developing country to the second largest economy in the world, with sufficient resources to create its own substantial space presence. Unlike previous conflicts in the Middle East, the Balkans, and Central Asia, if the United States engages in a conflict in the western Pacific, it will be confronted by a nation with a comprehensive set of space capabilities to counter America's own.

This article reviews the evolution of China's military thinking and the changed role of space within that context. It briefly examines China's space capabilities and development before discussing its concepts for military space operations and concludes with future Chinese space operations.

Evolution of Chinese Thinking about Military Space

While China's space program dates from the 1956 founding of the Fifth Academy of the Ministry of Defense, little public information is available on PLA thinking about space in the early years. This is likely due, in part, to the limited space capabilities available to the PLA, since China only orbited its first satellite in 1970.

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During this initial period, Chinese security thinking was dominated by leader Mao Zedong's focus on "early war, major war, nuclear war." According to Mao, the international security situation was marked by "war and revolution." The world, as envisioned by Mao, was on the brink of major global war. To prepare for it, Chinese military efforts were focused on the likelihood of protracted warfare against either Soviet or American invaders. This was further colored by Mao's belief in the continuing importance of "people's war," relying on extensive militia forces capable of waging guerrilla warfare rather than fielding conventional forces equipped with advanced weapons. Thus, perhaps two-thirds of Chinese defense industry facilities in the 1966–1975 time frame were built deep in the hinterland—scattered in valleys or buried in mountain redoubts—intended to support an extended guerilla war against the Soviet Union or the United States.[1] Even after China orbited its first satellite, the Dongfanghong-1, the military's focus was likely more on terrestrial conflict at a low level of sophistication rather than on military space operations.

When Deng Xiaoping succeeded Mao in 1978, military space considerations became even less of a priority. Far more pragmatic than Mao, Deng fundamentally altered the basis of Chinese security thinking from "war and revolution" to "peace and development." In essence, the expectation was that the world (and especially China) was no longer confronted by the prospect of imminent, major conflict. China therefore could shift its investment and planning horizon to the longer term. This allowed Deng to reallocate national resources away from military industries to rebuild the moribund civilian economy, with the top priorities being agriculture and light industry to produce consumer goods. Deng enforced a starvation diet on the Chinese military industrial complex. China's defense industries were expected to convert to civilian and commercial production to supplement their now-meager governmental contracts. In this context, space systems had to be justified based on their contribution to national economic development. According to Deng, the Chinese space program needed to focus less on gaining prestige and headlines and instead "concentrate on urgently needed and practical applied satellites."[2] During the early years of Deng's reign, only a few communications satellites and retrievable satellites (Fanhui Shi Weixing, whose payloads returned to Earth) were placed in orbit.

Having altered the assessment of the international situation, Deng, in 1985, set forth a new appraisal of the threat environment. He informed

the Central Military Commission (CMC), which is responsible for managing and overseeing the PLA, that "future conflicts were likely to be localized yet intensive."[3] Rather than "comprehensive war" or "all-out war (*quanmian zhanzheng*; 全面战争)"—major global war—the PLA would now prepare for "local war (*jubu zhanzheng*; 局部战争)," or wars that would occur within a defined area (most likely on China's periphery) using particular types of weapons (i.e., nonnuclear) with limited goals.[4]

Meanwhile, in the seventh five-year plan (1986–1990), it was reported that some 1,800 aerospace efforts were either converted or otherwise shifted toward commercial production. Indeed, Chinese computer and information technology advances during this period, including automated control systems and industrial robots, are all at least partially attributed to this shift by the aerospace industry toward civilian applications.[5]

Support for China's overall space program did not improve until 1986 when Deng, at the urging of a number of top Chinese scientists, authorized Plan 863, formally termed the National High-Technology Research and Development Plan (*guojia gao jishu yanjiu fazhan jihua*; 国家高技术研究发展计划).[6] Plan 863, which remains an ongoing effort, was seen as providing the scientific and technological research foundations essential for a modernizing economy. Aerospace, along with automation, advanced materials, and bio-engineering, were seen as key areas of high technology, justifying substantial, sustained resource investment. Even then, however, it is less clear how much it was incorporated into military planning, as the PLA was undergoing fundamental shifts in its outlook and doctrine.

At the same time, there was also recognition of the impact of modern technology. Chinese observations of the "Fourth Middle East War" (i.e., the 1973 Yom Kippur War), American military operations in Vietnam, and the 1982 Falklands conflict demonstrated that modern weapons offered increasing reach and lethality. Future conflicts would therefore be "local wars under modern conditions," an incremental improvement over World War II at the operational level, incorporating modern weapons, including precision-guided munitions.

Space and Local Wars under Modern, High-Tech Conditions

The coalition performance against Iraq in Operation Desert Shield/Desert Storm served as a wake-up call for the PLA. It demonstrated that

modern high technology was not a marginal change but had fundamentally altered the operational art. As the then–deputy director of the PLA's "think-tank," the Academy of Military Science (AMS), observed, "The Gulf War marked a big step forward in both military theory and practice."[7]

The PLA engaged in extensive analysis of coalition operations and sought to incorporate the resulting lessons into its own approach to war. The result was a thorough revision of almost every aspect of PLA thinking about future conflict. In 1993, the PLA produced a new set of "Military Strategic Guidelines for the New Period," introducing the concept of "local wars under modern, high-tech conditions." These guidelines constitute "the highest level of national guidance and direction" to the Chinese armed forces.[8]

In a December 1995 speech to the CMC, party general secretary Jiang Zemin, who succeeded Deng Xiaoping, emphasized the importance of these new guidelines when he charged the PLA with undertaking the "two transformations (*liangge zhuanbian*; 两个转变)." These entailed a shift from a military focused on quantity to one focused on quality, and from a military preparing for "local wars under modern conditions" to one that was preparing for "local wars under modern, high-tech conditions."[9]

According to PLA assessments, local wars under modern, high-tech conditions were marked by several key characteristics:

- The quality as well as the quantity of the weapons mattered. The side with more-technologically sophisticated weapons would be able to determine the parameters of the conflict and effectively control its scale and extent.
- The battlefields associated with such conflicts would be three-dimensional and extend farther and deeper into the strategic rear areas of the conflicting sides.
- The conflict would be marked by high operational tempos conducted around the clock under all weather conditions.
- The fundamental approach to warfare would be different. Such wars would place much greater emphasis on joint operations, while also incorporating more aerial combat, long-distance strike, and mobile operations.
- The role of command, control, communications, and intelligence was paramount. C3I functions were seen as essential to successful

> implementation of such wars; consequently, the ability to interfere with an opponent's C3I functions also became much more important.[10]

These latter two aspects—the role of joint operations and the importance of C3I—in turn both influenced the assessment of what role space should play in the PLA's concepts of operations.

The PLA's assessment of the first Gulf War highlighted the role of joint operations—operations involving two or more services at the operational level, according to a single plan, under a single command structure.[11] An instructor at China's National Defense University (NDU) noted that the Gulf War's "characteristics of a joint operation of all branches of the military displayed in that war gave us a glimpse of things to come in the early 21st Century."[12] PLA analyses concluded that the ability to coordinate the operations of different services would produce synergies that no single service could hope to match. Joint operations were seen as the "fundamental expression" of "local wars under modern, high-tech conditions."[13]

In this light, space capabilities were recognized as playing an essential role in any effort to wage a local war under modern, high-tech conditions. The 70 satellites that were ultimately brought to bear against Iraq provided the United States, according to PLA estimates, with 90 percent of its strategic intelligence and carried 70 percent of all transmitted data for coalition forces.[14] Indeed, these assets were the first to be employed, since they were essential for the success of subsequent campaign activities. As one Chinese analysis observed, "Before the troops and horses move, the satellites are already moving."[15]

Nonetheless, there were still some doubts apparently about the importance of the role of space. In the 1997 *PLA Military Encyclopedia*, the discussion for "space warfare (*tianzhan*; 天战)" explicitly states that space is not a decisive battlefield; the key to wartime victory would remain in the traditional land, sea, and air realms. "It is impossible for it [space warfare] to be of decisive effect. The key determinant of victory and defeat in war remains the nature of the conflict and the human factor."[16] Space was seen as a supporting, not a leading, player.

This growing emphasis on joint operations ultimately led to the revision of the PLA's combat regulations (*zuozhan tiaoling*; 作战条令), the operational guidance governing PLA operations at the campaign and tactical levels. In June of 1999, the "First Generation Operations Regulations," issued in the mid 1980s, were replaced with the "New Generation Operations Regulations." The product of several years of debate and study,

these new combat regulations made joint operations the capstone.[17] In essence, the PLA was stating that individual service campaigns are subordinate to joint campaigns, and it would train and equip itself to that effect.[18]

As envisioned by the PLA, joint operations would involve multiple services operating together across significant distances. The Gulf War, for example, sprawled across some 140 million square kilometers and included forces ranging from armored units to aircraft carriers and long-range bombers.[19] The successful conduct of joint operations on this physical scale, involving forces operating across a variety of domains, would therefore require close coordination, including not only extensive communications but also precise navigation and positioning information, both for units and for the growing plethora of precision munitions. Nor are joint operations solely a matter of combat forces; the demands of *local wars under modern, high-tech conditions* also require coordination of both combat and attendant logistical forces. Joint operations were therefore seen as requiring the ability to command and control operations across five domains: the traditional ones of land, sea, and air but increasingly also outer space and electromagnetic (cyber) space.

Conversely, as one PLA volume observed, future conflicts would also likely entail significant efforts at disrupting the enemy's ability to coordinate its forces, thereby paralyzing the entire array of enemy combat systems.[20] That, in turn, would entail operations in space and cyberspace to degrade enemy abilities while safeguarding one's own.

By 2002, however, this view had evolved further. In that year's supplement to the *PLA Encyclopedia*, a very different assessment is made of the importance of space. In a discussion on "space battlefield (*taikong zhanchang*; 太空战场)," the entry concludes with the observation that the impact of the space battlefield on land, sea, and air battlefields will become ever greater, and the space battlefield "will be a major component of future conflict."[21] It is clear that space, in the interval, was perceived as a substantially more important arena for military operations.

This progression may have been partly due to the intervening NATO conflict in the Balkans. The ability to defeat Belgrade through airpower clearly caught Beijing's attention. In their analyses of that conflict, the role of space power gained further prominence. NATO forces are assessed to have employed some 86 satellites.[22] These provided a dense, continuous flow of real-time data, allowing the NATO forces to establish precise locations for Serbia's main military targets for sustained, coordinated strikes.[23]

Space and Local Wars under Informationized Conditions

This shift may also have been a reflection of the ongoing development of Chinese concepts of future warfare. In 2004, Hu Jintao assumed chairmanship of the CMC, two years after becoming general secretary of the Chinese Communist Party (CCP). In December of that year, he gave a speech in which he outlined the "historic missions of the PLA in the new phase of the new century (*xinshiji xinjieduan wojun lishi shiming*; 新世纪新阶段我军历史使命)." These new historic missions include

- guaranteeing the continuing rule of the CCP;
- safeguarding national economic development through defense of sovereignty, territorial integrity, and domestic security;
- safeguarding China's expanding national interests, specifically including access to space (*taikong*; 太空) and the electromagnetic sphere; and
- helping ensure world peace.[24]

Incorporating space into the specific responsibilities of the PLA in terms of its *new historic missions* would seem to indicate a growing view of space as essential to Chinese security. It also clearly charges the PLA with undertaking military space missions.

Also during this period, the concept of future wars was further refined. From *local wars under modern, high-tech conditions*, the PLA now expected to engage in *local wars under informationized conditions*. This new phrase began in 2002 and was incorporated into the 2004 Chinese defense white paper.

Informationized conditions, in this context, did not simply refer to computers and cyber warfare. Rather, the informationized battlefield (*xinxihua zhanchang*; 信息化战场) is one in which all the relevant military activities—including tactics and operations as well as decision making—are digitized, and military materials and equipment are managed through advanced information technology.[25] The shift in terminology reflected the PLA's conclusion that, among the various high technologies, the most important with the most far-reaching impacts are those relating to information management.

This conclusion was also reflected in an apparent modification of the "campaign basic guiding concept (*zhanyi jiben zhidao sixiang*; 战役基本指导思想)." The campaign basic guiding concept is a distillation of military laws and theories and is intended to serve as a guide for PLA officers

in planning, organizing, and prosecuting campaign-level operations. In some ways, it somewhat parallels the "principles of war," while taking into account contemporary conditions.

In the 2001 edition of *The Science of Campaigns*, a PLA textbook, the "campaign basic guiding concept" for "local wars under modern, high-tech conditions" was established as "integrated operations, key point strikes (*zhengti zuozhan zhongdian daji*; 整体作战，　重点打击)." *Integrated operations* meant integrating all forces, integrating operations across all domains, and integrating all methods of warfare. *Key point strikes* meant concentrating forces on the key strategic direction at the critical junctures and moments against essential enemy targets so as to cripple and paralyze enemy forces.[26]

By the 2006 edition, the campaign basic guiding concept had changed. It was now "integrated operations, precision strikes to control/constrain the enemy (*zhengti zuozhan, jingda zhidi*; 整体作战, 精打制敌)." *Precision strikes* involve the use of precision munitions to attack vital targets. The goal is not only to destroy the enemy's key points but also to precisely control the course and intensity of a conflict.[27] It also entails disrupting the enemy's system, not just his weapons or forces.[28]

Central to the conduct of such strikes is the ability to establish superiority, or dominance, over the information realm. Seizing information superiority or dominance (*zhi xinxi quan*; 制信息权), is seen as vital.[29] An essential means of attaining information dominance, in turn, would be through military space operations. "Establishing space dominance, establishing information dominance, and establishing air dominance in a conflict will have influential effects."[30]

What did not change was the central role of joint operations. These are still seen as a key part of *local wars under informationized conditions* and remain the means for the PLA "to bring the operational strengths of different services and arms into full play."[31] Similarly, space operations remain an important part of joint operations, whether under high-tech or informationized conditions. In the 2001 edition of *The Science of Campaigns*, space is described as an essential part of fighting future wars, and the ability to undertake the kinds of operations needed to win such wars is substantially rooted in the ability to exploit space.[32] The 2006 edition specifically states that "the space domain daily is becoming a vital battlespace. . . . Space has already become the new strategic high ground."[33]

Chinese Space Capabilities

Concomitant with the growing interest in the military role of space in the wake of the first Gulf War, China's overall space capabilities expanded significantly during the past two decades. Indeed, its growth during this period is in sharp contrast to its first 20 years in space.

From 1956 to 1976, China enjoyed only very limited advances in its space capabilities due to a lack of financial, technological, and trained human resources as well as repeated political upheavals that disrupted research efforts. Even after orbiting its first satellites in 1970, space development remained limited, with only a handful of satellites orbited before Mao died in 1976. As noted earlier, Deng Xiaoping initially did little to promote space development for either the military or civilian sectors. Rather than commit further resources toward space during his first several years in power, Deng diverted them toward the civilian economy, forcing the space industrial sector to fend for itself through conversion to products with civilian demand.

In the 1990s, however, China's space program benefited from renewed investment and high-level support. Under Jiang Zemin (1992–2002), China deployed both low-Earth orbit and geosynchronous weather satellites (the Fengyun series) as well as improved geosynchronous communications satellites (the Dongfanghong-3 series) and recoverable satellites with varying payloads (the Fanhui Shi Weixing-2 series).

Chinese earth observation capabilities also improved during this period. In cooperation with Brazil, China in 1999 deployed the China Brazil Earth Resources Satellite (CBERS), its first electro-optical imaging satellite capable of beaming pictures directly down to Earth. China subsequently launched several similar satellites without Brazilian involvement; these are known as the Ziyuan series to distinguish them from the CBERS satellites.

In 2000, China became only the third country to deploy a navigational satellite system, launching two Beidou regional navigation satellites into geosynchronous orbit. This system also has a communications function, which was employed during the 2008 Sichuan earthquake.[34]

Since succeeding Jiang Zemin in 2002, Hu Jintao, the current party general secretary, chairman of the Central Military Commission, and PRC president, has maintained support for China's space program. During his two terms, China has deployed a variety of additional satellites, including new remote sensing satellites (the Yaogan series), microsatellites such as the Shijian series, and improved versions of the Fengyun and Ziyuan series.

Under Hu, China has also orbited several manned spacecraft (the Shenzhou program), as well as initiated a lunar exploration program, launching the Chang'e 1 and 2 lunar probes.

These investments were not solely for military purposes; indeed, Deng's admonition to focus on national economic development still seems to resonate in many aspects of China's space program. Its development of earth observation satellites, position and navigation systems, and weather satellites all support Chinese economic development objectives. But they also provide the PLA with key pieces of information deemed essential for *local wars under high-tech conditions*, as well as *local wars under informationized conditions*. And since the PLA's General Armaments Department (GAD) runs its space facilities, the military's role in China's space program should not be underestimated.[35]

Indeed, under Hu Jintao, China also demonstrated its space *combat* capabilities. The PLA tested its direct-ascent, kinetic-kill antisatellite (ASAT) system in January 2007. Launched from Xichang Satellite Launch Center, the ASAT missile destroyed a defunct Fengyun-1C weather satellite in low orbit. In the process, it also generated a massive amount of space debris.[36] Almost precisely three years later, in January 2010, China engaged in what was termed an antimissile test involving "two geographically separated missile launch events with an exo-atmospheric collision also being observed by space-based sensors," according to the US Department of Defense.[37] This test, however, likely also helped Chinese scientists improve their ASAT system. And in August 2010, two Chinese microsatellites were deliberately maneuvered into close proximity and apparently "bumped" each other.[38]

Today, China's space program is supported by a space industrial complex believed to involve over 200,000 people. Two major aerospace conglomerates, the China Aerospace Science and Technology Corporation (CASTC) and the China Aerospace Science and Industry Corporation (CASIC), manufacture the full range of space systems, including launch vehicles, satellites, ground equipment, and the associated subsystems and support items.

Chinese Space Development Priorities

The 2011 Chinese space white paper outlines a range of new capabilities the PRC expects to field in the course of the ongoing 12th five-year plan (2011–2015).[39] Besides the commitment to studying a human mission to the moon (the first time such a project has been officially included in a formal state document), the new space white paper indicates that the PRC

will be pursuing new launch vehicles, a new launch site, and a variety of new satellites. There appears to be a comprehensive modernization and improvement effort underway within China's space program. Many of these new systems will support both military and civilian users.

Launch vehicles include the Long March 5 heavy-lift vehicle, the Long March 6 light- to medium-lift vehicle, and the Long March 7 medium-lift vehicle. Interestingly, reports suggest there will be a high degree of commonality among the three designs, including possibly a modular approach to facilitate production.[40] The Long March 5, which may be comparable to the American Delta IV and the European Space Agency's Ariane 5, will likely be launched from the new facility under construction on Hainan Island, which should be completed in the course of this five-year plan. Chinese tracking, telemetry, and control (TT&C) facilities will also be upgraded, including provision of better tracking of systems beyond geosynchronous orbit.

The white paper lists a number of new satellite programs that might be orbited with these new systems. Prominent among them is a new high-resolution earth observation system, providing Chinese decision makers with "a stable all-weather, 24-hour, multi-spectral, various-resolution" capability. In essence, China, having previously deferred the acquisition of high-resolution reconnaissance satellites, will now begin developing one. This is likely to be supplemented by satellites mounting synthetic aperture radars, ostensibly for "environment and disaster monitoring."[41] In addition, China expects to continue augmenting its Beidou navigation constellation, enabling it to provide global rather than regional service.

Other programs mentioned in the space white paper include further developments in satellite applications as well as systems for tracking space debris, for simulating space debris collisions, and "a system to protect spacecraft from space debris." [42]

While some of these programs may have military applications, the space white paper itself makes no mention of military programs and only briefly mentions the term "national security" at all.

Chinese Concepts of Military Space Operations

Despite clear PLA interest in space and a substantial space infrastructure, as well as demonstrated space weaponry, as of 2011 there is no publicly available evidence that it has promulgated a specific doctrine governing

military space operations. This should not be surprising. A decade after the "Year of Regulations," those combat regulations governing such operations remain classified.

Certain themes recur in Chinese writings on military space operations, however, and these are likely to be incorporated into any formal PLA space doctrine. For example, there seems to be a consensus on what "space dominance (*zhitian quan*, 制天权); also translated as "command of space," or "space superiority")" or "space control (*taikong kongzhi*; 太空控制)" means: the use of space capabilities to exert control or to maintain the initiative (*kongzhi quan huo zhudao quan*; 控制权或主导权), during a certain time, over a certain area of outer space (*zai yiding de shijian nei dui mou yi kongjian lingyu*; 在一定的时间内对某一空间领域).[43] It incorporates both military space operations and what American theory would term offensive and defensive space control as it involves efforts aimed at limiting, reducing, or disrupting the enemy's aerospace systems and combat effectiveness as well as ensuring that one's own aerospace systems can operate normally and at full effectiveness.

One seeks space dominance as a means toward obtaining information dominance, or information superiority (*zhi xinxi quan*; 制信息权). Thus military space operations are often discussed in the context of the need to obtain information or to deny it to an opponent.[44] Similarly, the establishment of space dominance is often described in holistic terms involving disparate forces, both space based and non–space based, and involving not only operations in space but also on the ground, in the air, and at sea as forces act against not only space platforms but also terrestrial support facilities and the data links that tie the two together.[45]

Insofar as "strategic concepts are translated to doctrine through the development of campaign guidelines, and these guidelines [then] drive capabilities development," Chinese writings which discuss campaign guidelines and relate them to space operations would likely reflect potential aspects of any nascent Chinese military space doctrine.[46]

In this regard, Maj Gen Chang Xianqi's writings may provide significant insight. Chang was formerly commander of the GAD's Academy of Equipment Command and Technology (*zhuangbei zhihui jishu xueyuan*; 装备指挥技术学院) which, according to PLA writings, is the main institution responsible for training the personnel that staff China's space-related facilities, including launch sites and mission control centers.[47] In

2002, Chang wrote the PLA textbook *Military Astronautics*, which was reissued in 2005 in a second edition.

In his book, Chang proposes a "guiding concept for space operations (*kongjian zuozhan de zhidao sixiang*; 空间作战的指导思想)." Interestingly, it would seem to be modeled on the earlier campaign basic guiding concept: "Unified operations, key point is space dominance."[48]

Unified Operations

According to Chang, the establishment of space dominance will entail unified operations (*yiti zuozhan*; 一体作战), which will in turn involve unified forces, techniques, and operational activities.[49]

Unified forces involve two aspects. One is the integration of civilian and military space systems, both in prewar planning and wartime application. This provides a more robust capability at a lower cost. The other is unifying space forces with land, sea, air, and electromagnetic forces in joint operations. Terrestrial forces benefit from space support and can both degrade opponents' space forces (e.g., through attacks against ground stations) and preserve one's own space capabilities (by defending against comparable attacks).[50]

Unified techniques refer to combining soft-kill and hard-kill methods. It should be noted that both soft- and hard-kill techniques serve the same ends, which is to reduce an opponent's advantage in space while preserving one's own to secure space dominance. Soft-kill techniques are less likely to incur international repercussions but may allow an opponent to recover.[51] They include not only measures aimed at space hardware, such as "dazzling," but also cyber attacks aimed at either satellite systems or their terrestrial control elements. Hard-kill techniques may also be aimed at destroying not only satellites (such as in the 2007 ASAT test), but also include attacks against TT&C facilities and launch sites. Such measures will permanently remove a facility or a system but can create significant political problems and may be seen as escalatory.[52] PLA authors such as Chang would seem to support an approach that balances disruption (soft-kill) and destruction (hard-kill) of an opponent's space systems.

Unified operational activities involve coordinating offensive and defensive operations. Offensive activities, which may include both soft-kill and hard-kill methods, are likely to be undertaken at the earliest possible moment to seize the initiative and force the enemy into a reactive mode.[53] Defensive activities, meanwhile, will also be implemented from the onset

of operations to limit the effectiveness of enemy efforts to interfere with, seize, destroy, or disrupt one's own space systems.[54] These will include active and passive measures. Active defenses include the provision of air defenses and security forces. Passive measures include efforts at camouflage and concealment of space-related facilities, including launch and TT&C facilities, deception measures, redundancy, and mobility. Mobile TT&C facilities, for example, should be developed and deployed to concealed locations, ready to replace fixed sites should the latter be attacked.[55]

Key Point Is Space Dominance

The purpose of the unified operations outlined above is to establish space dominance, or space superiority (*zhitian quan*; 制天权)—the ability to exploit space for one's purposes, at the times and places of one's choosing, while denying an opponent that same freedom of action. To obtain space dominance, one needs to sustain the uninterrupted operation of space information collection and transmission systems. Key space platforms include

- reconnaissance satellites to conduct comprehensive, timely, and accurate intelligence gathering on enemy forces;
- communications satellites to provide global, all-weather, unbroken, secure, reliable communications and data relay;
- navigation and positioning satellites to allow one's own forces to engage in rapid, precise, mobile operations and engage in precision warfare against an opponent;
- weather satellites to collect global weather information; and
- survey and earth-observation satellites to precisely map various terrestrial terrain features, including potential enemy targets.[56]

Satellites alone, however, are not sufficient. Orbiting systems must be backed by a complete supporting infrastructure, including space launch facilities, TT&C systems, and the attendant data links that bind the components together. Successful efforts at establishing space dominance therefore must also take into account the sustainment of this entire structure of terrestrial and space systems and associated data and communications links, while striving to degrade or destroy an opponent's.[57]

To this latter end, one needs to conduct unified operations against an opponent's most important space targets. These are the key information and space assets which will most affect the enemy's capabilities in the main strategic direction. They should be attacked by one's best forces at the crucial moments of the campaign with the aim of degrading the enemy's ability to field unified space power.

Future Space Operations

Within the guiding operational concept that "unified operations, key point is space dominance," the PLA would likely pursue one or more specific types of space operations, including providing space information support, space offensive operations, space defensive operations, and space deterrence. It is important to recognize that such operations will most likely not be undertaken alone but in the context of a larger, joint campaign such as a joint landing campaign or a joint blockade campaign. The purpose of such operations is to effect information dominance by securing space dominance.

Space Information Support Operations

The foremost task for PLA space forces is to provide information from space-based sensors and platforms. Key tasks within this mission area of space information support (kongjian xinxi zhiyuan; 空间信息支援) to the ground, air, and naval forces include

- space reconnaissance and surveillance,
- communications and data relay,
- navigation and positioning,
- early warning of missile launches, and
- earth observation, including geodesy, hydrographics, and meteorology.[58]

Space information support is considered essential for *local wars under informationized conditions*. It allows global, real-time probing and early warning, permits intercontinental communications, and is the basis for implementing long-range precision operations. Moreover, it is not subject to limitations of national borders, weather, or geography.[59]

Space Offensive Operations

In addition to traditional space information support operations, several Chinese analysts seem to believe that future military space activities will include space offensive operations. Given the view that space capabilities include not only orbiting platforms but also terrestrial facilities and the associated data links that tie the entire network together, it should not be surprising that the general tenor of PLA writings suggests that space offensive operations involve attacking space-related targets both in orbit and on the ground.

Essential targets for securing space dominance include satellites and other objects in orbit as well as the ground components of space systems, including space launch vehicles and their launch sites and the attendant data and communications systems. Attacking an opponent's terrestrial space support functions is an essential means, in this view, of securing an advantage comparable to traditional attacks against enemy command nodes or military bases.[60] Such attacks carry the additional advantage of retarding an opponent's ability to reinforce or replace damaged or destroyed orbiting systems. As one analysis notes, striking at both space and terrestrial targets is necessary to establish local space superiority.[61]

Chinese authors, however, also recognize that attacks against terrestrial targets, especially those based in the enemy's home territory, are likely to have significant strategic implications and potential repercussions. Therefore, attacks against strategic space targets require the direction of the highest-level political authorities.[62]

Space Defensive Operations

While conducting space information operations and offensive operations, the PLA also expects to undertake space defensive operations. These seek to defend one's own space systems from attacks by enemy space or terrestrial weapons and also to protect national strategic targets from attacks from space systems or ballistic missiles.[63]

Defensively oriented operations need not mean solely passive or reactive measures. As one PLA article notes, one can, and should, also employ offensive means and seek the initiative in the course of space defensive operations. Both offensive and defensive means, moreover, should be undertaken by space forces in concert with land, sea, and air forces.[64] In the PLA's view, a combination of electronic and physical measures—including firepower strikes—may disrupt and suppress enemy space systems,

especially terrestrial support components such as the TT&C facilities, thereby allowing one's own side to achieve space dominance.

Passive measures will supplement counterattacks and active defenses. Chinese writings suggest that space systems should, as much as possible, incorporate camouflage and stealth measures to hide the nature and functions of spacecraft from opposing observation and probes.[65] They should also be hardened or otherwise shielded from enemy efforts at dazzling and interference. Another option is the deployment of small and microsatellites in networks and constellations rather than single large systems. Larger satellites should be capable of altering their orbits to evade enemy attacks and should be capable of functioning autonomously, so that even if their ground links are severed, they would nonetheless be able to continue operations.[66] Other measures include deploying satellites into orbits designed to avoid enemy detection; employing political, diplomatic, and other channels to mislead opponents on real operational intentions or otherwise confuse enemy decision making; and deploying false targets and decoys to overload opponents' tracking capacities.

It should be noted that the Chinese concept of "space defensive operations" does not necessarily parallel "defensive space control," as laid out in US Joint Publication 3-14, *Space Operations*. Indeed, some aspects would seem to overlap with those of "offensive space control" in the American sense.[67]

Space Deterrence Operations

Chinese writings also indicate that a key task for China's space forces, besides the provision of information, offensive operations, and defensive operations, is effecting space deterrence. For example, in the PLA textbook *Science of Strategy*, published by its Academy of Military Science, there is an extensive discussion about the requirements for strategic deterrence which may be based not only upon nuclear, conventional, and information strength but also upon space-based strength.[68]

In each case, the intent is the same: to dissuade an opponent from pursuing certain policies while persuading that opponent to pursue other policies. As the volume notes, both persuasion and dissuasion "demand the opponent to submit to the deterrer's volition."[69] The idea that deterrence essentially allows one to achieve one's own strategic goals while frustrating an opponent without having to resort to the actual use of force is echoed in other PLA writings.[70]

Space capabilities have several characteristics that make space deterrence especially powerful. In the first place, they enhance both conventional and nuclear forces, making them much more powerful through the provision of navigational, reconnaissance, and communications information.

Moreover, space systems per se may intimidate an opponent. They are very expensive and hard to replace. By holding an opponent's space systems at risk, one essentially compels it to undergo a cost-benefit analysis. Is the focus of deterrence worth the likely cost of repairing or replacing a badly damaged or even destroyed space infrastructure? Moreover, because space systems affect not only military but also economic, political, and diplomatic spheres, damage to space systems will have wide-ranging repercussions.[71]

Implications for the United States

The clear Chinese interest in the military role of space should serve as a caution for US policy makers, whether their focus is on China, US military efforts in the western Pacific, or space policy. Of particular concern is China's capacity to undertake what the US calls "antiaccess/area denial (A2/AD)" activities. China's growing space capabilities make it qualitatively different from any other post–Cold War or potential adversary. Since the fall of the Soviet Union, the United States has not had to deal with any opponent who has the capacity to either field its own space-based capabilities or to threaten US space assets and systems. Whereas Washington could, through sheer expenditure of funds, prevent Baghdad or Belgrade from accessing space information, Beijing's possession of the full array of space information systems means this policy would not be viable in the event of a conflict in the western Pacific.

China's demonstrated capabilities in space weapons exacerbate this concern. They underscore the likelihood that Chinese A2/AD capabilities apply in both the terrestrial and space context. Indeed, the DoD has recognized this reality in the new *Joint Operational Access Concept*, noting that "a logical opening operation to any antiaccess campaign is to neutralize US space assets."[72]

Unfortunately, there is little reason to believe that the United States and the PRC will reach a mutual accommodation on space security. For the PRC, the ability to successfully engage the United States, which it still views as a technologically superior foe, is essential in effecting deterrence and fulfilling the PLA's "new historic missions." This is *not* to suggest that

the Chinese government or military want confrontation. Rather, it is to note that it would be irresponsible for Chinese military officers, given their tasks and missions, not to seek ways to fulfill their orders. Both sides recognize that "space has become the primary location for global and regional reconnaissance assets used for . . . intelligence gathering, and support of combat operations on the earth's surface."[73] It is therefore logical for both sides to try to exploit space for their own ends while denying it to opponents. This situation is further complicated by the significantly different strategic situations confronting the two states and has led to asymmetric dependencies on space, given the different requirements for space capabilities.

For the PRC, although its military has slowly shifted from a contingency-based planning approach toward a capabilities-oriented one, the focus is regionally oriented. China's main security concerns are on its periphery: the foremost being Taiwan, but also the South China Sea and the Sino-Indian border. All of these potential flashpoints can be monitored without requiring space assets.

For the United States, on the other hand, its various commitments, whether to Taiwan, Japan, or the Philippines, all require an expeditionary posture. "The tyranny of distance" in the Asia-Pacific complicates American planning and operations much more than the PLA's. To provide the necessary intelligence, communications, and navigational information, the United States will therefore have to rely much more heavily on space than its Chinese counterparts. Consequently, any diminution of space capabilities will disproportionately affect American operations. Insofar as the United States is intent on effecting a "pivot" to the western Pacific, preserving access to space is an absolute prerequisite.

This dependence on space means that the United States must be able to operate in a degraded space environment, even in the face of concerted adversary action. This is likely to remain the case for the foreseeable future, even as it develops and fields alternatives to space-based systems for key mission areas. Maintaining such an ability would, in fact, serve as an effective deterrent to hostile actions in space—if such actions cannot deny US military forces vital information, then an opponent is likely to pursue alternative, nonspace means (which are likely less expensive and less challenging). Conversely, vulnerabilities, especially in such core areas as space, invite exploitation.

For US policy makers, then, the securing of American interests in space can only come from maintaining a robust space capacity, including modern systems (both in orbit and on the ground), good space situational awareness, and a healthy space industrial base to support these efforts. It must also include military space forces that are realistically trained and not hamstrung by rules of engagement, which require minutes to adjudicate when seconds count.

Within this framework is a place for space diplomacy and especially for ongoing dialogue with all space-faring powers, but only so long as participants are willing to discuss such things as space policy making and space decision making, steps toward genuine transparency, and a means of establishing crisis stability. Pursuit of space agreements, whether arms control treaties or codes of conduct, without first establishing this foundational set of interactions and mutual understanding, is an invitation to miscalculation and misconception at best and jeopardizes military training, readiness, and crisis response capabilities at worst. SSQ

Notes

1. Richard Bitzinger and J. D. Kenneth Boutin, "China's Defence Industries: Change and Continuity," in *Rising China: Power and Reassurance*, ed. Ronald Huisken (Canberra: ANU E Press, 2009), 131.

2. Li Dayao, "A Survey of the Development of Space Technology in China," *China Aerospace* (June 1999), 16–19, translated in FBIS-CHI [Foreign Broadcast Information Service–China], 21 September 1999.

3. David Shambaugh, *Modernizing China's Military: Progress, Problems, and Prospects* (Berkeley: University of California Press, 2002), 64.

4. *Chinese Military Encyclopedia* Committee, *Chinese Military Encyclopedia*, Vol. 2, (Beijing: Academy of Military Science [AMS] Publishing House, July 1997), 317.

5. "China's Aerospace Industry and Civil-Military Industrial Integration," *China Aerospace* (March 2001): 18.

6. Material drawn from *Guojia Gao Jishu Yanjiu Fazhan Jihua 863*, in FBIS-CHI, 21 July 2000. For further discussion of the creation of Plan 863, see Evan Feigenbaum, *China's Techno-Warriors* (Stanford, CA: Stanford University Press, 2003), esp.141–43.

7. Shi Yukun, "Lt. Gen. Li Jijun Answers Questions on Nuclear Deterrence, Nation-State, and Information Age," *China Military Science* 3 (1995), in FBIS-CHI, August 1995.

8. David Finkelstein, "China's National Military Strategy: An Overview of the 'Military Strategic Guidelines'," in *Right-Sizing the People's Liberation Army: Exploring the Contours of China's Military*, ed. Roy Kamphausen and Andrew Scobell (Carlisle, PA: Strategic Studies Institute, 2007), 82.

9. Zhang Qinsheng and Li Bingyan, "Complete New Historical Transformations—Understanding Gained from Studying CMC Strategic Thinking on 'Two Transformations'," *People's Liberation Army Daily*, 14 January 1997, in FBIS-CHI.

10. *Chinese Military Encyclopedia*, Vol. 2, 126–27.

11. Gao Yubiao, ed., *Joint Campaign Course Materials* (Beijing: AMS, August 2001), 26–27.

12. Col Zhou Xiaopeng, "On the Development of Joint Operations Theory," *China Military Science* (May 1996), in FBIS-CHI, May 1996.

13. Gao Yubiao, *Joint Campaign Course Materials*, 12.

14. Ibid., 54.

15. Gao Qingjun, "Characteristics and Deficiencies of Space Reconnaissance in High-Tech Local Wars," *Journal of the Academy of Equipment Command and Technology* 1, no. 16 (February 2005).

16. *Chinese Military Encyclopedia*, Vol. 3, 602.

17. David Finkelstein, "Thinking About the PLA's 'Revolution in Doctrinal Affairs'," in *China's Revolution in Doctrinal Affairs*, ed. James Mulvenon and Finkelstein (Alexandria, VA: CNA Corporation, 2005), 1.

18. Gao Yubiao, *Joint Campaign Course Materials*, 12–25.

19. Wang Houqing and Zhang Xingye, eds., *The Science of Campaigns* (Beijing: National Defense University [NDU] Publishing House, May 2000), 400.

20. Ibid.

21. *Chinese Military Encyclopedia*, supplemental vol., 455.

22. Zhang Yuwu et al., "Informationalized Warfare Will Make Seizing the Aerospace Technology 'High Ground' a Vital Factor," *People's Liberation Army Daily*, 30 March 2005.

23. Liu Kejian and Wang Xiubo *The First Conflict Won Through Airpower: The Kosovo War* (Beijing: AMS, 2008), 44.

24. Hu Jintao, "See Clearly Our Military's Historic Missions in the New Period of the New Century," speech to the CMC, Beijing, 24 December 2004. For further discussion of the "new historic missions," see Daniel Hartnett, *Towards a Globally Focused Chinese Military: The Historic Missions of the Chinese Armed Forces* (Alexandria, VA: CNA, 2008).

25. *Chinese Military Encyclopedia*, supplemental vol., 446. Interestingly, this definition equates "informationized battlefield" with "digitized battlefield" or "battlefield digitization."

26. For further discussion of "campaign basic guiding concepts," see David M. Finkelstein, *Evolving Operational Concepts of the Chinese People's Liberation Army and Navy: A Preliminary Exploration* (Alexandria, VA: CNA, 2002).

27. Wang and Zhang, *Science of Campaigns*, 81.

28. Wang Weiyu and Zhang Qiancheng, *Discussing Military Theory Innovation with Chinese Characteristics* (Beijing: NDU, 2009), 202–3.

29. Wang and Zhang, *Science of Campaigns*, 81.

30. Ibid., 83.

31. State Council Information Office, "National Defence Policy," in *China's National Defence in 2006* (Beijing: State Council Information Office, 2006).

32. Wang and Zhang, *Science of Campaigns*, 394.

33. Ibid., 87.

34. Lui Jin, "Satellite Communications—The Information Bridge during Earthquake Relief Operations," speech before the Chinese Communications Studies Association, 26 September 2008, http://www.ezcom.cn/Article/8591.

35. The PLA is managed by several general departments that oversee all the armed forces. These are the General Staff Department (GSD), the General Political Department (GPD), the General Logistics Department (GLD), and, since 1998, the General Armaments Department (GAD). These departments comprised the membership of the Central Military Commission (CMC) until 2004, when the PLA Navy, PLA Air Force, and Second Artillery were added.

36. Leonard David, "China's Antisatellite Test: Worrisome Debris Cloud Encircles Earth," *Space.com*, 2 February 2007, http://www.space.com/3415-china-anti-satellite-test-worrisome-debris-cloud-circles-earth.html.

37. "China: Missile Defense System Test Successful," *USA Today*, 11 January 2010, http://www.usatoday.com/news/world/2010-01-11-china-missile-defense_N.htm.

38. William Matthews, "Chinese Puzzle," *Defense News*, 6 September 2010, http://www.defensenews.com/story.php?i=4767907.

39. China's space white papers seem to be released in roughly five-year intervals, consistent with its five-year plans.

40. Bradley Perrett, "Longer Marches," *Aviation Week and Space Technology*, 15 March 2010.

41. State Council Information Office, *China's Space Activities in 2011* (Beijing: State Council Information Office, 2011).

42. Ibid.

43. Hong Bin and Liang Xiaoqiu, "The Basics of Space Strategic Theory," *China Military Science*, no. 1 (2002); and Li Daguang, "On Space Supremacy," *China Military Science*, no. 2 (2003).

44. See Wang and Zhang, *Science of Campaigns*, 299, 334, 340.

45. See Hong and Liang, "Basics of Space Strategic Theory"; and Li Dong, Zhao Xinguo, and Huang Chenglin, "Research on Concepts of Space Operations and Its Command," *Journal of the Academy of Equipment Command and Technology* 14, no. 5 (2003).

46. Cortez Cooper, "Joint Anti-Access Operations: China's 'System-of-Systems' Approach," testimony to the US-China Economic and Security Review Commission, 27 January 2010, 4, http://www.rand.org/content/dam/rand/pubs/testimonies/2011/RAND_CT356.pdf.

47. "Academy of Command Equipment and Technology," in *An Overview of Chinese Military Academies and Schools*, eds. Jin Peng and Dong Ming, (Beijing: AMS, 2002), 163.

48. Chang Xianqi, *Military Astronautics*, 2nd ed. (Beijing: Defense Industries Press, 2005), 273–79.

49. Note that *yiti* may be translated as either "integrated" or "unified." While the former translation is common, in the context here the latter would seem to be more appropriate. For that reason, as well as to avoid confusion with the term *zhengti*, which is also translated as "integrated," we will use the translation "unified" in the body of the paper.

50. Chang, *Military Astronautics*, 2nd ed., 275, 276.

51. Ibid., 290.

52. Ibid., 275.

53. Li Daguang, "The Characteristics and Rules of Law of Space Strategy," *China Military Science*, no. 1 (2002).

54. Fan Xuejun, "Militarily Strong Nations Are Steadily Developing 'Space Information Warfare'," *People's Liberation Army Daily*, 13 April 2005.

55. Guan Weiqiang, Qin Daguo, and Xiao Lianggang, "Research on Requirements for Aerospace TT&C Systems for Integrated-Style Joint Operations," *Journal of the Academy of Equipment Command and Technology* 17, no. 6 (2006).

56. Chang, *Military Astronautics*, 2nd ed., 276–77.

57. Ibid., 278–79.

58. Li, Zhao, and Huang, "Research on Concepts of Space Operations."

59. Yuan Wenxian, *The Science of Military Information* (Beijing: NDU, 2008), 320–21.

60. Hong and Liang, "Basics of Space Strategic Theory."

61. Li, Zhao, and Huang, "Research on Concepts of Space Operations."

62. The precise nature of such strategic targets, however, is not defined. Chang, *Military Astronautics*, 2nd ed., 314.

63. Zhang Qinghai and Li Xiaohai, "Space Warfare: From Vision to Reality," *China Military Science*, no. 1 (2005).

64. Hong and Liang, "Basics of Space Strategic Theory."

65. Chang, *Military Astronautics*, 2nd ed., 316.

66. Ibid., 320.

67. Joint Publication 3-14, *Space Operations*, 6 January 2009, II-6.

68. Zhou Peng and Wen Enbing, "Developing the Theory of Strategic Deterrence with Chinese Characteristics," *China Military Science*, no. 3 (2004).

69. Peng Guangqin and Yao Youzhi, ed., *The Science of Military Strategy* (Beijing: AMS, 2005), 215.

70. Zhou and Wen, "Developing the Theory of Strategic Deterrence with Chinese Characteristics."

71. Li Jingjun and Dan Yuquan, "The Strategy of Space Deterrence," *China Military Science*, no. 1 (2002).

72. Joint Chiefs of Staff (JCS), *Joint Operational Access Concept* (JOAC) (Washington: Office of the JCS, 2012), 50.

73. Ibid.