Statement on "China's Military Strategy for Space"
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China's Military Modernization and its Impact on the United States and the Asia-Pacific
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When China blinded a U.S. satellite in late 2006, the deputy head of Russia's Federal Space Agency was forced to feign nonchalance at the PLA's space-bound juggernaut. "We don't think China will outpace us in space research," Yuriy Nosenko declared. "We'll most probably move along in step with each other, as partners. And China will compete with us in space exploration."

Then -- caught like a deer in the PLA's ASAT headlights -- other world powers scrambled to voice surprise at China's January 2007 kinetic kill of an aging weather satellite. But by 2002, the PLA had already warned that "The prelude of the race to win 21st-century space dominance has begun."

The PLA Challenge

For more than a decade, Chinese military strategists and aerospace scientists have been quietly designing a blueprint for achieving space dominance. As a result, equipping the "Space Theater of Global War" will dictate the military-technical priorities of China's defense industry for the first quarter of the 21st century.

From 1997-1999, a fundamental restructuring of the Chinese defense industry shifted control of defense enterprises from the military to the civilian government, and integrated their operations with commercial advanced technology enterprises. This has resulted in an accelerated rate of military system modernization -- especially for defense electronics -- and portends China's emergence as an advanced technology "superstate." Against this backdrop, the prospects for the PLA's swift emergence as a challenger in space are said to be "bright."

According to Chinese military scientists, the PLA revamped its RDT&E program in the late 1990s. The Chinese decided to cancel weapons projects that had been active for 10 years or longer and to direct these funds to developing so-called "new-concept weapons": laser, beam, electromagnetic, microwave, infrasonic , climatic, genetic, biotechnological, and nanotechnological. The results demonstrate that -- besides solving the problem of modernizing its conventional forces -- China now has three military priorities: space, nuclear weapons, and "new-concept" weapons.

Chinese aerospace scientists argue that "as we produce one generation, research and develop one generation, and pre-search one generation, we must move on to explore one generation." Indeed the "leaps-and-bounds" theory has become the linchpin of Chinese military development for 21st-century warfare.

China aims to achieve at least two objectives in its advancement of military space capabilities and military-technological development:

- First, to develop strong-propulsion carrier rockets to carry digital reconnaissance satellites in a bid to form a "round-the-clock" spatial image reconnaissance system; and

- Second, to develop a new generation of solid-fuel rockets to carry micro-satellites in an endeavor to establish a space network for precise positioning, communications, and electromagnetic jamming and reconnaissance. These rockets use 120-ton liquid oxygen engines and 50-ton liquid oxygen/liquid hydrogen engines, and their carrying capacity can reach 15 tons. They are also capable of launching satellites into near-earth orbit.

Space Technologies

"The weaponization of space," say the Chinese, "is an inevitable developmental trend." And the "commanding height" of strategic competition in the 21st century "will not be on Earth, but in space."

According to the Chinese, the United States and Russia are engaged in a race to develop ground-, air-, and space-based weapons for achieving space dominance. These are said to include ground-based kinetic and airborne ASAT systems, high-altitude anti-missile weapons, space weapons platforms, aerospace aircraft, and space combat aircraft designed to execute simultaneous space and ground strikes.

The Chinese also charge that the United States is developing "some new-concept weapons" for its 21st-century space force, including kinetic, directed-energy, and non-antipersonnel weapons. Kinetic-energy weapons use ultra-high-speed warheads with extremely high kinetic energy such as electromagnetic cannons and intelligent intercepting bombs to collide with and destroy targets directly. Directed-energy weapons (laser, microwave, particle-beam, etc.) can be used not only to destroy various ground targets and flying targets such as aircraft, ballistic missiles, cruise missiles, satellites, and space stations, but also in both electronic warfare and photoelectronic warfare. Non-antipersonnel weapons include chemical energy-losing agents, low-energy-laser-blinding weapons, omnidirectional irradiation weapons, etc.

The Chinese agenda for space weaponry includes the following "new-concept" weapons, which will make outer space the fifth-dimension operational space after land, sea, air, and electromagnetism: laser weapons, ultra-high frequency weapons, ultrasonic wave weapons, stealth weapons, mirror-beam weapons, electromagnetic guns, plasma weapons, ecological weapons, logic weapons, and sonic weapons.

In early 2006, Chinese military strategists announced that "space weapons systems composed of hypersonic weapons will be the crack space troops with uniform tri-service land, sea, and air coordination and a widely increased scope of joint operations capability." They will be united in informational completeness, and the enemy -- thus exposed to space weapons attack -- will be forced to protect friendly land, sea, and air

forces against such attack. Hypersonic weapons will become "the dominant combat ordnance" in future high-tech battlefields, and aerospace integration will be the primary mode of operations in future high-tech warfare.

According to these experts, the interest of the major world nations in the development of hypersonic weapons will accelerate the development of this technology. It will thus generate new focal points and new circumstances for aerospace countermeasures. Whatever complications may arise in their technological development, **"**these types of weapons will be the nucleus of military competition in the early period of the 21st century."

In addition, hypersonic aerospace aircraft represent "one of the key weapons to be employed for controlling space and vying for 21st-century space dominance." These aircraft can: 1) ensure inexpensive, high-speed access to space; 2) counter satellites; 3) reconnoiter, monitor, and issue early warnings; 4) be used as space platforms for weapon launching; 5) be used as high-speed transport airplanes; and 6) be used as reserve command nodes in space during wartime.

Space Warfare

Published by the Chinese Academy of Military Sciences, a recent book entitled Strategy defines the components of "military space strategy" as 1) the policies and principles for building military space forces; 2) the fundamental principles for employing military space forces; 3) the significance and role of space dominance; and 4) the characteristics, forms, and tactics of space war.

Since 1996, Chinese military scientists have defined space warfare as combat operations whose major goal is to seize and maintain space dominance, whose major combat arena is outer space, and whose major combat strength is military space forces.

The features of space warfare are said to include: dogfights between the space-based combat systems of both belligerents; intercepts of strategic ballistic missiles by space-based combat platforms; strikes by space weapons on Earth targets and Earth-based counterspace or space defense operations; and strikes from the land, sea, and air on enemy space launch platforms and command-and-control organs.

Since 2005, Chinese military scientists have contended that space warfare will become the core of future non-contact combat. The integrated space-based "metasystem" of combat platforms, weaponry, and C^4ISR components will guide the various combat elements of the three armed services to launch long-distance precision attacks on ground, sea, air, and space targets.

Defensive campaigns will more often take offensive forms. Offenses and defenses will permeate, stimulate, and rely on each other; and the two will have a synergistic and systems-intimate relationship. Sea, air, and electromagnetic dominance will gradually subside and become subordinate to space dominance.

Because the space theater of war is in outer space and more than 120 km above the earth's surface, there are no restrictions concerning national boundaries and sovereign air space. The side possessing space dominance, say the Chinese, can therefore exercise complete freedom of action. The use of space-based weapons systems to strike endoatmospheric air, land, and sea targets demonstrates a unique superiority.

These unique, high-altitude advantages of space have strategic and decisive significance for the side exercising space dominance. If strike weapons are deployed in space, it will be possible to execute such offensive operations as satellite attack, missile intercept, and ground firepower support. It will be possible to guarantee the operational independence of friendly military space forces, and to translate these advantages into information, air, and sea dominance. Without space dominance, say the Chinese, one is actually putting oneself in the disadvantageous position of "being defeated first and then going to war."

Space Information Warfare

Both China and Russia have long contended that the "space-information continuum" constitutes the nucleus of the current "Revolution in Military Affairs" (RMA). The "Space Epoch" thus requires a colossal revision of military-strategic thought. "As informationized war advances," say the Chinese, "space will truly become the new theater of war and thereby establish a new milestone in mankind's history of warfare."

Echoing their Russian counterparts, Chinese military scientists assert that information warfare (IW) missions are accomplished most effectively by using space-based assets. The Chinese delineate at least three reasons for the critical importance of space warfare to IW missions. First, space is the "commanding height" for future IW. Second, seizure of space control constitutes "the first combat operation in future IW." With the continuing development of space weaponry and equipment, belligerents will conduct such new modes of space warfare as 1) space information warfare, 2) space electronic warfare, 3) space anti-satellite warfare, 4) space anti-missile warfare, and 5) space-to-Earth warfare.

The "core of space warfare" is thus the struggle for information dominance, so IW in space constitutes its main mode. The principal forms of space IW are: 1) conducting space electronic and space network warfare to inflict "soft" strikes on enemy space platforms, thereby disrupting and destroying their electronic equipment and computer systems; and 2) employing all types of anti-satellite weapons to inflict "hard" strikes on enemy platforms, thereby fundamentally destroying his space-information system.

Finally, the decisiveness of space dominance in future IW is clearly reflected in the ever-escalating preparations by world military powers to win future space wars. The pace of competition for the militarization of space has increased dramatically since Desert Storm, to include 1) the vigorous development and deployment of offensive and defensive weapons for space operations**,** 2) accelerated development of the space theater of war**,** 3) creation and organization of space combat troops**,** and 4) development of theories on space combat**.**

Space Electronic Warfare

Owing to its strategic significance, say Chinese aerospace experts, space electronic warfare (EW) -- aimed at jamming, sabotaging, and destroying satellites -- has become the most important way to gain information dominance in future wars.

As the pivotal role of space-based synthetic aperture radar (SAR) becomes increasingly manifest, various countries are rushing to develop countermeasures. Active jamming -- said to be the most effective technique among asymmetrical countermeasures -- is divided into active suppressive and active deception jamming. Active suppressive jamming includes barrage, spot, and random pulse jamming. Active deception jamming includes repeater, responsive, and scattered wave jamming. Chinese algorithms demonstrate that, in order to achieve the ideal jamming effect against SAR, the jamming signal must be highly coherent with the radar echo -- a technique deemed feasible from a Chinese engineering perspective.

Chinese experts in space EW note that the counter-jamming capabilities of radar systems have been continuously advancing. The production of jamming signals with the same frequency and coverage as the radar signals has already been realized. However, the jamming signal created by countermeasures equipment is often not in the same direction as that of the target echo. Space adaptive jamming suppression technology can suppress the jamming signals in different directions compared to the direction of the signal echo.

Furthermore, the jamming suppression system can correspondingly provide adaptive variations following changes in the jamming direction. This technology has thus gained wide recognition, and has become an important technological measure in the development of radar counter-jamming capability.

The air-space battlefield is said to be the quintessential battlefield for information counterattack. EW satellites traveling in geostationary orbits or 300-1,000 kilometer orbits can conduct electronic reconnaissance and jamming in wide areas. EW aircraft in flight can execute high-intensity electronic killing of enemy long-range radar stations, command centers, and communications centers to paralyze their command capabilities and disable their firing systems. They can also directly launch anti-radiation missiles to totally destroy the enemy.

According to Chinese military scientists, the high-powered microwave (HPM) weapon has triggered "a new revolution in electronic warfare systems and technology." Not only is it compatible for creating integrated systems with radar for low-power detection, target tracking, and target jamming, but its power can also be rapidly increased for hard damage/destruction of targets and for inflicting damage on the electronic equipment of enemy targets. These weapons portend extremely wide applications extending to aeronautic, astronautic, warship, and battlefield weaponry.

The Chinese charge that rapid advances are being made in U.S. HPM and high-powered radio-frequency weapons development, and that they have already entered the applications stages. But designers of electronic systems can adopt many countermeasures

for reducing HPM interference and damage, such as protective measures for the coupling and cable connections of systems and subsystems. Transmitters and receivers can be designed to be very sensitive to HPM; their duty ratios can be reduced; and redundant circuitry can be designed to further reduce HPM interference and damage.

Anti-Satellite (ASAT) Warfare

Chinese military scientists assert that ASAT warfare is the most effective way to achieve space dominance. The principal forms are: 1) use aircraft, warplanes, and rockets to launch anti-satellite missiles to destroy enemy satellites; 2) install "space landmines" on the orbits of enemy satellites for destruction once they hit the landmines; and 3) use positioning weapons such as lasers, clusters of particles, and microwaves to attack enemy satellites. According to the Chinese, the United States has conducted successful experiments using laser weapons to destroy targeted satellites. Russia has also conducted tests using clusters of particles to disrupt and destroy the electronic equipment of satellites.

Based on the capabilities of reconnaissance satellites, Chinese aerospace scientists have compiled the following list of "space-information countermeasures":

- Aim for the satellite's effective payload by applying suppression interference to cause overload in the satellite's receiving system, data processing system, and memory;
- Target the satellite's remote control system by 1) establishing a space target monitoring system to acquire the satellite's technical parameters and character information, and 2) effectively detecting and analyzing the satellite's operational system and down-link remote signal;
- Attack the satellite's space-to-ground communication and command nodes to weaken the connection, link, mutual operation, and networking flexibility in order to degrade its operational effectiveness; and
- Use high-energy and kinetic weapons to blind **[2006]** or destroy **[2007]** the reconnaissance satellite [dates added by author].

While Chinese military experts applaud the "brilliant" performance of the U.S. Global Positioning System (GPS) in recent high-tech military operations, they continue to clarify its inevitable "Achilles' Heel." They have delineated three major weaknesses. First, defeat GPS at its source by exploiting the weakness of the low orbits of navigation satellites. This is accomplished by attacking with 1) anti-satellite satellites, 2) high-energy laser weapons, and 3) high-altitude weather-monitoring rockets. Second, defeat GPS in the middle by exploiting the scattered and exposed ground stations.

Finally, defeat GPS at the end by exploiting the fact that navigation signals are highly attenuated. After attenuation by natural causes, the ground signal is very weak and easy to jam. To prevent the enemy from locating and destroying the GPS jammers and to avoid personnel losses, the GPS jammer can be carried on a variety of platforms -- such

as numerous aircraft and projectiles -- and thrown into a designated region for effective jamming.

The Chinese also allege a U.S. counterspace scenario against the Galileo system, which is said to consist of: 1) attacks by ground-based laser weapons, 2) attacks by airborne laser weapons, and 3) attacks by orbital weapons. (Orbital weapons capable of attacking enemy targets include laser and beam weapons.)

These experts also propose three measures that China and other countries could employ to counter the above-mentioned three "U.S." tactics:

- Passive Defense: Create a protective shield in space to disperse laser attacks
- Active Defense: Establish ground-based anti-satellite systems and orbital weapons platforms and deploy orbital weapons to attack and destroy hostile targets
- Develop strategic weapons to counter space weapons

Chinese aerospace scientists describe the "new-concept" orbital ballistic missile (orbital missile) as a multi-task, multi-role strike weapon capable of implementing random orbit transfer from Earth orbits. It can function as an intercontinental ballistic missile, an ASAT weapon, and an orbital bomber weapon. The missile is a cross between a ballistic missile and a satellite; it is a ballistic missile in a satellite orbit or a satellite with weapons capability. These missiles should be developed using the mutually interchangeable ground-based and space-based missiles, ground-ground missiles, and ASAT missiles.

To attack a target satellite, the orbital missile may ascend to the intercept point or it may enter a holding orbit around the Earth, and then encounter the target by changing the orbit. The advantages of the direct-ascent approach are that it is simple, its early-warning time is short, and its fuel-to-mass ratio is low. But this approach means that each launch has only one chance to attack.

In contrast, the approach of attacking from orbit has several chances in a single day. The possible operations include: 1) making the orbit of the missile coaxial with the orbit of the target satellite, and achieving interception by expanding the orbit with thrust impulse; 2) placing the missile in an Earth orbit lower than that of the target satellite, so that its apogee is almost coincident with the perigee of the target satellite's orbit, and achieving interception by faster orbital speed; and 3) still placing the missile into an Earth orbit lower than that of the target, but intercepting it at a certain orbit position by a dynamic jump. But this method requires a more complex control technology and a higher fuel-to-mass ratio. The target satellite will also have a longer early-warning period.

Anti-Missile Warfare

Anti-missile warfare refers primarily to the employment of an anti-missile system composed of space-, air-, and ground-based platforms to detect, identify, and track enemy ballistic missiles. Anti-missile space warfare also refers to the employment of positioning, kinetic, and other anti-missile weapons to intercept and destroy enemy

missiles. The United States, say the Chinese, is currently developing a national missile defense (NMD) system "which is actually an anti-missile system anchored primarily in space warfare."

Chinese aerospace scientists note that, compared with land-based, sea-based, and air-based antiballistic missile weapons, space-based antiballistic missile weapons have the following advantages: 1) they can intercept missiles on a global basis, 2) they can carry out highly efficient boost-phase interception, and 3) the virtually vacuum space is advantageous for improving an interceptor's capabilities, such as reducing the attenuation of laser energy in the atmosphere. (Space-based antiballistic missile weapons, however, have the shortcoming that they need enormous amounts of resources to build.)

In analyzing the capabilities of the air- and space-based laser systems that underpin the ballistic missile boost-phase interception stage of the U.S. NMD system, Chinese scientists have also analyzed the feasibility of boost-phase evasive measures, to include the following four methods: 1) employ fast-burning rocket motor to shorten the duration of the boost-phase and hence the duration for a laser attack; 2) perform active rolling of the missile body during the boost phase so that the energy of the laser spot at a given location remains lower than the damage threshold; 3) apply high-reflectivity, low-conductivity, anti-laser coating on the missile surface to reduce the thermal coupling coefficient of the laser and keep the temperature rise rate in the safe region; and 4) other countermeasures such as smoke.

Chinese military strategists stress that the creation of ballistic missile defense systems and corresponding "penetrating measures" again prove the "shield-spear" dialectic, each of which will always generate the other and advance competitively. For today, the Chinese propose the following "penetrating measures": 1) multiple warhead attack, 2) decoy penetration, 3) interruption and concealed penetrations, 4) enclosing balls (huge metallic membrane balloons), 5) trajectory change penetrations, 6) mobile launch, and 7) preemptive strike: "attack and destroy a certain part" of the NMD system.

Conducting a preemptive strike includes: 1) use "suicide satellites" (an orbital type of cruise satellite) or laser weapons to destroy the early-warning satellite system and space-based infrared systems of the NMD system to paralyze them, and 2) launch preemptive attacks against each component of the NMD system. According to Russian scientists, say the Chinese, it is possible to use a mid-air nuclear explosion to destroy the "command, control, and communication management center" of the NMD system to both paralyze and attack its essential defensive capabilities.

Chinese strategists assert that for the long term, "we must intensify new and high-tech pre-research in this field, focus on aerospace threats and missile-attack and defense confrontations, and establish an all-dimensional and integrated missile defense system as soon as possible."

"Integrated Air-and-Space Operations"

"This revolution," say the Chinese, "is first of all a revolution in concepts." Like their Russian counterparts, Chinese military strategists have long been articulating a body of operational concepts for conducting integrated "air-and-space operations" (ASO).

The boundaries dividing military aviation and aerospace will gradually disappear to create a unified aviation and aerospace entity whose range extends from the surface of the Earth to outer space. The ground, air, and space already constitute an indivisible operational environment -- as demonstrated by the experience of recent wars. Conducting integrated ASO is now only a matter of perfecting the relevant technologies, and no longer a matter of their feasibility.

Owing to the technological breakthroughs in systems such as the Space Shuttle, aerospace aircraft, space weapons, and "new-concept" weapons, integrated ASO are becoming a new operational form of informationized warfare. For example, the Space Shuttle will become a completely new space weapon that combines aviation and spaceflight strikes, transportation, and information operations.

This kind of milestone weapon, say Chinese scientists, will create the conditions for multidimensional, stereoscopic operations conducted from space to Earth, from Earth to space, and from space to space -- thereby transforming integrated ASO from theoretical to actual. An integrated air-space maneuver platform can transport troops to any location on Earth in a few hours, while the attack weapons -- such as laser and beam weapons -- can execute precision strikes at the speed of several hundred thousand kilometers per second. This speed is hardly something that defensive weapons can withstand.

The principles behind integrated ASO consist in "attacking systems" and "attacking the whole." Implementing a whole system-to-system confrontation is completely consistent with the Chinese concept of "whole operations" in informationized warfare (i.e., "integrated network-electronic warfare"). As space weapons continue to be developed, the speed at which targets can be acquired and attacked from outer space will undergo an Einsteinian change. Targets can be obliterated in an instant from distances of up to 10,000 kilometers, which makes the course of operations measurable in minutes or seconds. The concept of time in operations will thus move from the "time of combat vehicles" and "time of missiles" to the "time of the speed of light."

Chinese military strategists predict that the emergence of integrated ASO will inevitably trigger a sea-change in military strategy. The expanding space battlefield will compel new theories such as space threat warfare, space mobility warfare, space blockade warfare, space attack warfare, and space defense warfare.

As "new-concept" weapons continue to be developed, the expanding space arsenal will generate such operations as laser attacks, microwave attacks, meteorological attacks, genetic attacks, virus attacks, and non-lethal attacks.

The first wave of war will develop from "firepower attack" and "electromagnetic attack" to "satellite paralysis." Space will become, say the Chinese, "the first true battlefield."

Organizational Imperatives

Chinese military scientists note that, in order to implement space warfare, all organizational elements of the PLA must undergo both quantitative and qualitative changes. In general, the operational forces will now elevate technical elements, and operational systems will endure major adjustments.

First, the PLA will transform the current large unit formations. Operational units will become smaller, the number of combatants within the formations will be greatly reduced, and science and technology personnel within the PLA will increase dramatically.

Second, significant changes will occur in the composition of the PLA services and branches. In addition to eliminating some of the older military branches, a series of new technical and combat branches will be organized. These will include a "space force," an "aviation and aerospace corps," and "drone operations units."

Third, operational command systems and logistics (and technical) support systems will also be substantially adjusted and transformed. The command organization for space forces will be given prominence in the command system in order to constantly strengthen command-and-control capabilities for the operational air and space forces.

Implications for the United States

During the Cold War, the Soviets used the arms control process to gain time to overcome a perceived lag in emerging military technologies. And, like all good Marxist-Maoists, Chinese political leaders rarely say what they mean. But their PLA helmsmen do. Viewed as a military museum at the time of Desert Storm in 1991, the PLA has engineered a quantum leap into the "space club," even imposing its own terms in the process. So the recent blinding and pulverizing of satellites can hardly be cryptic to anyone who reads their open exhortations to their own cadres.

"Whoever loses space loses the future," they say -- and mean. Among other "new-concept" weapons openly earmarked for space dominance, laser technology appears to be the PLA's current "holy of holies." Based on their colossal progress to date, America should cease to be complacent about the sanctity of its orbital assets. Citing the Nikita Khrushchev of forty years ago, one PLA writer has warned that a new "Sword of Damocles" now dangles over the whole planet.