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China's Future in Space: Implications for U.S. Security
By Phillip C. Saunders

China's October 2003 manned space flight highlighted its dramatic achievements in space technology. Although Chinese space technology is not state-of-the-art, China differs from other developing countries by having a space program that spans the full range of capabilities from satellite design to launch services. China builds satellites on its own, and is involved in international commercial and scientific collaborations with Europe, Russia and Brazil. The People's Republic of China has a robust commercial satellite launch industry capable of launching payloads into geosynchronous and polar orbits. Its space program is also notable for the movement of personnel and technology between the civilian and military sectors.

Beijing's space aspirations pose significant security concerns for Washington. Most of China's space programs have commercial or scientific purposes, but improved space technology could significantly improve Chinese military capabilities. China may also seek to offset U.S. military superiority by targeting U.S. space assets. This article reviews Chinese efforts to exploit space for military purposes, explores the potential for China to attack U.S. military use of space, and considers whether a Sino-American space race can be averted.

Leveraging Space for Military Operations

China already employs space to support military operations in the areas of satellite communications, intelligence and navigation, albeit at a relatively basic level. Chinese space capabilities will improve in the coming decades, producing significant boosts in People's Liberation Army (PLA) military capabilities. The potential for Washington to restrict access to commercial satellite imagery or satellite navigation systems during a crisis is an important rationale for China to develop independent capabilities.

Secure, redundant communications are critical if the PLA is to achieve its stated objective of winning local wars under "informationalized" conditions. China employs satellites for both civilian and military communications; many satellites carry both types of signals. Satellite signals permit mobile communications and are harder to intercept or locate compared to radio communications. Commercial communications satellite programs will enhance military communications, but will not provide access to military-specific technologies such as jamming resistance and spread-spectrum transmission.

China uses satellites for the collection of photographic and electronic intelligence. China's imagery satellites use film canisters that are dropped back to earth for processing--a first-generation technology that does not provide near-real time intelligence. But the Sino-Brazilian Earth Resources Satellite program incorporates digital sensors that transmit images electronically. Low resolution limits the satellite's intelligence potential, but China is developing systems with high-resolution sensors that will provide near-real time imagery. China almost certainly exploits commercial high-resolution imagery for intelligence purposes. Chinese scientists are also exploring synthetic aperture radar technologies to provide radar imagery. China's capabilities will improve significantly as advanced technologies developed indigenously, and acquired through collaborative scientific programs, are incorporated into reconnaissance satellites.

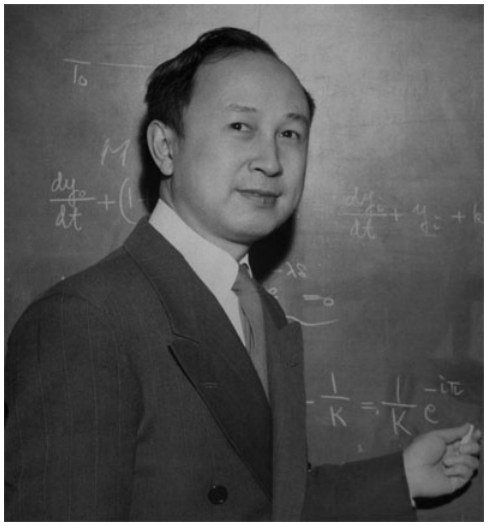
China currently uses the U.S. global-positioning system (GPS) and the Russian Glonass system and will participate in Galileo, a European satellite navigation system. China also operates its own two-satellite Beidou system, a less sophisticated system with significant limitations for military

applications. These satellites provide PLA units and weapons systems with navigation and location data that can potentially be used to improve ballistic and cruise missile accuracy and to convert "dumb bombs" into precision-guided munitions. Chinese scientists have explored using GPS signals to improve missile accuracy, but it is unclear whether current missiles employ this technology.

China’s Ability to Deny U.S. Military Use of Space

The U.S. military also makes extensive use of space for intelligence, communications, meteorology and precision targeting. Chinese analysts note that that the United States employed more than 50 military-specific satellites plus numerous commercial satellites in the 2003 Iraq war. They also highlight the extensive U.S. reliance on GPS to support precision-guided munitions. The United States’ space dependence will deepen as transformation and network-centric warfare increase the importance of rapid collection and dissemination of information down to tactical units and individual soldiers. Satellites also play a crucial role in U.S. missile defenses.

As U.S. dependence on space increases, concerns have grown about the potential for adversaries to attack U.S. space assets. According to current Department of Defense (DOD) doctrine, "The United States must be able to protect its space assets … and deny the use of space assets by its adversaries. Commanders must anticipate hostile actions that attempt to deny friendly forces access to or use of space capabilities." The 2001 Rumsfeld Commission report warned of a potential "space Pearl Harbor" if adversaries attack U.S. satellites. Underpinning these concerns is the possibility that China might target U.S. space assets in a future conflict.



One man’s dream: Following five years of house arrest in the U.S, and being investigated for allegedly spying for Communist China, Tsien Hsue-Shen, the father of that country’s space program left the U.S. “I do not plan to come back,” he said at the time. “I have no reason to come back. I have thought about it for a long time. I plan to do my best to help the Chinese people build up their nation to where they can live with dignity and happiness.”
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Chinese strategists view U.S. dependence on space as an asymmetric vulnerability that could be exploited. As one defense analyst wrote: "for countries that can never win a war with the United States by using the method of tanks and planes, attacking the U.S. space system may be an irresistible and most tempting choice." Chinese strategists have explored ways of limiting U.S.

use of space, including anti-satellite (ASAT) weapons, jamming, employing lasers to blind reconnaissance satellites, and even using electro-magnetic pulses produced by a nuclear weapon to destroy satellites. A recent article highlighted Iraq's efforts to use GPS jammers to defeat U.S. precision-guided munitions.

Chinese scientists have conducted theoretical research relevant to ASAT weapons, including the use of lasers to blind satellite sensors, kinetic kill vehicles, computations for intercepting satellites in orbit, and maneuvering small satellites into close formation. Efforts to develop high-powered lasers and mobile small-satellite launch capabilities involve technologies with both commercial and ASAT applications. China probably already has sufficient tracking and space surveillance systems to identify and track most U.S. military satellites. The extent to which interest in exploiting U.S. space dependence has translated into actual ASAT development programs remains unclear. Some reports claim that Beijing is developing microsatellites or direct-ascent weapons for ASAT purposes, but the open source literature does not provide definitive proof. However, based on Chinese strategic writings, scientific research and dual-use space activities, it is logical to assume China is pursuing an ASAT capability.

Is a Sino-American Space Race Ahead?

Efforts to exploit space for military purposes, and strategic incentives to target U.S. space assets, have put China on a collision course with a U.S. doctrine that emphasizes protecting U.S. space assets and denying the use of space by adversaries. Whether a Sino-American space race can be avoided will depend on strategic decisions by both sides and the priority placed on space control versus commercial, scientific and other military applications of space.

A key question is whether the United States can prevent potential adversaries from using space for military purposes without making its own space assets more vulnerable. United States doctrine envisions using a range of diplomatic, legal, economic and military measures to limit an adversary's access to space. However China will almost certainly be able to use indigenous development and foreign technology to upgrade its space capabilities. Non-military means may limit Chinese access to some advanced technologies, but they will not prevent the PLA from using space.

Despite U.S. economic and technological advantages, an unrestrained space race would impose significant costs and produce few lasting strategic advantages unless the United States can dominate both offensively, by destroying an adversary's space assets, and defensively, by protecting U.S. space assets. Otherwise, the likely result would be mutual (albeit asymmetrical) deterrence, with China building just enough ASATs to threaten U.S. space capabilities. This outcome would also legitimize anti-satellite weapons.

There are some incentives to avoid confrontation. Proliferation of space weapons would inhibit scientific cooperation and raise costs of commercial satellites. (The global trend in both sectors is towards international collaboration to reduce costs.) Actual use of anti-satellite weapons could create space debris that might damage expensive commercial satellites. Commercial users of space are therefore likely to resist efforts to deploy counter-space capabilities.

Beijing's strategic incentives may also change over time. Mindful of the Soviet Union's demise due to excessive military spending, Chinese leaders are wary of entering into an open-ended space race with the United States. Moreover, as Chinese military space capabilities improve and are integrated into PLA operations, the negative impact of losing Chinese space assets may eventually outweigh the potential advantages of attacking U.S. space capabilities.

Despite incentives to avoid a space race, arms control solutions face significant obstacles. China has long advocated a treaty to prevent an arms race in outer space. The joint Sino-Russian U.N. working paper, tabled in May 2002, called for a ban on weapons in orbit and on any use of force against outer space objects. The United States has been skeptical about the utility of such a

treaty, believing verification would be difficult and that it might limit future missile defense options. A ban on ASAT weapons would be one means of protecting U.S. satellites, but a verifiable ban would be hard to negotiate.

U.S. policymakers must address a number of difficult questions. Is space domination an achievable, affordable and sustainable objective? Will efforts to dissuade Beijing from developing ASAT weapons require tolerating significant improvements in Chinese military space capabilities? Can arms control protect U.S. space assets? The United States has legitimate security concerns about China's improving space capabilities, but will face tough choices in deciding on its best response.

Dr. Phillip C. Saunders is a senior research professor at the National Defense University's Institute for National Strategic Studies in Washington, D.C. The views expressed in this article are those of the author and do not reflect the official policy or position of the National Defense University, the Department of Defense or the U.S. government.