

Editors' Notes: The Space Security Dilemma

Bruce Blair and Chen Yali

In the pioneering space war games played in recent years by American military strategists at U.S. space control headquarters in Colorado, the United States and China occupied center stage in hypothetical confrontations that put them on a collision course in the exosphere. These games play on the fault lines that underlie their space relations in the real world, the key features of which include: the massive dependency of the U.S. military on space assets, both military and commercial; the globalization of commercial space services by multinational corporations operating partially outside the jurisdiction of sovereign nations; the recognition by Chinese strategists that space dependency is a potential Achilles heel of an otherwise overpowering U.S. military juggernaut; the resurgence of extreme worst-case threat estimation in U.S. intelligence assessments; the emergence of China as the leading candidate to replace Russia as the next designated super-rival of the United States; and flash points prone to spark military hostilities over competing vital interests.

The volatility of this mixture produces unstable results in war games. In these mental exercises, events tend to rush headlong into conflict. In one exercise, a confrontation over an unnamed island state in the Pacific, obviously a notional proxy for Taiwan, rapidly escalated from diplomatic crisis to limited strikes against space assets to nuclear war. Other forms of instability lurking in this brew simply shut down another exercise – as happened when the players managing a large-scale U.S. military intervention to defend Taiwan discovered that their forces' burgeoning appetite for commercial bandwidth for wartime military communications and reconnaissance operations vastly exceeded the available bandwidth. In this case, the notional adversary state, obviously representing China, managed to buy up long-term contracts with the multinational suppliers for the lion's share of their

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surplus commercial capacity, leaving only bandwidth crumbs for foraging U.S. forces. This deficit of cyberspace brought the U.S. military goliath's operations to a virtual standstill.

These war games point to latent tensions existing in the real world. Although that world today appears placid on the surface, the appearance is deceiving. Far from a vast expanse of tranquility, space is host to an expanding array of military operations and is becoming an arena of tension that mirrors earthly tensions among key nations. To avert the collision that this growing tension portends, the main interested parties – notably, China and the United States – must squarely confront the adverse trends and devise new instruments of dialogue and cooperation.

This issue of *China Security* aims to facilitate this dialogue on space. Although it might not read like Western-style policy analysis featuring a wide diversity of perspectives, its literature reviews and articles by top Chinese (and American) experts on what is still an extremely sensitive topic in China offer a rare glimpse of the internal debate over the future of its space program. In China, policy debates among the real experts on such sensitive subjects are generally conducted behind closed doors. This special issue cracks open those doors by presenting the views of leading Chinese policy analysts.

Bringing Chinese voices into the Washington policy discourse, and into thoughtful conversation with their expert counterparts in America and elsewhere, is the purpose of *China Security*. By providing an open forum that informs and enriches understanding of Chinese thinking on critical matters of security, the journal hopes to attract an expanding cadre of contributing experts from China's think tanks affiliated with military, security, foreign policy, and academic institutions. By tapping into the diverse views that exist in these intellectual circles, the journal promises to foster a genuine dialogue that helps bridge the gap of misunderstanding between Chinese and American analysts.

As the articles in this issue show, such bilateral exchanges of information, views, and constructive proposals for cooperation have barely begun in the arena of space policy. The dialogue is oblique, long on rhetoric and short on information. The governments harbor deep-seated suspicions of each other's aims and capabilities, and until they manage to overcome their fears and doubts, serious progress toward accommodation will remain a long way off.

China and the United States find themselves caught in a cruel paradox: space collaboration represents the best hope for allaying mutual suspicion, by making their activities in space transparent to each other, but at the same time this suspicion militates against open collaboration. The vicious cycle only heightens their mutual suspicion, their aversion to collaboration and transparency, and their commitment to secrecy in order to hide exploitable weaknesses and vulnerabilities from a prying potential adversary.

For fortress America, embracing space collaboration with China would

also incur domestic political risks. In the current political climate, military unilateralism and superiority, however questionable or counter-productive, is the politically safer approach to national security. For China, the prevailing worldview sees a superpower striving for absolute security, a quest driven by fear or hegemonic ambitions that are impervious to reason. U.S. space policy might be the best illustration of America's drive for security at the expense of others' security. China's fear of becoming contained and 'encircled' by a hegemonic state and its allies is constant. Through the eyes of the Chinese military, space is the heart of an ongoing revolution in military affairs and has demonstrably served this 'containment' stratagem of the United States. The United States has enforced an unprecedented ban on exporting any space-related technology and commodities to China since 1999, but has steadfastly refused to have any meaningful dialogue with China either through an international forum or bilateral channels. This comprehensive isolation of China's space program confirms the belief and fear of many Chinese military strategists that the United States seeks to arrest China's progress in space in order to thwart its ability to revolutionize its warfighting technologies and win on the high-tech battlefields of the future.

A zero-sum mindset toward space is hardening in China as a result of this apprehension, as amply illustrated in the public media. Space is eyed in China as an area of resources and possibilities to be acquired before it's too late. Shu Xing, whose book is reviewed later in this journal, likens the grabbing of satellite orbits to the "Enclosure Movement" in late 18th Century England in which the more capability one has, the more resources one can seize. Another reviewed author argued that countries scramble into space to fight for the tremendous resources found there and "once this fight for resources causes irreconcilable conflicts, it may lead to radical space confrontations." A space war seems to many Chinese to be another form of resource war. Such urgency in seeking control over resources is not unique to space, but also applies to energy and other areas. Given China's population and rapid economic growth, controlling resources is understandably a paramount concern. Regarding space, however, a zero-sum ('win-lose') attitude is narrow-minded and misguided. If feverish competition for resources in space causes Sino-American relations to deteriorate or leads to the outbreak of war between them, then both parties lose.

Maj. Gen. Chang Xianqi and Sui Junqin of the PLA Institute of Command and Technology (aka. Armament Command and Technology Academy) offer a straightforward description of the aims of China's space activities over the next five to 20 years, and explain why perceptions or accusations of hidden military aims in China's manned space flight program (which sent two astronauts into space in October 2005) do not withstand logical scrutiny. They characterize the country's space mission as dedicated to advancing science and to supporting China's economic modernization. They dismiss two key allegations concerning the manned space program that the Shenzhou spacecraft's ability for mid-course

orbital maneuvering indicates a Chinese military effort to apply the technology to Chinese strategic missiles in order to give these missiles the ability to avoid U.S. missile defenses, and that China envisions its manned spacecraft as platforms for conducting real-time reconnaissance and intelligence collection for military ends. China's orbital maneuver technology, they note, is decades old and evolved independently of the U.S. missile defense program, while the inefficiencies of conducting surveillance from manned platforms compared to satellites are widely appreciated and have led other space-faring nations to choose satellites for this mission.

This is where Chinese and American interpretations strike notes in different octaves. Chang and Sui understand that security is as much a state of mind as it is a physical condition, and therefore emphasize, as many Chinese observers often do, the peaceful intention of the Chinese space program. By this logic, capabilities can be controlled, and lose relevance, if one intends to be peaceful.

American threat assessments, however, focus almost exclusively on real or potential capabilities. Because intentions can be easily changed, asserting peaceful aims carries little weight for Americans. Such assurances do little to assuage suspicions or downgrade threat projections. Also, since the late 1990s, the predominance of "hawkish" American attitudes toward potential threats has pushed the U.S. intelligence community to adopt extremely conservative criteria for projecting threat – for instance, by assessing an adversary's 'possible capabilities' instead of 'likely capabilities.' This is a throwback to the early Cold War habit of using 'greater-than-expected' threats as the basis for building up U.S. nuclear forces. 'Possible' threat is even more extreme than 'greater-than-expected' threat. In any case, there is nothing China can do to convince American worst-case analysts that China could not possibly adapt its dual-use space capabilities for 'possibly' posing military threats to the United States. There is no escape from this logic trap.

Chang and Sui's exclusive focus on China's manned space program sidesteps the more serious U.S. concern with the non-manned space program. In the former arena, the predominance of peaceful purposes in manned space activities is widely appreciated, but the possibilities of threats to U.S. space assets by the non-manned space program are much more pronounced, as Chang's other publication reviewed later makes abundantly clear. We cannot, however, fault Chang and Sui for neglecting an arena that occupies the center of Western suspicions toward China. The non-manned space program is beyond the scope of their article. For a comprehensive examination of both arenas, interested readers should consult Chang's ground-breaking book *Military Astronautics* (reviewed later in this journal in the book review section), which is the product of a Chang-led task force of the PLA on military space.

While the China space threat consists of a spectrum of possibilities, the U.S. space threat to China clearly goes beyond the realm of possibilities, Zhang

Hui at Harvard University contends in his article that examines threats from a Chinese perspective. Drawing on authoritative sources, he argues that the United States is unambiguously committed not only to exploiting space for military purposes, but also to controlling space by all necessary means including weapons deployed in space. The objective is not only to protect U.S. space assets, but to deny adversaries the use of space in wartime. In its most ambitious rendition, controlling space applies even to the transitory period of several minutes when an adversary's missiles are passing through space enroute to their wartime targets on enemy soil. This prospective role for U.S. space control weapons – shooting down an adversary's ballistic missiles – is the central concern of Zhang's analysis, as it represents the most serious threat to China's security. A space-based U.S. missile defense system, especially one designed to shoot down ballistic missiles during their several minutes of boosted flight after launch (boost-phase defenses), would pose the gravest potential threat by enabling the United States to neutralize China's strategic nuclear missile deterrent.

In some respects Zhang and many U.S. analysts understate the degree of potential threat to China by stressing the huge cost of the thousands of space-based interceptors needed to maintain an around-the-clock vigil of Chinese missile launches, and by stressing the relative ease by which China's missiles could punch holes in this defensive constellation. The understatement derives from the fact that a far less extensive galaxy of U.S. space-based interceptors would be needed if the United States could choose the moment for initiating hostilities as part of a preemptive offensive strategy. Even a constellation of dozens of interceptors could be decisive if the United States enjoyed the luxury of setting the terms of the onset of conflict and the interceptors were optimally positioned at that moment.

In Zhang's view, China could counter by deploying anti-space weapons designed to cripple the U.S. missile defense network, but such a step could ignite an arms race in space (and, we might add, create impulses to preemptively strike in space during a crisis). Alternatively, China could ramp up its arsenal of nuclear missiles and warheads to the point at which it would overwhelm the U.S. defense capability, but the downsides are numerous. A Chinese missile build-up could trigger nuclear reactions from India. If Pakistan follows suit, an arms race in South Asia could result. It could also require China to re-start its fissile materials production facilities and thereby unravel China's commitment to the multinational treaty calling for all countries to stop future production of such materials.

From a Chinese perspective, according to Zhang, the prospect of an unregulated military space environment is decidedly bleak, and warrants renewed efforts to ban space weapons. He analyzes various approaches to banning their development or deployment, and concludes that a focused approach that bans the deployment of weapons in space would offer the best solution from the standpoint of feasibility and of China's overall security. Zhang does not adequately

explain why banning space-based missile defenses, thereby ruling out layered defenses, the cornerstone concept of American missile defense architecture, would be politically palatable to U.S. planners. But Zhang does lay out a strong case that space weapons run counter to both Chinese and U.S. interests, and that their regulation through arms control would well serve both nations' interests. He can be forgiven for overlooking the fact that nations often adopt policies that are contrary to their own best interests.

As if to underscore Zhang's notion that America's pursuit of space hegemony ill serves its national security, Joan Johnson-Freese recounts the feeble effort by the United States to retard China's development of military space capabilities, only to stimulate China's indigenous space industry, drive European companies into closer cooperation with China, and hurt the U.S. aerospace industry on which the U.S. military increasingly depends.

Since the politically charged Cox Commission in 1999 accused China of stealing U.S. space technology, the United States has clearly telegraphed to China that it has no desire for bilateral cooperation. Beyond that clear message, however, Johnson-Freese views strategic communications between the two countries on space issues as dysfunctional in all the major dimensions of cultural understanding, constructive engagement, presentation of policy choices, and influence on attitudes and behavior.

A dialogue of the deaf has resulted in both sides talking past each other – a scene replayed repeatedly in U.S.-China strategic dialogues in areas as sensitive as space – as the United States seeks to extract information about specific Chinese technologies and programs, while China seeks to comprehend the strategic and tactical purposes of U.S. space programs. Technological transparency is anathema to the Chinese, whose co-mingling of their civil and military programs keeps them under a shroud of opacity, much to the frustration and chagrin of U.S. observers. As for intentions, the United States seems to be almost schizophrenic. On one hand, there are ample official denials of plans to deploy space weapons, denials supported by the very modest sums being invested in such weapons. On the other hand, current doctrine and war games clearly envision space as a battleground and China as the main opponent there. Johnson-Freese also characterizes as hypocritical the arguments made by the United States in which it describes its own pursuit of certain space technologies as non-threatening while alleging “offensive” and “nefarious” intent when the same technologies are pursued by China.

Out of this uncertainty, inconsistency, and unpredictability springs the near-universal tendency to err on the side of caution. The prevailing view on both sides, Johnson-Freese concludes in her hard-hitting critique of the state of Sino-American discourse on space, holds that space progress is a zero-sum game in which any advance made by either side is harmful to the security of the other side. In this psychological climate, it is unclear what if any space activity would

be considered non-threatening, and the unfortunate effect is to foster an almost irreversible momentum of escalating tensions over space. Before the momentum propels the antagonists across the Rubicon, she recommends that they redouble their effort to convey clear and consistent messages, improve the dialogue, and step lightly into cooperation in the non-threatening area of space science through strategic-level talks about the Bush Moon-Mars Initiative.

In spite of the bleak and deteriorating space relations between China and the United States, hope springs eternal in the essay by Sun Dang En, a research fellow of the Academy of Military Sciences. Sun's hard-nosed realism acknowledges China's uphill struggle to advance its progress in space and China's need for support from international partners, especially the United States, to fulfill its ambitious quest. Like Chang, he disputes the allegations about China exploiting its manned space flight program for military purposes, adding to Chang's points a rebuttal of the charge that the Shenzhou launch vehicle could be fitted with a warhead and serve as an advanced ballistic missile. Sun disputes this dubious charge on the persuasive grounds that this vehicle takes 20 hours to fuel (compared to U.S. and Russian missiles that are always ready for launch within minutes). He implies, correctly, that such lengthy preparations would be readily detectable and that a militarized Shenzhou rocket would be extremely vulnerable to a preemptive strike by U.S. or other forces. We (the editors) estimate that the combined surveillance, detection, and attack time of modern missile and aircraft forces in the U.S. arsenal is far shorter than the Chinese rocket's fueling time alone.

While rebutting allegations that China is advancing its military space program under the guise of a civilian mission, Sun acknowledges that Chinese opaqueness engenders suspicion: "At present, the main obstacle to Sino-U.S. cooperation on manned spaceflight is that the U.S. believes China's space programs lack transparency and are controlled by the military." Yet Sun finds cause for optimism in their space relations building upon recent friendly gestures such as the voluntary passing of information on space debris from the United States to China prior to the launch of Shenzhou VI. He calls upon both countries to expand their cooperation dramatically into a host of space activities dedicated to economic, human, and scientific development.

In the essay by Teng Jianqun of the China Arms Control and Disarmament Association, the specter of weapons in outer space looms large and eclipses the promise of international cooperation envisioned by Sun. Teng's military background doubtless frames his perspective on outer space as a future extension of the battlefield, and concentrates his mind on the extensive militarization of space that has already occurred: "Consequently, it is reasonable to assume that the development of human productivity will ineluctably bring war from land, sea and air into outer space if no constraints are placed on it."

Having tracked the growing dependence on space technology by the

militaries of the world, Teng accepts the prevalent military view that whoever controls outer space will also control the Earth. Military competition for the high ground coupled with rapid advances in space and information technology will culminate in the fielding of weapons in outer space.

By concluding that space weaponization is inevitable and thus defying somewhat the official policy line, Teng speaks from the camp of hard-core realism that is heard only in Chinese academic publications (such as *Military Astronautics*, in which Chang's task force of senior military officers reached the same conclusion), if at all. Teng urges China to shed its passive mindset of denial, recognize the real-world trend, and pursue a policy path that seeks to slow, confine, and shape the future contours of space weaponization by means of effective rules of the road in outer space.

Teng's rather fatalistic prognosis is thus tempered somewhat by his conviction that the international community can delay, channel, and otherwise regulate this inexorable extension of the battlefield into space. In fact, he considers this form of international space cooperation – a non-proliferation regime applied to space weapons to nip proliferation in the bud – to be an urgent priority for the international community. In Teng's view, the prospects for successfully regulating the security environment in outer space hinges upon an early start in identifying, limiting, or banning the application of certain technologies to military missions in space. Dual-use technology with space applications is especially important to control in its infancy. Once these technologies mature and occupy outer space, the ability to regulate them will be infinitely harder. A key difficulty is anticipating the nascent weapons technologies and defining their characteristics well enough to subject them to arms control limitations. Teng's reading of the tea leaves envisions, in very broad outline, a new space battleground in which space and information technology merge – a space and digital arena expanding war into an “electromagnetic space” featuring “digital troops”, information weapons, and other cybernetic elements of a computer space war. Future work by Teng will hopefully flesh out more of the details of the pertinent technologies and the arms control agenda needed to subdue them.

Denying technologies to thwart China's development of space and missile capabilities has been a paramount aim of U.S. policy toward China since the 1990s, but the policy has proved unsuccessful, according to Guo Xiaobing of the China Institute for Contemporary International Relations. America's attempt to block China's access to U.S. space technology – notably, by restricting the export of U.S. commercial satellites to China for launch by Chinese rockets, and by requiring foreign exporters to conform to U.S. export regulations if their products contain sensitive U.S. parts – severely hampered China's space program for several years. But China has outmaneuvered the sanctions by developing an indigenous space capability and by forging new partnerships with Europe and around the world, pulling itself out of its temporary doldrums. It appears that many nations, ranging

from Europe to Russia to Brazil, regard the American policy of isolating China's space program as draconian, and the export restrictions as excessive, and have reacted by forming new business relations and joint space exploration projects. The key common denominator of this newfound business cooperation among Russia, China, India, Japan and Europe is the avoidance of U.S. components and U.S. satellite export restrictions.

This sweeping, isolationist U.S. export policy may be inflicting even greater damage to U.S. space companies than to Chinese enterprises. Guo cites statistics indicating that the export restrictions have allowed overseas business competitors such as European satellite components suppliers to flourish while U.S. satellite companies watched their market share plunge. Guo's account of how the unintended consequences of U.S. export policy have harmed its business interests is thought-provoking. He makes a good case that Sino-American space cooperation and a loosening of export restrictions would well serve the interests of both countries.

Guo categorically dismisses the rationale given for blocking space technology exports. He finds no merit whatsoever in the claim that China would steal technology secrets with a view to enhancing its military and missile capabilities. The policy is instead portrayed as stemming from a false indictment of China – one built on exaggeration, political exploitation, a desire to retard China's general economic and military development as well as its space and missile development, and groundless suspicions bordering on paranoia. The article does not close the case, however. If history is a story without end, then this export policy remains open to historical interpretation on any number of levels.

The probable historical reflection on this export policy is that in the end it proved to be a minor drag on Chinese space growth, a minor footnote in a story of rapid expansion of China's commercial and military space program. The dominant narrative of this story will not be U.S. export policy, but rather U.S. space weapons policy and its dynamic interaction with Chinese space interests and apprehensions. The dénouement of this story also has yet to be written, and there exist a number of alternative endings ranging from active cooperation and peaceful coexistence to antagonism and aggression.

Drawing on an extensive set of Chinese- as well as English-language sources, Eric Hagt of the World Security Institute delves deeply into all of the story strands appearing in this journal's collection of articles and weaves the strands into a persuasive tale of two powerhouse nations on a collision course in space. Hagt provides a comprehensive account of China's heady commercial expansion and ambitions in space, and its growing reliance on dual-use space assets for its economic development and military strength. This growing dependency creates a growing vulnerability. As commercial space assets and operations are becoming indispensable to China's economic and military security, they will need to be protected with no less diligence than how America pursues its own

space security. China views a ban on space weapons as one partial answer to the growing vulnerability that attends China's growing dependence on space, but the political feasibility of such a treaty appears strongly in doubt given the U.S. rejection of this option. In Hagt's view, U.S. opposition to a space weapons ban, (eds. note – already strong because of American desire to preserve its options for space-based missile defense), may indeed stiffen as the opaque dual-use Chinese space program continues to expand and seek its own guarantees of protection.

Apart from an official policy of advocating a ban on space weapons, China has not revealed how it will respond to space weaponization if the United States indeed takes that historic step. Hagt distills the thinking found in the literature written by serious military scholars on space and concludes that the Chinese response to the threat posed by the United States in space features a distinctly defensive orientation that emphasizes protecting Chinese space platforms from U.S. offensive attack – for example, past or anticipated efforts to improve satellite hardening, encryption, anti-jamming, maneuverability, redundancy, and rapid replacement. This accretion of Chinese defensive capabilities, coupled with military space operations involving reconnaissance, communications, and navigation, certainly contribute to the militarization of outer space, however. Questions also linger about China's next steps, questions magnified in Western minds by the secretiveness of the entire Chinese space program. The prospect of a Chinese offensive space orientation, driven by China's sense of vulnerability, cannot be ruled out. (As these editors discuss later, a purely offensive Chinese space strategy designed to cripple critical U.S. space assets and thereby diminish U.S. regional warfighting capabilities also cannot be ruled out.) Hagt spins out a relatively mild form of the classic action-reaction phenomenon between two rational actors entwined in a security dilemma and self-escalating arms race. Hagt's scenario features Chinese defensive and American offensive interactions in space, a defense-offense arms spiral that has been observed often in other military contexts. In a twist of the classic arms spiral, however, Hagt explains how China's successful commercial sector growth in space creates demands for protection and pushes China in the direction of space weaponization.

China's military establishment appears to fully embrace the view that operating from space is crucial to modernizing its earthly military capabilities, and cannot fail to notice the many signs of American determination to dominate space in the event of conflict. The standard military response would normally be to devise ways to both passively and aggressively deny the United States the ability to deny China its use of space during hostilities. Hagt focuses on the passive end of the spectrum. But to these editors, if diplomacy fails and China seeks military answers for space protection, then the normal progression of protective measures would include offensive operations ranging from jamming to attacking U.S. satellites with anti-satellite (ASAT) weapons. It seems to us that the Chinese military would be inclined to consider carefully, within the parameters allowed by

their political superiors, the merits of an anti-satellite capability.

The opaqueness of the Chinese effort in this arena precludes a definitive estimate of progress toward the actual development of such an option. A suspicious Western observer might cite, as Hagt notes, the refusal of China to endorse a no-first-deployment of space weapons as a possible indication of a Chinese contingency plan for a 'break-out' of anti-satellite weapons in the event that this security dilemma crosses the tipping point of restraint and triggers a full-scale arms race in space. Hagt correctly notes that the Chinese would perhaps not wish to dignify such suspicions if in fact they have no intention of pursuing space weapons, but his assertion that a no-first-declaration could remedy suspicions can be questioned. While it may be plausibly credible to many nations, it would ring dubious in U.S. military circles. China's diplomatic assurances of its commitment to the peaceful use of space also ring somewhat hollow in the face of the steady Chinese militarization of space, and the Chinese military's certain need to protect both the commercial and military assets on which it increasingly depends.

As Hagt notes, however, the pernicious security dilemma in which China finds itself can negate its best efforts to protect itself in space. China's active pursuit of self-defense in space can be self-defeating if those pursuits only trigger a stronger countervailing reaction by the United States. China must strike a delicate balance between protective effort and restraint, at least as long as the behavior of the United States partially depends on Chinese behavior. It is an open question, with huge implications, whether the United States is committed to maintain absolute dominance in space – the ability to fully protect its own space assets while totally denying an adversary any use of space. If space hegemony is its goal, then Chinese restraint is practically irrelevant, Hagt believes, although we (the editors) believe some agreed rules or norms for crisis management and operational restraint may still have utility in averting conflict. If some lesser degree of unilateral space security is an acceptable U.S. goal, and the challenge for both China and the United States is to escape the security dilemma that presently have them trapped, then a number of cooperative ventures to avert space weaponization could be recommended. Hagt presents a number of good ideas in this vein.

In Hagt's article and much of the germane Chinese literature, the primary motivating rationale for China's military space program is to create a force-multiplying effect on China's ground, sea, and air forces to strengthen their ability to defend Chinese territory and win regional conflicts. As part of this rationale, Chinese space assets must be protected and defended lest the force-multiplying factor dissipates to zero. We (the editors) would add that this protection and defense does not rule out an offensive component meant to deter or thwart an adversary's effort to suppress China's space operations. For instance, a Chinese capability to degrade U.S. satellite communications or surveillance might be developed with a view to deterring U.S. attacks on Chinese satellites.

We have reason to believe that the actual thrust of China's space strategy and technological development is defensive in nature and orientation. However, both the U.S. thrust toward space weapons and the state of Sino-U.S. strategic relations could alter the future direction of China's space program. A certain body of Chinese literature indicates another possible offensive mission for the future Chinese space program: attacking an adversary's space assets in order to diminish its regional warfighting capability. Delivering a sharp and possibly crippling blow to an adversary's ground, sea, and air forces that depend heavily on those assets to conduct operations could have decisive consequences.

If China and the United States unfortunately stumble into a war over Taiwan, the Chinese military, we believe, may be driven to conduct offensive space operations – cutting the adversary's forces' umbilical cords to space, and depriving them of their force-multiplying assets. Chinese strategists steeped in Chinese military traditions are acutely aware that space infrastructure could be an adversary's Achilles Heel, and that an inferior space power may prevail in conflict if it manages to sever those critical tendons. Given that asymmetrical warfare is axiomatic in the Sino-American context, the weaker Chinese side, we believe, would have ample reason to design and utilize offensive weapons such as ASATs in order to degrade critical U.S. space support, by jamming U.S. communications and blinding U.S. sensors, or to cripple them using blunt (nuclear weapons detonated in space) or surgical instruments (attack satellites). Such offensive anti-satellite operations would be conducted for reasons quite removed from the issue of self-protection from adversarial threats. They would be purely offensive in nature.

It is an open question whether this form of asymmetrical offensive space warfare resides exclusively in the realm of Chinese strategic thought, or has advanced beyond theory into practice. According to Hagt, the preponderance of evidence available in the open literature suggests that China's exploration of technologies relevant to anti-satellite weapons – kinetic energy vehicles, ground-based lasers and radars, and high-powered microwave transmitters involves theoretical or basic research only. Hagt challenges allegations to the contrary, such as the Pentagon's 2005 report to Congress asserting that "China is working on, and plans to field, ASAT systems" on the grounds that no evidence exists of China testing or deploying any anti-satellite weapon, or intending to do so.

If Hagt is wrong, and the Chinese intend to take a great leap forward into offensive space warfare technology, then he is right about the adverse unintended consequences of the security dilemma. The two sides may find it impossible to extricate themselves from the escalation dynamics of their predicament in space in an era of revolutionary military technologies and asymmetrical warfare. At this stage of space warfare development, however, the Sino-American relationship still stands on the unweaponized side of the abyss, and neither side appears quite ready to take the leap.

The Chinese caution against shifting from a defensive to an offensive orientation in space appears to stem not only from a strategic calculation that the national interest lies in restraint, and in restraining the United States from embarking on an offensive quest. As Wu Chunsi's and Hagt's essays reveal, China's economic reforms have worked to severely dampen Chinese military ambitions in space in favor of dual-use commercial technology. Such dual-use technology is poorly suited to confer significant offensive military capability, in our (the editors) assessment. Capable offensive weapons generally cannot emerge as a serendipitous by-product of commercial space pursuits. On the contrary, such weapons must be designed to meet military specifications and missions, and little valuable commercial by-product would be derived from this military-driven process.

So the die was cast long ago when China's national strategy subordinated military development to economic development, gave precedence to domestic policies over external challenges, and required China's space program to serve economic goals first and foremost. It seems incredulous to American security analysts (or Russians for that matter) that any national strategy would not define security as its predominant requirement, but as Wu Chunsi of Fudan University persuasively asserts: "Military and security considerations are certainly important to any country, but they are not the first priority in the current Chinese grand strategy." That amazing statement reflects a deliberate choice made by the Chinese leadership some 30 years ago to undertake a sweeping reform program that in effect commercialized many defense industry sectors, including space.

The wholesale reconfiguration of China's space sector thus resulted in civilian, commercially competitive technologies with marginal military applications. Its re-institutionalization and restructuring that continues to this day all but precluded any ambitious military projects or planning for space warfare because the Chinese military was stripped off its previously predominant influence and, in our view, relegated to a distant secondary status in the hierarchy of priorities. This institutional history preordained an inherent technological tilt toward commercial applications that at best allow for minor military defensive-protective measures to evolve alongside. In broader terms, as Wu puts it, "...a large portion of the civilian space program, in terms of the technological sophistication, thus is not useful in modern military terms." At the same time, she implies that the opportunity to pursue dedicated military space weaponry, let alone modern offensive space weapons, has been severely constrained.

This tectonic shift three decades ago was allowed by an improving security environment for China, Wu notes. Receding threats to China from the Soviet Union and the United States opened the window of opportunity for economic reform. As both Wu and Hagt explain, this process of forcing the space sector to transform and compete in the marketplace drastically altered the entire Chinese program. The divestment of the military from commercial activities across the board, including the space sector, since 1999 has created new opportunities and

incentives for international collaboration. In theory (the editors'), Sino-American space cooperation should have deepened rather than frozen. However, the U.S. Cox Commission report engendered an effort to isolate China's space program. Wu remains convinced of the benefits of space cooperation. Many Chinese analysts particularly emphasize the U.S. Mars initiative as a new starting place for Sino-U.S. space cooperation. Deeper integration with the international community would help further separate China's commercial space industry from the military, she contends. Conversely, the continuing isolation of China's space sector has the opposite effect, and may rejuvenate military influence. And although "China does not have the luxury to engage in a military competition with superpowers in space or in other areas," Wu believes that "we now stand at the threshold of space weaponization" and urges the international community to act quickly "to establish a system of rules to manage and coordinate space activities."

The deployment of space weapons by any nation would cast a dark cloud over the future security of China and the world. The Chinese authors in this volume seem quite united in their view of the need to avoid crossing this threshold, and instead revive a spirit of international cooperation in space. That call, we believe, is sincere and places the ball in America's court for now. China bears some responsibility, however, for clarifying its program, making its technologies as well as intentions more transparent, and encouraging both military and civilian policy analysts to study and debate publicly. China needs to address squarely how space will be used to strengthen its national security, and explain how exchanges and cooperation with the United States and others in space projects will not be exploited to obtain potential advantage over those partners. China and the United States should open new venues for dialogue at different levels, and build confidence through cooperation in apolitical matters such as data sharing in debris monitoring. The Chinese view of the paramount importance of the politico-strategic intentions behind space cooperation has merit. If China and other space-faring nations intend to pursue the peaceful use of space and seek cooperation for the benefit of mankind, then the time is ripe to reopen a constructive agenda of action as well as talk. 