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COERCIVE SPACE ACTIVITIES
THE VIEW FROM PRC SOURCES

A CNA report

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EXECUTIVE SUMMARY

The People's Republic of China (PRC) is developing space technologies, in part, to deter and compel the United States from taking actions that Beijing deems counter to its national security interests. PRC coercive space efforts are intended to achieve effects in, from, and to space. People's Liberation Army (PLA) researchers have assessed space capabilities as playing an outsized role in strategic coercive efforts. In comparison to nuclear capabilities, PLA researchers perceive space capabilities as a more usable and effective method of influencing an adversary.

PRC writings on space deterrence and compellence highlight several factors that may complicate the ability of the United States to deter the PRC from taking military action. The perception that space underpins U.S. military superiority may make U.S. space assets an irresistible target for PLA planners. The perception on the part of some PLA researchers that space is an offense-dominant domain, and that coercive efforts and conflicts may begin in space, also suggests the PLA may place a high priority on threatening U.S. space assets.

Considering the role of deterrence and compellence in PLA space operations may also provide insight into the motivations for PLA demonstrations of space power, such as the 2007 test that destroyed a satellite and the 2022 towing of a satellite to a graveyard orbit by the *Shijian-21* satellite. As part of the PRC's active defense strategy, PRC researchers state that coercive activities can occur in both peacetime and wartime and can involve demonstrations of space power, tests of space capabilities, and the use of force. As a result, PRC development, testing, and use of space and counterspace capabilities may be intended to demonstrate the capability and resolve to attack U.S. satellites, raise doubts about the U.S. nuclear deterrent, and threaten the U.S. homeland with attack. These implications and others are discussed in more detail in the next section.

KEY FINDINGS

PRC writings discuss the potential for space capabilities to enhance a nation's ability to both deter and compel potential adversaries.

- PRC researcher discussions of the Chinese term *weishe* (威慑), translated as deterrence in many Western studies, contains elements of deterrence and compellence and for the purposes of this study is translated as coercion.
- PRC writings argue that the goal of coercion is to raise the threshold of war so that a potential enemy will realize that the costs of entering into armed conflict against the PRC exceeds the benefits.
- PRC writings argue that increased space power allows militaries to strengthen their coercive space capabilities for use against potential adversaries.

PLA researchers discuss eight types of coercive activities that provide an escalatory ladder from least to most escalatory.

PLA researchers discuss eight types of coercive space activities that are intended to achieve effects in, from, and to space. These measures appear to provide a series of steps from least escalatory to most escalatory. PLA researchers note that these measures are not mutually exclusive, however, and can be employed simultaneously and without a strict prioritization and must be flexibly applied based on the situation.

Enhancing conventional force capabilities. PLA researchers conclude that space capabilities enhance the coercive effect of conventional forces by increasing the efficiency and effectiveness of warfighting through improved intelligence collection, increased speed of operations, more mobile operations, and improved effectiveness of strikes.

Deterrence by denial. Deterrence by denial was not widely discussed in the writings reviewed for this study. One source, however, states that one deterrence by denial strategy, international cooperation, can restrain an opponent's offensive behavior by entangling one country's space operations with the operations of other countries. Attacking a cooperative system could thus potentially raise the cost of the conflict to the attacker by involving third parties.

Deterrence by detection. Space-based intelligence, surveillance, and reconnaissance (ISR) capabilities can provide advanced warning of adversary actions and enable a country to influence adversary decision-making before military action takes place through the detection of mobilization activities and military deployments.

Deterrence by punishment. PLA researchers write that the United States has made declaratory statements intimating nuclear retaliation for attacks against space assets.

Displays of space power. Displays of space power are conducted during peacetime and at the beginning of crises. They can involve displays of new equipment, weapons tests, and the publication of concepts of operations.

Space warfare exercises. Space warfare exercises are conducted when a crisis escalates and displays of space power have been ineffective.

Space power deployments. Space power deployments also occur when a crisis escalates and can help create the conditions for wartime employment of space assets.

Coercive space strikes. Coercive space strikes are described as potentially the most escalatory of coercive space measures. Coercive space strikes can be kinetic or non-kinetic, and their escalatory level can be modulated through a range of actions, including disrupting, damaging, and destroying space assets.

PRC discussions of coercion are guided by three characteristics.

Adherence to the PRC's active defense strategy. The PRC's active defense strategy calls for offensive measures in defense of the PRC's stated territorial and sovereignty claims in both peacetime and war.

PRC perceptions of moral superiority. PRC perceptions of moral superiority could be used to justify its actions to achieve a balance of power and use force. PRC researchers characterize the PRC approach to coercion as more principled than the Western approach. This characterization is based on the PRC perception that it merely seeks to protect its legitimate national interests whereas Western countries use coercion for illegitimate gain.

Transition to a broad-based set of strategic capabilities. PRC researchers assert that although nuclear weapons must serve as the ultimate guarantee of the PRC's security, PRC security is best secured through the broad-based development of strategic capabilities that include space capabilities.

PLA authors assert that space capabilities can undermine an adversary's space, nuclear, and conventional forces, as well as its economic performance.

PLA researchers describe coercive space activities as playing an outsized role in strategic deterrence and compellence distinct from other types of military power. PRC writings state that space and counterspace capabilities can not only deter adversaries from attacking PRC satellites but can also form one element of an overall coercive campaign intended to influence an adversary from taking military action in other domains.

PLA authors assert that the critical role of space assets in enabling military operations and underpinning economic activities make the use of space capabilities a more effective means of both influencing and defeating an adversary than nuclear or conventional options. Multiple PLA writings indicate that space and counterspace operations can undermine an adversary's nuclear and conventional deterrent posture by degrading command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) capabilities, including nuclear command, control, communications, and intelligence (NC3I) capabilities, through precision strike and counterspace operations. Some PLA researchers also imply that strikes against space assets can negatively affect a country's economic infrastructure.

PRC writings on space deterrence and compellence blur the line between coercive and warfighting efforts.

Coercion can take place at any point during peacetime, crisis, and conflict. The identification of the PRC's active defense strategy as a principle of its approach to coercion suggests that the strategy has both peacetime and wartime implications. Multiple PLA writings state that space coercion may be the first type of coercive measure used in a conflict.

PRC discussions of space coercion have implications for escalation control.

A dangerous dynamic appears to be developing between the United States and the PRC in space that could lead to misperception and unintended escalation. PLA writings on space coercion and

its development of space capabilities suggest that the United States and the PRC have entered into a security dilemma with the potential to destabilize the military dynamic between the United States and the PRC in space, exacerbated by the relationship's zero-sum competitive aspects and the PRC's view of the offense-dominant nature of space.

PRC writings describe coercive measures as being conducted first in space. PRC researcher discussions of the reliance of the U.S. military on space and descriptions of the space domain as offense dominant and lacking national boundaries may result in the PRC placing a high priority on threatening U.S. space assets.

PRC perceptions of moral authority may increase confidence in escalatory actions. PRC government statements and researchers contend that the PRC is a moral force for the peaceful uses of space and the United States is a destabilizing force driving space weaponization. This belief may be used to justify potentially escalatory actions as a necessary means to stop what the PRC sees as the illegitimate use of space power by the United States.

PRC ambiguity may increase the risk of miscalculation. PRC ambiguity about its intentions toward the development and use of space and counterspace capabilities could raise uncertainty and lead to inadvertent escalation.

PRC writings lack discussion of the effects of attacks against entangled nuclear/conventional early warning systems and space domain awareness systems. The entanglement of space-based nuclear and conventional early warning systems and nuclear early warning systems with space domain awareness systems raises the possibility that strikes against these systems could be interpreted as purposefully degrading a country's nuclear command and control systems as a prelude to a nuclear strike. PLA writings may in the future provide more clarity as it develops its own space-based early warning capability.

Factors that may constrain PRC coercive space activities.

Some PRC writings acknowledge uncertainty over space coercion outcomes. Some PRC writings, especially those discussing actions at the strategic level, warn that coercive space activities may have detrimental, unknowable, or unintended consequences, including the creation of space debris. These sources recommend caution when conducting coercive space efforts.

Growing symmetries in reliance on space. PRC researchers regularly discuss the military and economic benefits of space and only rarely acknowledge that, as the PRC's space program expands and improves, it will acquire many of the same vulnerabilities perceived in the U.S. military's reliance on space.

PRC development, testing, and use of space and counterspace technologies have coercive implications for the space, nuclear, conventional, and economic domains.

PRC development, testing, and use of space and counterspace technologies suggest a broad-based program to develop and communicate the existence of space capabilities intended to deter the United States from becoming involved militarily in a conflict with the PRC by threatening U.S. space, nuclear, and conventional capabilities, as well as the U.S. economy.

Space implications

- PRC development of a wide range of counterspace capabilities, including cyber, direct-ascent, co-orbital, directed-energy, and electronic warfare technologies, suggests that it is

taking a combined arms approach to space warfare to threaten U.S. satellites from the ground to geosynchronous orbit.

This combined arms approach could allow the PRC to tailor its responses to particular situations based on escalatory potential with actions that create temporary effects at the lowest level of escalation, followed by permanent but nondestructive capabilities and then followed by destructive capabilities at the highest level of escalation. Escalating demonstrations of counterspace capabilities could be used to incrementally degrade the U.S. space architecture as a prelude to war.

- PRC development of an orbital bombardment capability raises concerns about China's willingness to uphold its commitment to the Outer Space Treaty, which bans the placement of nuclear weapons in space.

Nuclear implications

- The use of a nuclear-armed orbital bombardment system could enable the PRC to evade early warning systems.
- Improved precision strike enabled by space-based C4ISR systems could allow a country to better track, target, and strike an opponent's nuclear forces. PRC perceptions of the ability of U.S. space capabilities to degrade its second-strike nuclear capability with precision conventional weapons guided by space-based capabilities could lead the PRC to drop its no first use nuclear policy.
- PRC development of a space-based early warning capability is intended to increase the survivability of the PRC's nuclear force and may indicate a transition from a minimum deterrent to a launch on warning nuclear posture.
- PRC researchers see the potential development of space-based missile defenses as undermining the ability of a country to successfully use nuclear-armed missiles.
- The potential targeting of U.S. ground-based space surveillance networks that also serve a dual ballistic missile early warning mission, and space-based ballistic missile early warning systems, such as the U.S. Space-Based Infrared System, could threaten the U.S. nuclear deterrent.

Conventional implications

- Space-based C4ISR capabilities can enable the PLA to detect U.S. military deployments before a conflict begins.
- Space-based C4ISR capabilities could improve the PLA's ability to achieve a more transparent operational environment and facilitate the use of capabilities to degrade U.S. forces and increase doubt in U.S. defenses.
- Counterspace capabilities could be used to threaten U.S. space-based C4ISR capabilities that have allowed it to overmatch conventional adversaries.
- The use of an orbital bombardment system could increase PLA power projection capabilities against bases and territories globally, including targets in the 50 states. The

use of an orbital bombardment system can complicate U.S. missile defenses by forcing the U.S. to defend against joint and combined arms attacks from multiple directions.

Economic implications

- Space coercion can be used to threaten critical economic functions that space enables, allowing a country to project power and achieve national-level effects against an adversary that do not cross the nuclear threshold, yet are severe enough to inflict significant costs on an adversary.
- Attacks against space assets could degrade the U.S. economy with the denial of some types of credit card and banking transactions, ride-hailing and delivery services, and certain types of communication and entertainment services.

Deterring the PRC from using counterspace weapons or escalating a conflict in space may be difficult, especially if the PRC perceives that its territorial integrity and sovereignty are at risk. PRC perceptions of the space domain as offense dominant, the reliance of the U.S. military on space, the PRC's active defense strategy, the lack of national boundaries in space, and PRC perceptions of China as morally superior to the United States may require the U.S. to proactively and consistently utilize diplomacy and space domain awareness capabilities to combat false narratives and predict PRC actions and to develop capabilities to deter attacks.

PRC intransigence may also require strong demonstrations of U.S. capability and will. Such demonstrations, however, present a conundrum for U.S. policymakers. Attempting to manage escalation in such a manner risks further aggravating PRC threat perceptions and intensifying Beijing's belief in the necessity of continued resistance, which could lead to a contest for escalation dominance.

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CHAPTER 1: INTRODUCTION

The role of deterrence in preventing a military confrontation between the United States and the People's Republic of China (PRC) has gained more attention as PRC military activities against Taiwan have increased. PRC military activities involving China and territorial disputes over Taiwan and islands in the East and South China Seas have similarly renewed interest in PRC views of deterrence, compellence, and the risk of escalation.

A critical component of the PRC military capabilities is its space program. The head of the U.S. Space Command has called the PRC's space program the United States' "pacing challenge" and stated that although the United States is still the leading space power, the PRC is developing space capabilities that may threaten traditional U.S. areas of superiority.[1] Similarly, the head of the U.S. Strategic Command declared in 2021 that the PRC had conducted a "strategic breakout" that points toward an emboldened PRC and that the PRC has the "capability to unilaterally escalate a conflict to any level of violence, in any domain, worldwide, with any instrument of national power, and at any time."[2]

Since 2000, China has made significant progress across a broad range of space technologies, including launchers, satellites, lunar exploration, human spaceflight, and counterspace technologies. It has the second largest number of satellites in orbit behind the United States that can be used to support an increasingly sophisticated command, control, communications, computers, intelligence, reconnaissance, and surveillance (C4ISR) network. According to the Defense Intelligence Agency (DIA), between 2018 and 2022, the PRC nearly doubled its number of intelligence, surveillance, and reconnaissance (ISR) satellites to more than 250, "most of which could support monitoring, tracking, and targeting of U.S. and allied forces worldwide, especially throughout the Indo-Pacific region."[3] The Department of Defense also notes that "as of 2021 the PRC has at least one early warning satellite in orbit" and in June 2020, the PRC completed its BeiDou global satellite navigation system, a system independent from GPS that will support navigation and precision strike.[4]

The PRC is also developing and deploying a wide range of counterspace capabilities. According to the head of the U.S. Space Command, "in the next 5–10 years the People's Liberation Army's (PLA's) Strategic Support Force will field a range of counterspace weapons with a mature space and counterspace infrastructure to directly challenge United States' space superiority and threaten the United States in all orbital regimes."[5]

According to DIA, the PLA has developed electronic warfare capabilities to jam space-based communications, radar systems, and GPS and deployed ground-based lasers "of varying power levels to disrupt, degrade, or damage satellites."[6] DIA predicts that "by the mid- to late-2020s, China may field higher power systems that extend the threat to the structures of non-optical satellites."[7] The PLA has deployed ground-based direct-ascent missiles that have the ability to attack satellites in low-Earth orbit and will probably develop capabilities to attack satellites in a geosynchronous orbit.[8] Finally, the PRC has launched multiple satellites to test on-orbit servicing and maintenance capabilities that can also have counterspace applications.[9]

The PRC's rapidly developing space capabilities raise concerns about their wartime use and how they may be employed in peacetime to deter and compel potential adversaries. Indeed, actions

by the PRC since 2007, when China destroyed a retired satellite with a direct-ascent kinetic kill vehicle, have highlighted the role that space may play in PRC coercive efforts directed toward the United States. In 2021, the Space Force's Vice Chief of Space Operations reportedly stated that "both China and Russia are regularly attacking U.S. satellites with non-kinetic means."[10] In 2021, the PRC conducted an orbital launch of a hypersonic glide vehicle that may provide the PLA the ability to project conventional power globally and degrade the U.S. nuclear deterrent.[11] In December 2021, the PRC's *Shijian*-21 satellite towed a defunct BeiDou navigation satellite to a graveyard orbit. Although ostensibly a test of space debris mitigation technologies, the capability also has counterspace applications.[12]

SOURCES AND APPROACH

To better understand PRC views of the role of deterrence and compellence in space operations, we examined PRC government documents and nearly 40 journal articles, media articles, and books by PRC military and civilian authors published between 2000 and 2022. Our goal was to highlight themes and perceptions that appeared to be particularly salient for understanding the conceptual context against which the PRC decisions about coercive space activities may be made.

The texts selected for analysis were written by PRC military and civilian researchers at a variety of institutions. Some authors come from prestigious military institutions such as the Academy of Military Science (AMS) and National Defense University (NDU). Most important, these texts include *Lectures on the Study of Space Operations* (hereafter referred to as *Lectures*), published by AMS in 2013, and the various editions of the *Science of Military Strategy* (SMS), published in 2001 and 2013 by AMS, and in 2017 and 2020 by NDU. These sources were backed by the following:

- Official PRC documents, such as PRC defense white papers and documents submitted to the United Nations
- Scholarly books and journal articles
- PRC media reporting in official sources, such as the *PLA Daily*
- U.S. military statements
- U.S. government documents, such as various editions of the *Military and Security Developments Involving the People's Republic of China* published by the Office of the Secretary of Defense
- Western media reporting

OVERVIEW OF ARGUMENT

This paper argues that the PLA is developing space technologies, in part, to prevent or mitigate foreign interference in its stated national security interests. It argues that the PLA is shifting from a force focused on nuclear deterrence to one more capable of achieving a variety of coercive effects in, from, and to space. Taken in this context, the paper argues that the development of coercive space capabilities could have significant implications for the ability of the United States to deter the PRC from taking military action and the escalatory dynamic between the two countries as each attempts to deter the other in space.

The PRC conceptualization of coercive space activities found in the writings surveyed for this report has concerning escalatory implications. PRC perceptions of the space domain as offense dominant, the reliance of the U.S. military on space, PRC military strategy, the lack of national boundaries in space, and PRC perceptions of China as morally superior to the United States are all likely factors that could complicate efforts to deter PRC actions and may require strong demonstrations of capability and will. Such demonstrations, however, present a conundrum for U.S. policymakers. Attempting to manage escalation in such a manner risks further aggravating PRC threat perceptions and intensifying Beijing's belief in the necessity of continued resistance, which could lead to a contest for escalation dominance.

CHAPTER 2: PRC WRITINGS ON COERCION

This chapter provides the context for PRC writings on space coercion by discussing the Chinese concept of *weishe* (威慑). Understanding the meaning of *weishe* has important implications for understanding how the PRC may conduct coercive activities. PRC writings describe a range of activities as falling under the rubric of *weishe*, from actions normally thought of as peacetime actions to the use of armed force against adversary space architectures. In this regard, PRC sources view *weishe* as subordinate to the PRC's active defense strategy, which can include the use of offensive strikes, such as preemption, when the PRC perceives that its sovereignty and territorial integrity are threatened.

DEFINING *WEISHE*

Weishe is often translated in Western studies as deterrence. PRC discussions of *weishe*, however, include a range of actions intended to both deter and compel potential adversaries. In Western literature, *deterrence* is defined as "prevention or discouragement, by fear or doubt, from acting."[13] *Compellence*, in contrast, is defined as "forcing a side to take action." The difference between deterrence and compellence is the initiator of the action.[14] In short, deterrence is to prevent an action; compellence is to force an action to the initiator's advantage. Together, deterrence and compellence are more broadly defined as elements of coercion.[15]

PRC writings are inconsistent in their definitions of *weishe*, however.[16] Some discussions suggest that the term should be translated as "deterrence." The 2020 *SMS*, for example, defines *weishe* as "the comprehensive use of multiple means to cleverly display force and the will to use force so as to confront an opposing side with unacceptable or even unbearable loss in order to make it back down, compromise or submit."[17] Additionally, Zhang Wenzong, director of the Politics Research Office in the Institute of American Studies of the China Institutes of Contemporary International Relations, cites Thomas Schelling and explicitly differentiates between deterrence (referred to as *weishe*) and compellence (referred to as *xiepo* (胁迫)).[18]

Other sources, however, appear to implicitly acknowledge the use of both deterrence and compellence measures. The 2013 edition of the *SMS* defines *weishe* as "the threat or the actual use of force to influence an adversary's strategic decision-making in order to make them believe that [their] goals will be difficult to achieve or that the cost of achieving them will be too high."[19]

Further complicating our understanding of *weishe* is that its meaning is often context dependent.[20] Even the 2020 *SMS* definition, cited above as centering on deterrence, describes the goals of *weishe* as either deterring or compelling an adversary.[21] Moreover, in some situations, the term clearly refers to deterrence, while in others it clearly refers to compellence.[22]

As a result, PRC discussions of *weishe* can include a range of actions associated with both deterrence and compellence measures that are intended to raise the threshold of war so that a potential enemy will do a cost-benefit analysis and realize that the costs of armed action against the PRC will exceed the benefits.[23] Therefore, although this paper often refers to coercion, in some instances it makes references to deterrence or compellence that, unless specifically noted, still refer to *weishe*.[24]

THREE ELEMENTS OF EFFECTIVE COERCION

PRC analysts write that coercion must possess three elements to be effective: capability, resolve, and communication.[25]

- Capability refers to having the means to carry out threats. PRC analysts write that China must possess some form of actual capability, otherwise the threat will be viewed as empty.[26]
- Resolve refers to the willingness to carry out threats with action.[27]
- Communication refers to being able to effectively signal the possession of capability and resolve to an adversary.[28] PRC sources recognize that not every form of coercion is perceived, understood, or received by the enemy. As a result, an ability to carry out threats must be complemented by an effective means of communication.[29]

Although all three elements—capability, resolve, and communication—are indispensable for coercion to be effective, capability is considered its foundation.[30] Of these factors, military force is regarded as the core element of coercive power.[31]

NOTABLE ELEMENTS OF PRC CHARACTERIZATIONS OF COERCION

PRC discussions of coercion are guided by three characteristics that are relevant to how the PRC may approach coercion: (1) the necessity of conforming coercive actions to the PRC's active defense strategy, (2) PRC perceptions of moral superiority, and (3) the necessity of moving away from nuclear deterrence as a primary means to prevent and contain conflicts and relying instead on a broad-based set of capabilities under the rubric of "strategic coercion" that involves a range of nuclear and conventional capabilities that includes space capabilities.

The PRC's active defense strategy and coercion

The requirement for PRC coercive actions to conform to the PRC's active defense strategy has reportedly been mandated by PRC leader Xi Jinping and provides insights into why and when the PRC may resort to coercive actions.[32] The active defense strategy has influenced PLA military doctrine in some way since at least 1935 and was elaborated on in 1936 when Mao Zedong called for the PLA to pursue a strategy of active defense that he described as an "offensive defense" and "defense through decisive engagements."[33]

Active defense is best described as strategically defensive but operationally offensive. At the strategic level, the PRC states that it will never start a war and that it will only counterattack in response to actions that harm its interests.[34] Despite this characterization, PRC sources describe the strategy as having a strong offensive component that includes preemption, especially in situations involving PRC perceptions of its sovereignty and territorial integrity. According to the 2020 *SMS*, in these situations the PRC "has the right to use military measures at any time."[35]

PRC discussions of the seemingly defensive nature of active defense coupled with its offensive elements suggest a paradox that is best explained by the political nature of what the PRC may consider a "first shot." According to the 2001 *SMS*, actions taken at the political or diplomatic level by a potential adversary that harm the PRC's stated sovereignty and territorial claims can be considered a first shot that requires a military response.[36]

In this context, PRC support of Russian rationales for the invasion of Ukraine as a response to NATO enlargement may provide insights into how the PRC could justify future coercive efforts. According to PRC government and military statements, NATO enlargement created the strategic conditions that justified the Russian invasion. Applied to the context of the PRC, a change in the strategic environment involving US-PRC-Taiwan relations in which the United States is seen as upgrading its relations with Taiwan past a certain point could justify, in PRC thinking, military action.[37] These explanations of active defense suggest that there is little to distinguish the PRC's active defense strategy from an offensive military strategy when it comes to armed conflict involving sovereignty or territorial issues that the PRC considers inherently defensive, such as those involving Taiwan and the South China Sea.

PRC perceptions of moral superiority

The prospect of PRC peacetime coercive activities and difficulties in deterring the PRC may be reinforced by a self-perception of its moral superiority, leading it to see its coercive measures as inherently defensive and a justification for the use of force. This characterization is based on the PRC perception that it merely seeks to protect its legitimate national interests whereas other countries use coercive measures for illegitimate gain.[38] According to one researcher:

> The national defensive character of China itself determines its defensive nature. It has a basic difference from Western hegemonic deterrence. In the deterrence of "Taiwanese Independence," it is for reuniting the motherland, preventing division, and preserving the interests of the nation and people. It is entirely just and is also in accordance with the development trends in world military strategies.[39]

PRC writers assert that the PRC practice of coercion is geared toward avoiding war while also maintaining PRC interests by focusing on nonmilitary methods of resolving disputes. This assertion stands in contrast to what the writers claim is a Western acceptance of the use of force as a legitimate way to reach political goals. U.S. coercive efforts are described as being based on "dominance and expansion" and characterized by power politics intended to maintain its hegemony.[40] According to the 2013 *SMS*:

> From a historical and practical perspective, China's military coercion has the fundamental attributes of being for self-protection, defensive, and limited, making it essentially different when compared with Western countries like the United States. Viewed from the fundamental goal, China's military coercion is for containing aggression and preventing a conflict from escalating to a war or for implementing counter-coercion against hegemonic-style coercion. It is not for threatening or "compelling" (*xiepo*; 胁迫) other countries with force, and much less for seeking regional and global hegemony.[41]

This perception is repeated in the 2020 *SMS*, whose authors write that as a socialist country, the PRC "cannot or should not" use coercion "as a tool of hegemonism."[42]

Development of strategic coercive capabilities

PRC researchers assert that although nuclear weapons must serve as the ultimate guarantee of the PRC's security, PRC security is best achieved through the broad-based development of capabilities that can achieve non-nuclear strategic effects, such as advanced conventional strike,

cyber, and space capabilities.[43] According to the authors of the 2013 *SMS*, the PLA should "focus on multiple current and future strategic requirements" that involve developing capabilities for a variety of contingencies below the threshold of nuclear war.[44]

When combined with nuclear weapons, these capabilities form a "strategic coercive system" that is intended to prevent major wars, prevent China from being blackmailed, and prevent external forces from interfering in the PRC's stated sovereignty claims.[45] The establishment of a strategic coercive system appears to have gained official acceptance when Xi Jinping in his October 2022 report to the 20th National Congress of the Chinese Communist Party tasked the PLA to "establish a strong system of strategic coercion."[46] Citing Xi Jinping, one group of PLA researchers from the Nanjing Army Command College write that strategic coercion is "an important component of today's international military struggle."[47]

The trend of expanding the concept of strategic capabilities beyond nuclear weapons appears to be the result of at least three factors. The first factor is the 1999 U.S. bombing of the PRC Embassy in Belgrade, which is widely regarded within the PRC as being intentional. According to the biography of Zhang Wannian, who was vice chair of the Central Military Commission at that time, the PRC's top leadership decided after the incident that the PLA needed to reinvigorate its development of "assassin's mace" weapons, characterized as cutting-edge technologies that could exploit key adversary vulnerabilities, that could "see far, shoot far, and strike accurately" and could give the PRC the strategic initiative.[48] These development efforts became centered on weapons that could generate decisive effects on the battlefield and act as strategic deterrents against the United States.[49]

The second factor is the PRC's expanding global interests. In 2004, the PLA was tasked with defending the PRC's expanding interests according to its "New Historic Missions." The PLA would no longer be responsible for defending the PRC's interests only within its territorial boundaries, airspace, and territorial waters but also its interests in the distant oceans, outer space, and cyberspace.[50] This new mission set likely required the PLA to develop capabilities to defend PRC interests in each of these domains.

A third factor has been the increasing utility of new technologies. According to Xi Jinping, the PLA must "comprehensively improve coercive and actual warfighting capabilities under informatized conditions."[51] The authors of the 2013 *SMS*, for example, conclude that "various new conventional coercive means will produce a revolutionary influence on the traditional ideas, modes, and mechanisms" of coercion. Although they do not identify specific technologies, they refer to "new means" of coercion that can blind, paralyze, and disable an opponent. They argue that the PLA must build a military that integrates networked land, sea, air, space, and cyber forces whose operations are characterized by improved battlefield awareness, command and control, precision strike, and support capabilities as well as building capabilities to carry out multiple types of information operations to deter large-scale enemy information attacks.[52]

In this regard, even though the PLA is developing many of the same capabilities as the U.S. military, asymmetric capabilities are considered an important component of the PRC's coercive capabilities that can focus on the weak links of an adversary's military.[53] Indeed, taking an asymmetric approach to coercive measures is cited as a primary principle of Xi Jinping's thinking on coercion.[54]

Based on this, PLA researchers write that the PRC must develop capabilities across multiple domains, with an emphasis on space and cyber capabilities.[55] According to the 2013 *SMS*, these capabilities include a "flexible and diverse space force" that can enable the free and effective use of space through strategic early warning, C4ISR, and counterspace capabilities.[56]

CHAPTER 3: PRC WRITINGS ON SPACE AND COERCION

The importance of space coercion is related to the importance of space as a warfighting domain. It is one of five types of space operations, in addition to space blockade operations, space strike operations, space defense operations, and space information support operations.[57] A common refrain in PRC writings is that "whoever controls space, controls the Earth."[58] PRC sources describe outer space as an increasingly important domain for a country's military power, economic vitality, and scientific and technological development.[59] The 2020 *SMS* states the following:

> Space is not only an important strategic interest, but also the strategic highpoint of international military competition and the strength of a country's military space power determines that country's international position and security. It is important not only to a country's military but also to a country's economic position in the information age and the robotic age.[60]

The importance attached to space is also reflected in PRC government assessments. According to the PRC's 2015 defense white paper, outer space is one of four critical domains, along with the maritime, cyber, and nuclear domains. The PRC's 2019 defense white paper elaborates on the importance of space, calling it "a critical domain in international strategic competition" that "provides strategic assurance for national and social development." It states that "threats to outer space…loom large" and lists "safeguarding security interests in space" as one of nine national defense aims.[61] The 2015 defense white paper is even more explicit, describing space as a "new commanding height in strategic competition" and stating that threats from outer space "will be dealt with to maintain the common security of the world community" and that the PRC will "secure its space assets to serve its national economic and social development, and maintain outer space security."[62]

Based on this perception of space warfare, PLA researchers conclude that achieving space superiority, defined as the ability to freely use space and deny the use of space to others, will become a deciding factor in future wars.[63] PRC researchers argue that the importance of space to warfare means space warfare will become more prominent as militaries not only seek to gain the benefits of space but also deny its use to adversaries.[64]

PLA researchers describe space coercion as an important component of the PRC's overall coercive capability due to the critical role of space in modern military operations and economies. According to *Lectures*, "space weapons have the characteristics of fast launch, high accuracy, and great power, so that space capabilities can quickly and accurately destroy important political, economic, and military targets within the depths of the enemy's operations."[65] As a result, "the impact of space security will therefore not be limited merely to outer space but will penetrate and radiate to almost every aspect of a nation's…security."[66]

In fact, the 2013 *SMS* states that even the routine development and operation of space capabilities can "generate significant deterrent effects."[67] According to other PLA researchers, the importance of space to a country's military power and economic vitality means that "space coercion should be used in future wars" and that coercive space measures could be so effective they may disincentivize an adversary's willingness to escalate.[68] According to PLA researchers,

although space power allows militaries to strengthen their coercive space capabilities for use against potential adversaries, increased military and economic reliance on space also makes countries more susceptible to space coercion.[69] PRC researchers argue that space is a key enabler of modern military operations and that the U.S. military derives most of its intelligence from space-based ISR and relies on satellites for 90 percent of its global communications.[70] According to the authors of *Military Astronautics*:

> In future wars, the use of various methods to threaten the survival of an adversary's space capabilities and to hold them "hostage" or to use them as "collateral" can force an adversary (especially developed countries that rely to a great extent on space) to fear that their space equipment will be destroyed, causing it to be unable to achieve victory or to absorb too great of a loss so that it does not dare conduct operations against us.[71]

The 2013 *SMS* is also explicit in the role of space coercion in influencing adversary decision-making by threatening an adversary's military and economy:

> The reason why space systems and space military forces can be used for the goal of coercion and generate significant coercive effects is closely correlated to the rapid development and wide-ranging application of space technology, as well as its far-reaching influence. Due to human daily life, the operating of society, and the unfolding of military activity, there is an ever-greater reliance on assisting support and safeguarding support by space systems, and human society has ever greater difficulty bearing the grave aftermath when space systems fail to work, become disordered, and are incapacitated. The means and activity which potentially can cause jamming and sabotage of the normal operation of space systems, even if they do not cause actual sabotage, still can create psychological fear to a certain extent, and have an influence on national decision-makers and the associated strategic decision-making activity.[72]

PLA researchers also argue that the nature of the space domain as offense dominant increases its coercive utility.[73] According to the authors of *Lectures*, space systems are easily destroyed and their defense systems are complex, making space warfare inherently offensive. In a departure from the active defense strategy, they assert that "active offense is the only method for achieving victory in war."[74]

Because of this, PLA studies assert that space coercion will be the first type of military coercive method used or that future wars may begin in space, not only because of the offense-dominant nature of space warfare but also because of the lack of political boundaries in space, the global reach of space capabilities, and military reliance on space. This may particularly be the case when non-kinetic means are used.[75]

SPACE COERCION

PRC sources are nearly uniform in their definition of space coercion and take into account both deterrent and compellence aspects: "with strong space power as a backing, the use of threats or the actual limited use of space power to coerce and restrain adversary military operations."[76] According to the 2013 *SMS*, space coercion is "the main mode for safeguarding China's space rights and interests, so space attack and defense operations first must be able to meet the needs and

requirements of space coercion and contribute to boosting the effectiveness of space coercion."[77] The 2020 *SMS*, however, proposes a different definition that appears to emphasize deterrence. According to its authors, "space coercion refers to the display of space power and the expression of the willingness to use space power in order to force the enemy to not take military action or to not escalate military action."[78]

PRC writings on space coercion align with the broader set of PRC writings on coercion.[79] PRC discussions of space coercion state that effective space coercion involves the possession of capabilities, the resolve to use them, and the proper communication of both.[80] PLA researchers state that the goal of space coercion is to prevent and reduce the scale of war by creating fear and sowing doubt in an adversary through the demonstration of space capabilities and the willingness to act against space systems.[81] PRC writings also state that space coercion will be most effective when coordinated with nuclear and conventional coercion as well as economic and diplomatic efforts.[82]

Like most writings on *weishe*, PRC writings on space and *weishe* also contain elements of deterrence and compellence. According to the 2013 *SMS*, the purpose of peacetime space coercion is to contain crises and maintain peace and stability in space.[83] This purpose is accomplished by generating doubt and fear in the enemy by creating a favorable posture and demonstrating strength and resolve. Reflecting both the deterrent and compellent nature of coercive space activities, *Lectures* states that the goal of these activities is to "break the enemy's resistance without fighting or with *minimal fighting*" [emphasis added].[84]

Before and during war, space coercion can be used to deter attacks against a country's space systems and to control the scale of an adversary's space warfare activities.[85] These activities include taking an asymmetric operational posture against adversaries and, when necessary, conducting coercive space activities "to prevent losing control of the situation and escalation of the conflict," including conducting strikes against an adversary.[86] Reflecting the strategic nature of space operations, PRC writings state that forces participating in coercive space actions should fall under a centralized leadership composed of the highest level of command from all participating forces.[87]

COERCIVE SPACE ACTIVITIES

A survey of PRC writings for this paper identified eight types of activities intended to achieve coercive effects in, from, and to space: 1) enhancing conventional force capabilities; 2) deterrence by denial; 3) deterrence by punishment; 4) deterrence by detection; 5) displays of space power; 6) space warfare exercises; 7) space power deployments; and 8) coercive space strikes. Not all are explicitly cited by PLA sources as being a component of coercive space operations. *Lectures*, for example, lists only four activities and appears to only consider activities that are specifically directed against space assets—displays of space power, space warfare exercises, space power deployments, and coercive space strikes.[88]

According to *Lectures*, coercive space activities are "usually" conducted in a manner of increasing escalatory intensity but can be conducted simultaneously or not in order of intensity, based on the situation.[89] *Lectures* notes, for example, that during peacetime or in the early stages of a crisis, the goal is to deter an adversary from taking action.[90]

Enhancing conventional force capabilities

Based on their study of wars conducted since the 1991 Gulf War, PLA researchers conclude that space capabilities enhance the coercive effect of conventional forces by increasing the efficiency and effectiveness of warfighting through improved intelligence collection, increased speed of operations, more mobile operations, and improved effectiveness of strikes.[91] According to the 2020 *SMS*, the benefits of the use of space have given the U.S. military the ability to strike any target from any domain at any time and place.[92] This includes strikes against a country's nuclear forces. PRC researchers have pointed out that space-based C4ISR systems could allow a country to better track, target, and strike an adversary's nuclear forces.[93]

Deterrence by denial

Deterrence by denial, defined in U.S. writings as "strategies seek[ing] to deter an action by making it infeasible or unlikely to succeed, thus denying a potential aggressor confidence in attaining its objectives," was not widely discussed in the writings reviewed for this study.[94] One exception is international cooperation. *Lectures*, for example, states that international cooperation can restrain an opponent's offensive behavior by entangling one country's space operations with the operations of other countries. Attacking a cooperative system could thus potentially raise the cost of the conflict to the attacker by involving third parties.[95] One article notes that expanding international cooperation is an explicit U.S. policy to deter other countries from attacking its space assets.[96]

Other activities that are associated with deterrence by denial efforts, such as deploying large constellations of satellites, hardening satellites, and reducing reliance on space-based assets, were either little discussed or not discussed at all. Such omissions may reflect the offensive predilection of PRC writings on coercion, less developed conceptual thinking, and/or the state of PRC technology development at the time the sources used for this study were published.

Moreover, developing counterspace capabilities may have been seen as a more effective means of achieving coercive capabilities than developing large constellations of satellites. This situation could continue to be the case. Although the PRC has the second-largest number of satellites in orbit, the United States has nearly six times as many satellites in orbit than the PRC and can also rely on allied space assets to augment its capabilities. This situation could change as PRC capabilities increase, however. The PRC, for example, plans to establish a megaconstellation of nearly 13,000 communication satellites.[97]

Deterrence by punishment

Deterrence by punishment is defined in U.S. writings as "threaten[ing] severe penalties, such as nuclear escalation or severe economic sanctions, if an attack occurs."[98] Although not mentioning deterrence by punishment specifically, *Lectures* refers to deterrence by punishment in the context of U.S. statements threatening nuclear attack against an adversary that attacks its space systems. According to *Lectures*:

> The United States and other military powers stress that an attack by any nation against their space systems is equivalent to launching a nuclear war. Based on these circumstances, when using space strengths, it will be necessary to stand at the vantage point of strategy and to comprehensively consider various political,

> diplomatic, economic, and military factors, in order to make decisions cautiously and to strive not to "fire the first shot" at the strategic level. This kind of outer space strategy has determined that space operations will be defensive in nature.[99]

Deterrence by detection

Space-based ISR capabilities can open a window of opportunity to influence adversary decision-making before military action takes place by providing early warning of adversary actions. Citing the Cuban Missile Crisis and the Berlin Airlift as examples, *Lectures* argues that deterrence by detection was the main form of space deterrence activities conducted during the Cold War. It concludes that "it was precisely because the great powers used nuclear deterrence and space deterrence together at this stage that the Cold War was prevented from [taking] steps that would slide into a 'nuclear winter' and that a great many major international strategic crises were diffused."[100]

Similarly, a researcher at the Academy of Military Sciences wrote in a 2018 article that during the Cold War, space-based capabilities provided strategic stability by "ensuring the retaliatory capability of both sides' strategic forces." According to the researcher, space capabilities served as "an auxiliary force for nuclear deterrence" during the Cold War that enabled both the United States and Soviet Union to monitor, provide warning of, and intercept the opposing side's missile launches.[101]

Displays of space power

Displays of space power involve displays of new equipment, weapons tests, and the publication of concepts of operations.[102] They can involve open methods, such as television, radio, and print and online media, and semi-open methods, such as displays to foreign officials.[103] Displays of space power do not have to be fully transparent, however, and can obscure a system's full capabilities in order to create doubt within the adversary. Displays of space power are described as being used during peacetime and at the beginning of crises and having a low escalatory potential.[104]

Space warfare exercises

Space warfare exercises can be computer simulated or live. They can include missile defense and counterspace exercises that demonstrate the PLA's ability to achieve space superiority, and their scale can be adjusted to fit the situation. Space warfare exercises are conducted when a crisis escalates and displays of space power have not been effective at deterring an adversary. They can also demonstrate the PLA's ability to use real-time or near real-time space-based sensing.[105]

Space power deployments

Space power deployments can include launches of new satellites and changing the orbits of satellites to better meet operational requirements. They occur when a crisis escalates, especially when it is believed that an adversary is preparing for war. Space power deployments have a middle to high degree of escalatory potential and can help create the conditions for the wartime employment of space assets. As such, coercive space power deployments can be conducted in preparation for an actual contingency.[106]

Coercive space strikes

Coercive space strikes are conducted when the previous coercive measures have failed and are intended to demonstrate to an adversary that the other side has completed preparations for war. According to the 2013 *SMS*, "When necessary, we can even conduct limited space operational activities with warning and punishment as goals, to stop the adversary from willfully escalating the intensity of a space confrontation."[107]

Similarly, the authors of *A Strategic Vision for China's Air and Space Security* write that coercive space strikes are acceptable if the PRC's space interests have been harmed or if it is evident that a crisis will escalate to conflict.[108] According to *Integrated Aerospace Operations*, coercive space strikes are intended to achieve limited effects in ways that do not encourage an adversary to escalate. On the other hand, coercive space strikes can facilitate a transition to war, if necessary.[109]

Coercive space strikes are considered the most escalatory of coercive space measures and can be kinetic or non-kinetic and can include electronic warfare methods against satellites, radars, and communications nodes and computer network attacks. Kinetic attacks can also be conducted, but are described as sudden, of short duration, and limited.

Coercive space strikes may also include strikes from space to the ground. According to *Lectures*, "the execution of strikes from outer space against targets on the ground, at sea, and in the air has superiority unmatched by other operational activities."[110] Targets of orbital bombardment include reconnaissance and early warning systems, communication hubs, and command centers; logistics systems, military-industrial bases, electric power and energy systems, and other infrastructure; and counter-force targets, including missile positions, airfields, naval bases, nuclear bases, and information warfare installations.[111]

THE CHARACTERISTICS OF SPACE COERCION

Space coercion differs from nuclear and conventional coercion

PLA researchers assert that space coercion differs from nuclear and conventional coercion in important ways.[112] Space coercion is described as more strategic than conventional coercion, and unlike conventional coercion, which can involve attacks against targets in an adversary's territory, no political or geographical restrictions on the use of weapons against targets in space exist.[113]

According to these sources, space coercion is also more useable, controllable, flexible, and credible than nuclear deterrence.[114] A major distinguishing factor between space weapons and nuclear weapons is that the threshold for using space weapons is much lower.[115] The precision of space weapons and their ability to strike at key military and economic vulnerabilities means they can be effective while causing much less collateral damage than a nuclear strike.[116] The escalatory effects of space coercion can also be modulated and include actions to disrupt, damage, or destroy space assets.[117] PRC researchers, on the other hand, argue that nuclear threats lack credibility because the use of even low-yield nuclear weapons could lead to a larger nuclear war that the initiator would not dare start.[118]

Nevertheless, *Lectures* also argues that some space weapons are like nuclear weapons: they play a deterrent role but should not be used without great consideration. In this respect, *Lectures*

argues that China must possess such weapons and be prepared for their use in order to deter the outbreak of a war, control the escalation of a conflict, and to resolve a crisis in China's favor.[119]

Space coercion is subordinate to the principles of the PRC's active defense strategy

Similar to coercion in general, PRC researchers place space coercion within the context of the PLA's active defense strategy.[120] According to *Lectures*, actual space warfare and coercion are two major components of "active defense" whose use must be integrated.[121]

Lectures states that "space operations overall are defensive," yet it argues that offensive actions are conducted "during the process of strategic defense."[122] *Lectures* also states that "in order to break the United States' monopoly on outer space, various countries…have treated active defense as the basic guide in developing their construction of outer space." Citing the U.S. threat that attacks against U.S. satellites will be treated as similar to a nuclear attack, *Lectures* cautions that decisions about the use of force against space assets should not be made rashly and that China should not seek to "fire the first shot" at the strategic level.[123]

However, just as with active defense in general, defining what constitutes a first strike is critical to understanding the nature of active defense in space operations. According to *Lectures*, "strong enemy" (i.e., the United States) war preparations involving the use of space-based assets to conduct more intensive ISR against China may constitute the beginning of hostilities. These U.S. actions, *Lectures* asserts, will "strictly speaking" constitute a "first shot" in space that will allow China to conduct counterstrikes and seek to take the initiative at the operational and tactical levels.[124]

PRC views of coercive space activities are shaped by its view as a responsible space actor

Just as the PRC government and PLA researchers depict the United States as a malign actor that destabilizes global peace and stability, they also depict the PRC as a moral and principled space actor and the United States as the greatest threat to peace and stability in space.[125] PRC researchers write that it must match and counter U.S. space capabilities by maintaining a balance of power in space through efforts to deter U.S. military action and, if necessary, compel the United States to cease military action.[126]

Numerous PRC sources point to U.S. space policy, its development of new technologies and operational concepts, and the holding of space wargames as indications that the United States is intent on dominating space and restricting China's access to it.[127] Moreover, the PRC government concludes that the United States has an ongoing antisatellite weapons program, described by one researcher as "well-funded and multifaceted."[128] According to these researchers, the United States has developed a variety of counterspace weapons, including kinetic kill weapons, electronic warfare systems, and co-orbital capabilities.[129]

The sentiment that the United States is a malign actor in space may be best expressed in an article written by a PLA Strategic Support Force officer who argues that even defensive capabilities proposed by the United States, such as making satellites more resilient to attack, using constellations of smaller and cheaper satellites, and distributing satellite functions across multiple satellites, are a threat to the PRC and indicators of the U.S. military trying to maintain its dominance of space. According to the officer, "the U.S. space deterrence strategy aggravates an arms race in space, giving rise to strategic misjudgment, and compressing the space of China's

space activities, which will ultimately be detrimental to maintaining a peaceful space environment."[130]

Figure 1. The X-37B Orbital Test Vehicle

Source: U.S. Air Force.

PRC concerns over the U.S. military's space program are exemplified by characterizations of the X-37B Orbital Space Vehicle. Indicative of these concerns is a September 14, 2017, *PLA Daily* article examining the missions and implications of the X-37B that is described as an important component of the U.S. goal to develop prompt global strike capabilities. Although assessed to offer just an initial operational capability, the X-37B is described as being able to carry out remote sensing, communications, counterspace, and long-range precision strike missions. The author concludes that the X-37B is an indicator of the United States' intention to develop space-based coercive capabilities that will ultimately lead to a space arms race.

Source: Si, "The Background of the U.S. X-37B Flights."

PRC RESEARCHERS VIEW SPACE COERCION AS COMPLEX

Although PLA researchers advocate for the development of space weapons, some sources state that many unknowns surround their use. PRC researchers cite several factors that complicate effective space coercion that could lead to deterrence failure, unintended escalation, or war.

Outcomes of space coercion are difficult to predict

Lectures describes space coercion as involving sharp conflicts of interest that can be contradictory and intricate and involve complex, interwoven issues. Because a space war has not yet been fought, many factors, such as the psychological effect of coercive space operations, international reaction to attacks in space, human agency, chance, and adversary deception may be unknowable.[131] Similarly, a Strategic Support Force officer argues that the ambiguity of assigning responsibility for a space attack, the difficulty of knowing an adversary's true intentions, and the lack of a code of conduct for space and clear red lines complicate any responses to an attack in space.[132]

PLA researchers write that space coercion involves balancing the strength of coercive measures so that goals can be achieved while providing an adversary with off-ramps for de-escalation. Coercive measures should involve both offensive and defense measures and should strike a balance between being strong enough to influence the adversary yet not so strong that it encourages the adversary to escalate.[133] PLA researchers also state that timing is important. Coercion conducted too early could reveal strategic intent and enable an adversary to develop countermeasures or to take its own escalatory measures. However, the opportunity to influence an adversary may be lost if the coercive action is taken too late.[134]

Lectures also provides a cautionary note on the use of kinetic attacks. The debris produced by kinetic attacks can not only affect an adversary's spacecraft but also PRC and third-party spacecraft. Similarly, attacks against adversary ground installations on adversary territory could lead to an expansion of a war while attacks against adversary installations located in third-party countries could drag other countries into a war, complicating China's military activities and diplomatic outreach.[135]

As a result, the unknowns of coercive space operations may lead to unintentional escalation and war. The authors of *Lectures* argue that to mitigate risk, decision-makers should perform a cost-benefit calculation of the proposed actions before engaging in coercive space activities to determine the best strategy, the resources required to achieve the objective, the scope of the coercive actions, the goals to be achieved, the measures used, and appropriate targets. Even with this planning, however, decision-makers are advised to proceed with caution and to try to achieve the best results with the most limited coercive measures.[136] Despite this complexity, the 2020 *SMS* concludes that space coercion "will mature and play an increasingly important role."[137]

The United States is the stronger space power

The 2013 *SMS* argues that China should be cautious in starting a space war with a stronger power like the United States. The publication states that China should only attack U.S. space assets when deterrence has failed and the U.S. continues to attack PRC space assets.[138]

CHAPTER 4: CONCLUSIONS AND IMPLICATIONS

PRC coercive space efforts are intended to achieve effects in, from, and to space. PRC researchers argue that China must develop a set of strategic capabilities composed, in part, of space forces that can achieve a balance of power with the United States. They also argue that China's buildup of military space power is intended to form part of a broad-based coercive capability that can enable the PRC to achieve peacetime goals and win wars by holding U.S. military superiority and economic vitality at risk.

SPACE CAPABILITIES ARE INTENDED TO ACHIEVE STRATEGIC-LEVEL COERCIVE EFFECTS

Coercive space activities are intended to enable the PRC to achieve its broader military and political objectives.[139] PRC space capabilities are not only intended to coerce China's adversary's from attacking PRC space assets but also to create power projection capabilities that can deter and compel the United States from becoming involved in conflicts over PRC stated territorial integrity and sovereignty claims.

In this context, the role of coercion as a primary mission of the PLA may provide insight into the motivations for recent PLA demonstrations of space power. As part of the PRC's active defense strategy, PRC researchers state that coercive activities can occur in both peacetime and wartime and can involve demonstrations of space power, tests of space capabilities, and the use of force, among others. Although PRC deployment of a space-based early warning capability appears to be intended to enhance its nuclear deterrent capability, PRC attacks on U.S. satellites, the SJ-21 satellite capture of a defunct BeiDou satellite, and the testing of an orbital bombardment capability may not only serve as tests of operational capabilities but also as a form of signaling to the United States that war with the PRC will entail high costs, including forcing the United States to develop sophisticated and expensive countermeasures. These capabilities thus may be intended to demonstrate the capability and will to attack U.S. satellites, raise doubts about the U.S. nuclear deterrent, and threaten the U.S. homeland with attack (see Table 1).

Table 1. Potential PRC coercive space activities

Action	PRC Coercive Category	Comments
2007 test of direct-ascent kinetic kill vehicle	**Displays of space power**	Potential signaling of counterspace capability.
SJ-21 capture of BeiDou satellite		Potential signaling of counterspace capability.
2021 test of FOBS capability		Potential signaling of capability to evade early warning and missile defenses.
Deployment of space-based early warning satellite	**Space power deployment**	Capability to detect missile launches.
Attacks against U.S. satellites	**Coercive space strikes**	Potential signaling of capability to strike U.S. spacecraft.

Sources: Burke, "China's SJ-21 Framed as Demonstrating Growing On-Orbit Servicing, Assembly, and Manufacturing (OSAM) Capabilities"; Hitchens, "It's a FOBS, Space Force's Saltzman Confirms Amid Chinese Weapons Test Confusion"; Office of the Secretary of Defense, "Military and Security Developments Involving the People's Republic of China 2021"; and Rogin, "A Shadow War in Space Is Heating Up Fast."

COERCIVE SPACE ACTIVITIES ARE LIKELY INTENDED TO UNDERMINE AN ADVERSARY'S SPACE, NUCLEAR, AND CONVENTIONAL FORCES, AS WELL AS ITS ECONOMIC PERFORMANCE

PLA writings on space coercion state that the critical role of space in enabling military operations and underpinning economic activities make it a strategic capability more useable than nuclear coercion and more effective than conventional coercion. Multiple PLA writings assert that space and counterspace operations can undermine an adversary's nuclear and conventional deterrent posture and economy by degrading C4ISR capabilities, including NC3I, through precision strike and counterspace operations.

According to a researcher at the PLA's Space Engineering University Space Security Research Center, the employment of missile defenses, precision strike, hypersonics, and space control technologies will weaken traditional forms of deterrence, making space coercion the "new strategic high point of military coercion."[140] This point is also discussed in an article on the history of coercion in the PRC journal *Military History*. Referring to the "High Frontier" strategy published by the Heritage Foundation in 1982 that advocated for the deployment of space-based missile defenses, the author argues that because the proliferation of nuclear weapons has diminished its coercive power, the United States is now using space to undermine nuclear deterrence.[141]

Space implications

PRC development of coercive space capabilities has implications for the space domain.

China developing combined arms approach to space warfare

The development of a wide range of counterspace capabilities, including cyber, direct-ascent, co-orbital, directed energy, and electronic warfare technologies, suggests that the PRC is taking a combined-arms approach to space warfare to threaten U.S. satellites from the ground to geosynchronous orbit.

This combined arms approach could allow the PRC to tailor its responses to particular situations based on escalatory potential with actions that create temporary effects at the lowest level of escalation, followed by permanent but nondestructive capabilities, and then followed by destructive capabilities at the highest level of escalation. Escalating demonstrations of counterspace capabilities could be used to incrementally degrade the U.S. space architecture as a prelude to war.

Orbital bombardment capability raises questions over China's commitment to Outer Space Treaty

PRC development of an orbital bombardment capability raises concerns about China's willingness to uphold its commitment to the Outer Space Treaty, which bans the placement of nuclear weapons in space.[142]

Nuclear implications

PRC development of counterspace, orbital bombardment, and improved space-based C4ISR capabilities has implications for nuclear deterrence.[143] According to Kaufman and Waidelich, "many PRC authors and policy makers have expressed concern that offensive space operations could weaken China's nuclear deterrent, undermining long-standing asymmetric strategic stability between the United States and China and requiring a reassessment of how this stability may be restored."[144] According to one PRC article, a country facing an adversary with strong space

capabilities will be unable to effectively defend its nuclear forces from precision strikes enabled by space-based capabilities and will face a degradation of its nuclear deterrent capabilities.[145]

Potential for PRC to drop no first use (NFU) pledge

PRC perceptions of the ability of U.S. space capabilities to degrade its second-strike nuclear capability with precision guided conventional weapons and the potential first mover advantage afforded by space-based capabilities could lead the PRC to drop its NFU nuclear policy.[146]

Potential for PRC to establish launch on warning nuclear posture

PRC development of a space-based early warning capability is intended to increase the survivability of the PRC's nuclear force and may indicate a transition from minimum deterrent to the launch on warning nuclear posture.[147]

Space-based missile defense undermines nuclear deterrent

PRC researchers see the potential development of space-based missile defenses as undermining the ability of an adversary to successfully launch nuclear-armed missiles.[148]

Potential attacks against NC3I increase instability

PRC targeting of early warning systems, such as ground-based space domain awareness (SDA) networks that serve a dual ballistic missile early warning mission, and space-based ballistic missile early warning systems, such as the U.S. Space-Based Infrared System, may increase instability due to concerns that the PRC is attacking the U.S. NC3I architecture.

Conventional forces better able to monitor, track, and target nuclear forces

PRC researchers express concern that improved precision strike enabled by space-based C4ISR systems could allow a country to better track, target, and strike its nuclear forces.[149]

Orbital bombardment systems able to evade early warning systems

The use of a nuclear-armed orbital bombardment system could enable the PRC to evade U.S. early warning systems. Although it is possible for ground-based radars to detect targets in orbit, key components of the U.S. ground-based early warning system are stationed in areas that only allow for the detection of objects in northern latitudes.

Conventional implications

PRC development of space-based C4ISR capabilities and counterspace capabilities are intended to threaten the U.S. military's conventional capabilities and reduce confidence in the U.S. ability to counter conventional PRC military actions.

Space capabilities contribute to deterrence by detection

Space-based C4ISR capabilities can enable the PLA to detect and counter U.S. military movements before a conflict begins. These capabilities could be used to demonstrate that the PLA has the intelligence capabilities to successfully track the U.S. military in order to prevent the success of U.S. denial and deception efforts.

PRC space capabilities help degrade U.S. conventional forces

Space-based C4ISR and satellite navigation capabilities could lead to improvements in the ability of the PLA to degrade U.S. forces and increase doubt in the ability of U.S. defenses.[150]

PRC counterspace capabilities degrade U.S. conventional military performance

Counterspace capabilities could be used to degrade critical U.S. military space-based C4ISR capabilities that have allowed it to overmatch conventional adversaries since the 1991 Gulf War. A significant loss of space capabilities could reduce the U.S. military to fighting industrial-age warfare.[151]

Orbital bombardment systems could increase PLA power projection capabilities

The use of orbital bombardment platforms could increase PLA power projection capabilities against bases and territories in the Western Pacific as well as against targets in the 50 states. The use of orbital bombardment systems could also complicate U.S. missile defenses against conventional attack by forcing the U.S. to defend against joint and combined armed attacks from multiple directions.

Economic implications

The effects of space coercion go well beyond the military domain. Space coercion can also be used to deny critical economic functions that space enables, allowing a country to project power and achieve national-level effects against an adversary in ways that fail to cross the nuclear threshold, yet are severe enough to inflict significant costs on an adversary.

PRC writings appear to imply that the loss of many of the technologies the modern world takes for granted depends on space and that their loss could have widespread economic effects. Satellite positioning, navigation, and timing, for example, facilitate financial transactions and ride-hailing and delivery apps, and improve electrical power generation. Space-based remote sensing provides detailed mapping. Satellite communications enable credit card transactions, satellite television, and global connectivity.[152] According to one U.S. analysis, the loss of GPS alone would cost the United States more than $45 billion over a 30-day period.[153]

ESCALATORY IMPLICATIONS OF PRC WRITINGS ON COERCIVE SPACE OPERATIONS

PRC writings on space coercion blur the line between coercive and warfighting efforts

The identification of the PRC's active defense strategy as a principle of its approach to coercion suggests that the strategy has both peacetime and wartime implications. In this respect, the PRC's active defense strategy calls for active measures in defense of its stated territorial and sovereignty claims. As a result, coercion can take place during peacetime, crises, and war and can involve a variety of measures, including kinetic and non-kinetic means.[154] In fact, multiple PLA writings state that space coercion may be the first type of coercive measure used in a conflict.

These discussions of coercion, active defense, and the use of military force have implications for escalation control.

Potential escalatory factors

Lectures acknowledges that the many unknown factors of space warfare could lead to miscalculation, unintended escalation, and war and urges caution when conducting coercive space operations. Other PRC writings, however, do not acknowledge the uncertainty of coercive space operations. In addition, no PRC source explicitly acknowledged other factors that could lead to inadvertent escalation or war.

Misperceptions caused by attacks against space-based assets

No source reviewed for this paper discussed the possibility that attacks against adversary space systems could be interpreted as an opening salvo of a war by an adversary that would necessitate an escalatory response.[155] In addition, although analysts have devoted some attention to the potential escalatory risks of PLA conventional and nuclear forces sharing the same command and control structure, they have paid relatively little attention to the escalatory potential of striking dual-mission nuclear/conventional early warning systems as well as nuclear early warning/SDA systems.[156]

Misperceptions caused by attacks against NC3I systems

No source reviewed for this paper acknowledged that the degradation of either side's NC3I in support of conventional operations could lead to concerns that the strikes are a prelude to a nuclear strike. Indeed, the role of space-based early warning systems to detect conventional ballistic missile launches suggests that the PLA may consider these legitimate conventional targets.

The lack of discussion of the potential escalatory effects of attacks on the U.S. NC3I architecture could be driven by a belief that the PRC's no first use (NFU) nuclear weapons policy should be viewed as a commitment to refrain from actions that purposefully degrade the U.S. nuclear deterrence. According to one PRC academic, "For nuclear weapon states that maintain a NFU policy—including China—antisatellite weapons could not, by definition, provoke a nuclear attack."[157]

Misperceptions caused by attacks against dual SDA/early warning systems

No source discussed how the destruction or degradation of ground-based radar ballistic missile early warning systems that also serve a dual role in SDA feed perceptions of an imminent nuclear strike. Strikes against these systems could degrade the ability of either country to detect nuclear strikes, increase uncertainty, and increase the possibility of inadvertent escalation leading to nuclear war. This is especially concerning considering the prominent role that conventionally armed ballistic missiles could play in PRC military operations and the role that U.S. early warning satellites would play in defending against them.

PRC perceptions of moral authority may increase confidence in escalatory actions

A complicating factor to deterring the PRC from attacking the U.S. space architecture and managing escalation is the PRC's belief that it only fights just wars and that the U.S. maintains its superpower status through illegitimate means. PRC government statements and PRC researcher assessments that the PRC is a moral force in the conduct of space activities and the United States is a destabilizing and malign force in space may be used to justify potentially escalatory actions in space as a necessary means to stop what the PRC sees as an illegitimate use of space power by the United States.

PRC ambiguity may increase the risk of miscalculation

PRC ambiguity in regard to its intentions and actions toward adversary space assets could increase uncertainty and lead to inadvertent escalation. Despite evidence to the contrary, the PRC government continues to remain ambiguous about its development of counterspace weapons. It is possible that the PRC wants to feign what it sees as its morally superior position of publicly advocating for a ban on space weapons while at the same time pursuing unacknowledged counterspace capabilities that have been largely conducted outside the public domain.

Ambiguity also allows the PRC to intimate consequences without committing itself. In this respect, ambiguity keeps a potential adversary guessing about the PRC's true intentions. Not knowing what actions may trigger a reaction from the PRC, an adversary may prefer to remain cautious by not challenging the PRC or by engaging in conduct that falls well below China's threshold for reaction.

This ambiguity would appear to be contrary to the third element of effective deterrence: the ability to communicate to a potential adversary the capability and will to defend its interests. The limits of this approach have been acknowledged by at least one PRC researcher, who writes that the PRC's 2007 antisatellite test, its January 2010 missile defense test, and its test flight of a space plane have served a deterrent role, but the deterrent effect of these activities has been limited by PRC secrecy issues, which have prevented more complete disclosures of information.[158]

PRC writings do not discuss the deterrence role of space domain awareness

No PRC writings reviewed for this report discuss the use of SDA capabilities in coercion, although more recent PRC studies dedicated to SDA characterize it as a fundamental component of space operations.[159] The U.S. Space Force defines SDA as the "effective identification, characterization, and understanding of any factor associated with the space domain that could affect space operations."[160] SDA can enhance deterrence and reduce inadvertent escalation. During peacetime, SDA can provide real-time situational awareness to identify and help deter activities. During a crisis or prelude to war, it can identify mobilization activities related to space, such as prepositioning satellites in certain orbits and deploying counterspace capabilities. During war, it can better inform decisions to escalate by determining whether an attack is limited or all out.[161]

The lack of discussion of the role of SDA in coercion may reflect any of these possibilities:

- PRC capabilities were undeveloped at the time the sources used for this report were published to the extent that PRC researchers did not deem them worthy of attention.
- The conceptualization of space coercion is underdeveloped.
- PRC researchers view offensive capabilities as more important than defensive measures.

Monitoring future PRC discussions of deterrence by denial or SDA could reveal clarifications or changes in the PRC's coercive space posture.

Attempts to deter the PRC or to persuade it to deescalate may require strong demonstrations of capability and resolve

PRC writings on space coercion highlight several factors that may complicate the ability of the United States to deter the PRC from taking military action in space. PRC perceptions of the space domain as offense dominant and not limited by political boundaries, the reliance of the U.S. military on space, the PRC's active defense strategy, and PRC perceptions of China as morally superior to the United States are all factors that will likely complicate efforts to deter PRC actions and may require strong demonstrations of capability and resolve, especially if the PRC perceives that its territorial integrity and sovereignty are at risk.

Strong demonstrations of capability and resolve, however, present a conundrum for U.S. policymakers. Attempting to manage escalation in such a manner risks further aggravating PRC

threat perceptions and intensifying Beijing's belief in the necessity of continued resistance, which could lead to a contest for escalation dominance.

Security dilemma aspects of U.S.-PRC space competition may increase instability

PRC writings on space coercion and its development of space capabilities suggest that the United States and the PRC have entered into a security dilemma that can potentially be a destabilizing influence on the military dynamic between the two countries in space, exacerbated by its zero-sum competitive aspects and the offense-dominant nature of space.[162]

PRC researchers describe strategic stability as no longer limited to nuclear stability and may take space capabilities into account when assessing the overall strategic balance between the United States and China.[163] As a result, U.S. investments in any space capabilities may affect PRC perceptions of its ability to deter the United States and may lead to a space arms race.

FACTORS THAT MAY CONSTRAIN PRC COERCIVE SPACE ACTIVITIES

Uncertainty over space coercion outcomes

Despite the apparent predilection for the use of coercive space efforts, some PRC writings, especially those discussing actions at the strategic level, caution that coercive space activities may have unknowable or unintended consequences. Factors such as the psychology of the opponent, the intensity of the coercive action, and the strategies and denial and deception efforts of both sides can affect coercive outcomes. According to the *Lectures*, if these factors are not well accounted for, it could lead to failure and "set off a war or an escalation of war."[164]

As a result, these sources recommend caution when conducting coercive space efforts. At least two sources recommend that decisions to use counterspace capabilities should be made at the highest levels of a command structure.[165] In addition, the 2020 *SMS* states that offensive actions in space should be limited.[166] At least one source acknowledges that counterspace operations could lead to the creation of space debris that could undermine the PRC's own access to space.

Creation of space debris

Due to their potential indiscriminate effects, the PLA could refrain from conducting destructive tests and attacks that create space debris. PLA sources do recognize the danger space debris pose to spacecraft and are cautious in recommending the use of "hard kills," although we found no source that explicitly ruled out taking actions that can produce space debris. The 2020 *SMS*, for example, notes that space debris is a growing problem.[167] *Lectures* also notes that the effects of space debris can be indiscriminate and warns that "hard kill actions against enemy satellites, spacecraft, and other space systems can have a major impact on the overall situation, and it is even more necessary to be extremely prudent and to make thorough preparations, so as to prevent enemy retaliation."[168] PRC criticism of U.S. efforts to enlist international support for its self-imposed ban on debris creating antisatellite weapons tests as "fake arms control" and an effort to "weaken others" may also indicate that the PRC has not ruled out taking destructive actions in space.[169]

Nevertheless, the broad range of counterspace weapons being developed by China, such as electronic warfare and directed energy weapons, gives the PLA options other than destructive means to deny an adversary space capabilities. The caution expressed in *Lectures* that some space weapons should only be used with great consideration and that hard kill strikes should be limited

suggests a sensitivity to debris creating activities.[170] If this were the case, debris-creating weapons could primarily play a deterrent role in PLA crisis management and warfighting plans.[171]

Growing symmetries in reliance on space

The importance of space to military operations and economic vitality and the PRC's growing capabilities suggests that as PRC investments in space increase, it will acquire many of the same vulnerabilities that PRC researchers perceive in the U.S. military's reliance on space. Until recently, PRC writings did not discuss the potential vulnerabilities that the PLA will experience with an increased reliance on space.

That may be beginning to change. The 2020 *SMS*, for example, states that given increased activities in space, it may be possible to establish a "relationship of mutual restraint" between adversaries.[172] Zhou Bo, a retired PLA senior colonel, noted in 2021 that "Beijing is vulnerable, too" in space and argued that the United States and the PRC should engage in cooperative efforts to reduce the risk of conflict in space.[173] Although not explicitly stating that the PRC is vulnerable in space, Zhang Chaohan, a professor at the PRC's Northwest Polytechnic University, argues that recent U.S. actions, including the claimed conjunction event between China's Tiangong space station and a SpaceX Starlink satellite, create an urgent need for better space governance.[174] In addition, PLA writings on the use of artificial intelligence in future warfighting, known as "intelligent" or "intelligentized" warfare in PRC writings, recognize that an increasingly interconnected sensor-to-shooter system will expose militaries to vulnerabilities they may not have been exposed to previously.[175]

ABBREVIATIONS

AMS	Academy of Military Sciences
C4ISR	command, control, communications, computers, intelligence, surveillance, and reconnaissance
DIA	Defense Intelligence Agency
FOBS	fractional orbital bombardment system
ISR	intelligence, surveillance, and reconnaissance
NC3I	nuclear command, control, communications, and intelligence
NFU	no first use
NDU	National Defense University
PLA	People's Liberation Army
PRC	People's Republic of China
SDA	space domain awareness
SMS	Science of Military Strategy

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