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BACKGROUNDER

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Evolving Chinese Thinking About Deterrence: What the United States Must Understand About China and Space

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Abstract

While China has engaged in nuclear deterrence since it exploded its first nuclear weapon in 1964, it has increasingly focused on "space deterrence." This is partly due to China's growing space capabilities, which began to expand in the late 1990s and partly due to the simultaneously growing role of space forces in calculations of modern military power. As with Chinese views of nuclear deterrence, Chinese views of space deterrence occur within a very different context than Western views. For Chinese decision makers, successful deterrence is ultimately a form of political activity and psychological warfare, whereby an adversary is constrained in his actions, allowing China to achieve its goals. Space deterrence is about employing space capabilities in order to achieve broader political ends, rather than deterring an adversary from engaging in space activities. For the United States to engage in successful space deterrence, it must be able to retain the ability to access space, while denying that same access in time of conflict to an adversary.

While China has engaged in nuclear deterrence since it exploded its first nuclear weapon in 1964, it has increasingly focused on "space deterrence" (*kongjian weishe*; 空间威慑) over the past two decades. This is partly due to China's growing space capabilities, which began to expand in the late 1990s, and partly due to the simultaneously growing role of space forces in calculations of modern military power. The first Gulf War (Operations Desert Shield and Desert Storm, in 1990–1991) demonstrated the growing role of space systems in conventional warfare. Subsequent conflicts in the Balkans, Afghanistan, and the Middle East have only underscored

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Key Points

- As with Chinese thinking on nuclear deterrence, Chinese thinking on space deterrence occurs within a very different context than Western thinking.
- The Chinese see deterrence as a *means* to achieving political ends, not about avoiding actions in a particular domain. For Chinese decision makers, successful deterrence is ultimately a form of political activity and psychological warfare, whereby an adversary is constrained in his actions, allowing China to achieve its goals.
- While the People's Liberation Army is not necessarily reliant on space for its operations, its most dangerous adversary, the United States, is seen as dependent on space systems. Denying an adversary the ability to exploit space, as well as securing it for one's own use, is therefore integral to establishing space dominance.
- The United States needs to demonstrate that attacks against American space systems will not paralyze or fundamentally degrade the overall military capability of the United States.

the greater importance of space capabilities in waging war.

As with Chinese views of nuclear deterrence, Chinese views of space deterrence occur within a very different context than Western views.[1] The Chinese focus is on compellence, including coercion, rather than solely, or even primarily, on dissuasion. Thus, the idea of "deterrence" is seen in both coercive and dissuasive terms. Equally important, the Chinese see deterrence as a *means* to achieving political ends. There does not appear to be much focus on deterring or dissuading an adversary from acting in space. Instead, for Chinese decision makers, successful deterrence is ultimately a form of political activity and psychological warfare, whereby an adversary is constrained in his actions, allowing China to achieve its goals.[2] In this regard, nuclear deterrence would seem to be the exception, with a general desire to avoid the use of nuclear weapons. Space deterrence, by contrast, is about employing space capabilities in order to achieve broader political ends, rather than deterring an adversary from engaging in space activities.

Indeed, Chinese writings suggest that decision makers will focus not on deterring action in the space domain, but in securing the larger Chinese strategic objective (such as compelling Taiwan to abandon its quest for independence, and obtaining support for Chinese claims to the South China Sea). The purpose of deterrence is to help achieve a particular goal—*deterrence is not the goal itself*.

Chinese Concepts of Space Deterrence

Chinese writings since at least the late 1990s have repeatedly emphasized the importance of establishing "space dominance" (*zhi taikong quan*; 制太空权) as part of fighting "local wars under modern, high-technology conditions," "local wars under informationized conditions," and now "informationized local wars." While the People's Liberation Army (PLA) is not necessarily reliant on space for its operations, its most dangerous adversary, the United States, is seen as dependent upon space systems. Denying an adversary the ability to exploit space, as well as securing it for one's own use, is therefore integral to establishing space dominance.

This, in turn, elevates the role of space deterrence, which is now seen as a vital mission for the People's Republic of China's (PRC's) space forces. It is a relatively new task, arising in light of the rapid development of space technology, as well as the broad reliance on space systems in support of other military functions.

In the Chinese view, space deterrence has several unique characteristics.[3] One is "its broad impact" (*quan fangwei xing*; 全方位性). Effective space deterrence will affect not only space forces but terrestrial forces and operations as well. This reinforces the point that, from the Chinese perspective, "space deterrence" is not about deterring adversaries from acting in space, but exploiting space-related systems to achieve certain political and military aims (largely on Earth).

Chinese writings since at least the late 1990s have repeatedly emphasized the importance of establishing "space dominance."

Related to this is the assessment that "space deterrence is unified" or "integrated" (*yiti xing*; 一体性). This is a reflection of the unified nature of space capabilities, which includes military, civilian, and commercial space systems, and which encompasses systems in orbit, terrestrial tracking and control facilities, and associated data links. Successful space deterrence will employ a variety of means, including land-based, sea-based, and air-based systems as well as space-based capabilities, and will include both offensive and defensive operations.

Finally, implementing space deterrence must take into account "its comprehensive nature" (*zonghe xing*; 综合性). Space strength touches on a nation's

1. See Dean Cheng, "Evolving Chinese Thinking About Deterrence: The Nuclear Dimension," Heritage Foundation *Backgrounder* No. 3240, August 16, 2017, https://www.heritage.org/asia/report/evolving-chinese-thinking-about-deterrence-the-nuclear-dimension.
2. [Please note that articles that were originally published in Chinese have the author's surname listed first.] Zhou Peng and Wen Enbing, "Developing the Theory of Strategic Deterrence with Chinese Characteristics," *China Military Science*, Vol. 3 (2004), p. 20.
3. This section is drawn from Chinese Military Encyclopedia 2nd ed. Editorial Committee, *PLA Encyclopedia, 2nd ed., Military Strategy* (Beijing, PRC: China Encyclopedia Publishing House, 2007), pp. 280 and 281.

economic, financial, and scientific, as well as military capabilities. Space deterrence therefore reflects, in part, a nation's economic and scientific sophistication; that is, a country cannot have a strong space deterrent if it is economically and scientifically weak. At the same time, since a nation's space capabilities include not only its military systems, but also its commercial and civilian assets, facilities, and personnel, space deterrence must include these elements as well.

Chinese Space Deterrence Activities

Chinese writings define space deterrence as the use of space forces and capabilities to deter or coerce an opponent, preventing the outbreak of conflict, or limiting its extent should conflict occur. By displaying one's own space capabilities and demonstrating determination and will, the PLA would hope to induce doubt and fear in an opponent, so that he would either abandon his goals, or else limit the scale, intensity, and types of operations. It is important to note that space deterrence is not aimed solely, or even necessarily, at deterring actions in space, but rather, in conjunction with nuclear, conventional, and informational deterrence capabilities and activities, influence an opponent's overall perceptions and activities.

PLA writings suggest that there is a perceived hierarchy of space deterrence actions. In the 2007 *PLA Encyclopedia*, for example, global aerospace powers are said to engage in "four main forms" (*zhuyao fangshi*; 主要方式) of space deterrence:

1. **Active development of space technology,** with steady acceleration of aerospace strength acquisition. This includes development of new missile, as well as space, technology.

2. **Acceleration of development of space weapons.** In particular, the *Encyclopedia* notes the development and deployment of offensive (*jingong xing*; 进攻性) space weapons.

3. **Organization of space combat forces.** While the focus has tended to be on American military developments, Chinese writings specifically note Russian development of aerospace forces, including the reorganization and creation of a space service.

4. **Implementation of space warfare exercises.**[4] The Chinese authors likely have in mind events such as the American Schriever series of space-related war games.

Although states may signal their broad pursuit of space deterrence through development of various technologies, in time of crisis or conflict, PLA teaching materials and textbooks suggest that the Chinese conceive of a "deterrence ladder" of space actions when in a crisis. This ladder goes beyond broad technological and bureaucratic developments and involve displays of space forces and weapons, military space exercises, deployment or augmentation of space forces, and employment of space weapons.[5]

"Displays of space forces and weapons" (*kongjian liliang xianshi*; 空间力量显示) occur in peacetime or at the outset of a crisis. The goal is to warn an opponent in the hopes of dissuading him from escalating a crisis or pursuing courses of action that will lead to conflict. Such displays involve the use of various forms of media to highlight one's space forces and are ideally complemented by political and diplomatic gestures and actions, such as inviting foreign military attaches to attend weapons tests and demonstrations.

An article from a leading PLA journal suggests that the space deterrence calculus includes not only military space forces but civilian systems as well.[6] Because of the steady increase in civilian space activities, and the concomitant rise in dual-use capabilities, many civilian space activities can rapidly morph into military ones. Thus, the article notes, launch of multiple satellites from one rocket and on-orbit satellite repair have military applications, and the conduct of such activities, even by civilian entities, is nonetheless a form of space deterrence.

"Military space exercises" (*kongjian junshi yanxi*; 空间军事演习) are undertaken as a crisis escalates if displays of space forces and weapons are insufficient to compel an opponent to alter course. They can

4. Ibid., p. 281.
5. This section draws upon Chang Xianqi, *Military Astronautics*, 2nd ed. (Beijing, PRC: National Defense Industries Press, 2005), and Jiang Lianju, *Space Operations Teaching Materials* (Beijing, PRC: Military Science Publishing House, 2013).
6. Sun Haiyang and Chang Jinan, "A New Shape of Military Deterrence—Space Deterrence," *Military Art*, Vol. 10 (2003), p. 33.

involve actual forces or computer simulations and are intended to demonstrate one's capabilities but also military preparations and readiness. At the same time, such exercises will also improve one's military space force readiness. Examples include ballistic missile defense tests, anti-satellite unit tests, "exercises demonstrating space strike" (*kongjian tuji*; 空间突击) capabilities, and displays of real-time and near-real-time information support from space systems.

"Space force deployments" (*kongjian liliang bushu*; 空间力量部署) are seen as a significant escalation of space deterrent efforts. It occurs when one concludes that an opponent is engaged in preparations for war and involves the rapid adjustment of space force deployments. As with military space exercises, this measure is not only intended to deter an opponent, but should deterrence fail, is seen as improving one's own preparations for combat. Such deployments, which may involve moving assets that are already in orbit or reinforcing current assets with additional platforms and systems, are intended to create local superiority of forces so that an opponent will clearly be in an inferior position. It may also involve the recall of certain space assets (such as space shuttles), either to preserve them from enemy action or to allow them to prepare for new missions. This may be akin to the evacuation of dependents from a region in crisis, as a signal of imminent conflict.

Various space deterrence activities are unlikely to be undertaken in isolation. Rather, they will be coordinated with other, non-space activities.

The Chinese term the final step of space deterrence as "space shock and awe strikes" (*kongjian zhenshe daji*; 空间震慑打击). If the three previous, non-violent (or less violent) deterrent measures are insufficient, PLA writings suggest that it may engage in punitive strikes, so as to warn an opponent that one is prepared for full-blown, comprehensive conflict in defense of the nation. Such strikes are seen as the "highest...and final technique" (*zuigao xingshi he zui hou shouduan*; 最高形式和最后手段) in seeking to deter and dissuade an opponent. Employing hard-kill methods, soft-kill methods, or a combination, one would attack an opponent's physical space infrastructure or data links, respectively. If this succeeds, opposing decision makers will be psychologically shaken and cease their activities. If it fails, an opponent's forces will nonetheless have suffered some damage and losses, facilitating the securing of space dominance in a wartime context.

These various space deterrence activities are unlikely to be undertaken in isolation. Rather, they will be coordinated with other, non-space activities. Indeed, several Chinese analyses note that space operations enhance other forms of deterrence, including nuclear and conventional. By providing precise information on adversary forces (such as location), they make nuclear attacks more effective. Space dominance can be rapidly converted into advantages for one's air, naval, and ground forces.[7] Similarly, by maintaining constant surveillance of an adversary under all conditions, one exerts a broader psychological pressure that also enhances deterrent (and coercive) efforts.

Space Blockades. In addition to specifically deterrence-oriented actions, Chinese military writings also discuss "space blockade operations" (*kongjian fengsuo zuozhan*; 空间封锁作战). Such operations are clearly intended to intimidate or coerce an adversary and therefore should also be considered part of the Chinese portfolio of space deterrence activities.

Space blockades, according to PLA writings, involve the use of space and terrestrial forces to prevent an opponent from entering space and from gathering or transmitting information through space. There are several different varieties of space blockade activities. One is to "blockade terrestrial space facilities" (*hangtian jidi fengsuo*; 航天基地封锁), including launch sites; tracking, telemetry, and control (TT&C) sites; and mission control centers. They can be disrupted through the use of kinetic means (such as special forces or missiles) or through computer and information network interference.

Another means is to "blockade orbits" (*guidao fengsuo*; 轨道封锁). This can include actually destroying satellites that are in orbit, or else creating clouds of space debris or deploying space mines, thereby denying an adversary the easy use

7. Ibid., p. 35.

of a given orbital track. The purpose of destroying satellites is not necessarily to attack an adversary's systems—one might choose to destroy, for example, one's own satellites and thus demonstrate a capability. As important, by threatening the destruction of adversary satellites (without necessarily doing so), one might limit the function of those satellites (for example, by limiting their maneuvers). Chinese analyses recognize, however, the risk that either such step might damage third-party space systems, which in turn could lead to strategic consequences. Therefore, those analyses warn that this approach to imposing a space blockade imposes very high requirements for precise control, extremely detailed space situational awareness, and highly focused, limited deployment.

Space blockade operations can also entail the "blockade of launch windows" (*fashe tongdao fengsuo*; 发射通道封锁). If one can delay a launch, whether through interfering with its onboard systems or otherwise disrupting the schedule, then a satellite may not be able to reach its proper orbit. In the past, some American space launches have been delayed because fishing and pleasure boats were present down-range.[8] This alternative also includes the possibility of a boost-phase intercept of a space launch vehicle.

Finally, one can impose an "information blockade" (*xinxi fengsuo*; 信息封锁). By interfering with and disrupting an opponent's data links between terrestrial control stations and the satellite, one can effectively neutralize an orbiting satellite by hijacking the satellite's control systems, or prevent ground control from issuing instructions. Alternatively, one can interfere with the data that the satellite is transmitting. That is, rather than tampering with the satellite's controls, one can contaminate or block the data that is passing through the satellite. A third form of information blockade involves "dazzling" a satellite, using low-powered directed energy weapons against sensors or other systems. In each case, the intent is to effect a "mission kill," whereby the satellite cannot perform its functions, but is not necessarily destroyed.

Implications for the United States

As careful students of other people's wars, the PLA has seen how the "American way of war" is characterized by precision long-range strikes, carefully coordinated joint operations, and a desire to minimize both adversary and American casualties. This approach, in turn, relies heavily on space systems to locate and track the enemy, create common situational awareness among participating American forces, and guide weapons. Therefore, degrading or otherwise disrupting space systems is likely to influence American effectiveness.

As important in the context of deterrence, by reducing American effectiveness, it may be possible to at least delay American intervention (as the U.S. compensates for lowered capabilities), if not influence political decision makers. Chinese authors have questioned whether American decision makers would continue to intervene at the price of a reduced space infrastructure that would not only affect the immediate campaign, but would also reduce information support for American forces worldwide.

> The Chinese think of space deterrence as a means of achieving a predetermined political goal, not to prevent actions in the space domain.

This underscores the fact that the Chinese think of space deterrence as a means of achieving a predetermined political goal, not to prevent actions in the space domain. Moreover, Beijing is *currently* engaging in space deterrence. The Chinese recently announced the test of a mid-course missile interceptor.[9] The interceptor appears to be oriented primarily towards intermediate-range ballistic missiles—a system that is not deployed by the United States or Russia (as per the Intermediate-Range Nuclear Forces Treaty), or Japan, Taiwan, or Vietnam. As important, the system is believed to incorporate elements

8. "Atlas 3 Scrubbed to Tuesday," *Space Daily*, May 21, 2000, http://www.spacedaily.com/news/eutelsat-00g.html (accessed February 27, 2018), and Jessica Orwig, "A Rocket Launch Monday Was Delayed Because of a Boat—How Could a Boat Interfere with a Rocket?" *Business Insider*, October 28, 2014, http://www.businessinsider.com/why-rocket-launch-delayed-by-a-boat-2014-10 (accessed February 27, 2018).
9. Zachary Keck, "China Claims that It Has Tested a Mid-Course Missile Defense System," *The National Interest*, February 11, 2018, http://nationalinterest.org/blog/the-buzz/china-claims-it-has-tested-mid-course-missile-defense-system-24434?page=show (accessed February 27, 2018).

that have previously been used with Chinese anti-satellite weapons (ASATs). The demonstration of this and other Chinese ASATs, including one capable of reaching systems in geosynchronous orbit, perhaps the most valuable real estate in space, is consistent with Chinese publications on space deterrence. For Chinese decision makers, deterrence, including in space, is a constant concern, rather than an action undertaken in time of acute crises.

Recommendations for American Decision Makers

Given these growing challenges from the PLA, the United States needs to undertake steps that will demonstrate that attacks against American space systems will not paralyze or fundamentally degrade the overall military capability of the United States. By demonstrating this, it will signal to the Chinese leadership that the Chinese cannot achieve their political goals (the aim of Chinese *weishe* activities) through such attacks—which will not only make it less likely that the Chinese will attack American space systems, but also make it less likely that the PRC will challenge the United States in the first place. Such steps should include the following:

Increasing American Space Resilience. The most immediate need is for the United States to demonstrate that it can perform certain space missions even in the face of attacks and interference with its current space systems. There are a number of approaches that can improve the resiliency of American space systems. One is to *increase the use of commercial systems*. Telecommunications satellites have long been run by commercial operators; indeed, some of the world's largest owners and operators of satellites are commercial firms, such as Intelsat and Inmarsat. There are now companies that are discussing the deployment of hundreds, even thousands of satellites. Such constellations would provide an unprecedented level of coverage, with a satellite overhead every few hours, perhaps even every few minutes.

Such commercial systems, however, are likely to be effective only if they ensure that there are redundant means of accessing their data, even in the face of intense intrusions and interference. This would require not only multiple downlink sites and mission control facilities, but also significant investment in cybersecurity, since the constellation can only be effective so long as there are means of controlling its operation.

Another means of increasing resilience may be to *disaggregate some of the various functions* in future satellite systems. Current satellites are the size of Greyhound buses, often with a variety of instruments aboard to support a variety of functions. While this makes each multi-billion-dollar satellite more cost-effective, it also makes them much more lucrative targets for attack. Designers of future satellite systems may wish to pursue more single-purpose satellites, in order to make each satellite less attractive as a target. Coupled with a greater emphasis on smaller satellites, this may improve the survivability of key systems and, as important, the prolonged performance of key missions.

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In this regard, Cubesats may offer a path to resilience. Individual Cubesats are 10 x 10 x 10 centimeters and weigh only about 1.33 kilograms each. They can be assembled, like Lego building blocks, into larger structures, however. Incorporating more advanced sensors, onboard processing, and cybersecurity software might allow for an individually less capable satellite that could be launched by a larger variety of platforms, perhaps in large numbers. Such military Cubesats could constitute a key bridge between current large, exquisite, but sparse platforms and ubiquitous but less secure commercial systems.

Reducing Reliance on Space. While increasing resilience can reduce the impact of enemy attacks on American space systems, so long as the U.S. is reliant on space, its systems will be targeted. Therefore, alongside increasing resilience there must also be an effort to reduce reliance on space systems. Some small steps have already been undertaken in this regard. The U.S. Naval Academy, for example, has reintroduced instruction in "shooting the sun," employing a sextant and charts. The Army, meanwhile, is reinvigorating training on land navigation, again without reliance on the Global Positioning

System (GPS) network. Such measures need to be supplemented by training and practice in the conduct of more complex activities, such as joint air strikes, without the benefit of space-based communications, weather, and navigation systems.

This should be further supplemented by the establishment of terrestrial alternatives for certain functions, including navigation and timing. The United States ceased funding for the LORAN-C system of radio navigation beacons in 2009 and did not fund the proposed e-Loran successor, in the belief that GPS had made terrestrial beacons obsolete.[10] This decision has been questioned, and in 2017, there were efforts to reinstate funding for a new e-LORAN system, including the National Timing Resilience and Security Act of 2017. These efforts should be pursued, and Congress should fund "the development, construction, and operation of a backup to the Global Positioning System," one which does not rely upon satellites.

Practicing Operating Without Space Capabilities. While the provision of alternative systems and greater resilience may make American space systems less of a target, those systems will likely remain priority targets for an adversary for the foreseeable future. Consequently, American forces need to regularly exercise without space capabilities, including not only navigation satellites, but communications and reconnaissance systems as well. Indeed, the entire process of planning and implementing joint strike operations needs to be practiced without access to any space systems (including weather data). Only by publicly demonstrating that American forces can operate effectively without space systems is the threat to those systems likely to diminish at all.

Expanding American Counter-Space Operations and Capabilities. Given that revisionist states such as the PRC are investigating how to deny American military forces information from space, it is essential that the U.S. be able to similarly deny an adversary information from space. The benefits of asymmetric access to space has been demonstrated from the first Gulf War, through operations in the Balkans and Afghanistan to the war in Iraq. U.S. forces operating without access to the strategic high ground of space would be operating at a perilous disadvantage if Chinese or other forces could retain access to that same domain. The United States therefore needs to demonstrate a capacity to neutralize any adversary's space systems.

As important, this capability needs to encompass the entire range of systems, from those in low-earth orbit to geosynchronous and even to cis-lunar space (the volume of space that extends beyond the geosynchronous belt to the Moon). China has already demonstrated what is believed to be a direct ascent anti-satellite system intended to target systems in geosynchronous orbit (GEO), while it is also starting to deploy communications relay satellites to a Lagrange point, far beyond GEO. Other states are likely to follow both such offensive and defensive moves. The U.S. needs to counter both, including fielding a demonstrated ability to deny space to adversaries.

Conclusion

With the new National Security Strategy and National Defense Strategy, it is clear that the United States has begun to reorient its forces from a predominantly counter-insurgency focus to one more intended to counter nation-state actors and peer competitors. An essential difference is that most of the nations the United States has militarily engaged since the end of the Cold War (Saddam Hussein's Iraq, Serbia, Afghanistan) have not had independent access to space or a meaningful space infrastructure. By contrast, the PRC is one of the world's foremost space powers, and with Russia, possesses not only a substantial space industrial complex, but a demonstrated counter-space capability. For the United States to engage in successful deterrence, it must therefore be able to retain the ability to access space, while denying that same access in time of conflict to an adversary.

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10. GPS.gov, "LORAN-C Infrastructure and e-Loran," https://www.gps.gov/policy/legislation/loran-c/ (accessed February 27, 2018).