



National Institute for Public Policy

A GUIDE TO THINKING ABOUT SPACE DETERRENCE AND CHINA

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Executive Summary

U.S. space systems are the backbone of the U.S. economy and national security. Chinese counter-space weapon developments promise to make the satellite protection mission ever more challenging. There are significant challenges to deterring China from aggressive behavior in space, and for this reason U.S. policy makers and defense planners must start planning now for a possible future military confrontation involving China that also may involve military space contingencies. The purpose of this report is to provide a framework for thinking about deterrence and the protection of U.S. space assets.

Deterrence

Successful deterrence strategies are, to the extent possible, tailored to the unique characteristics of diverse adversaries and political circumstances. By merely threatening to attack U.S. space systems unprotected by a strong deterrent or defenses, a country (in this study's scenario, China) might be able to deter, or significantly alter, the United States' involvement in the region or even its willingness to enter a conflict. When it comes to a possible conflict involving China, space cannot be considered a sanctuary from war.

For U.S. space deterrence to be as broad as possible, a space aggressor must perceive and fear that unacceptable costs will be imposed following an attack and that he will not adequately achieve expected goals by aggressive action in space. This means having actual and known retaliatory capabilities that may be employed in space or on earth. Deterrence assumes that the United States will be able to recognize that an attack has occurred, when it occurred, and by whom. For the strongest possible deterrence, the adversary should have a good understanding that its own highly valued assets would be at risk as a consequence of attacking the United States, be they in space, on land, or at sea.

China–Deterrence, Warfighting, and Counter-Space Capabilities

Beijing has invested significantly in expanding its military capabilities, including its anti-satellite (ASAT) capabilities, to support an aggressive active defense strategy. Chinese military leaders believe that deceiving the enemy and being unpredictable can enhance deterrence and have operational advantages when deterrence fails. China's military strategy involves the use of coercive tactics short of armed conflict in order to advance China's interests. A brief war in space, in other words, may be viewed as a way of preventing a larger, more violent and bloody contest with the United States.

Though not nearly as advanced as the United States, China's space capabilities are evolving and expanding to aid military modernization and drive economic and technological advances, all of which would allow China to challenge U.S. information superiority. Although China publicly states its belief in the peaceful uses of space, this should not disguise the fact that China's behavior and past statements support the idea that space is a warfighting domain. China is developing and has demonstrated a wide range of counter-space technologies and is believed to be very close to having operational systems.

U.S. Counter-Counter-Space: Policy and Capabilities

China believes America's dependence on space is its Achilles Heel. In order to go into a crisis with the strongest possible position against the United States, China's leaders believe the best approach to deter U.S. intervention may require counter-space actions. The risk a space attack would pose to national security would depend on the type of satellite interfered with and the redundancy in the space system network under attack. It is imperative that U.S. leaders understand U.S. vulnerabilities in space and act swiftly to correct any security imbalance. Losing space will have implications for warfighting effectiveness in the land, sea, and air domains.

Over the last few years the United States has taken steps to improve the resiliency of its space systems by adopting passive defenses such as disaggregation, distribution, diversification, protection, proliferation, and deception. The United States is not able to respond militarily with agility to destructive space threats, at least not within the space environment, and it is nowhere near where it needs to be to have a truly responsive space reconstitution capability. Space deterrence depends on the sum of all U.S. military capabilities, because the United States will never simply fight a "space war." Rather, it will fight a war that may escalate to involve the space domain. Today U.S. space control capabilities are very limited or at least not very public. This is particularly true with the U.S. ability to incapacitate foreign satellites. Yet one does not need to be able to execute strikes in space in order to hold an adversary's space assets at risk. There are non-kinetic counter-space means available, such a cyber-attack, as well as operationally available military land-, sea, and air forces to strike at space assets on the ground. Space Situational Awareness (SSA) is critical to defensive and offensive counter-space operations and is essential to space deterrence strategy.

A Framework for Thinking about Deterrence – The North Korean Crisis (2021)

This chapter lays out a framework for thinking about how to deter China from attacking U.S. space systems in the context of a specific scenario—a U.S.-North Korean crisis circa 2021. There are situation-specific challenges to forming and implementing a space deterrence strategy, and it is important to understand what may be required to deter China from engaging in hostile actions against U.S. and allied space systems. A successful deterrence strategy depends greatly on specificity, obtaining as much precision as possible in the information about the targeted opponent and the context within which the United States intends to engage the opponent.

What is the Strategic Context? In the hypothetical 2021 scenario, the United States views the North Korean regime as unstable and one posing the greatest near-term risk to its security. China views North Korea as a "buffer state" against U.S. forces in the Republic of Korea and is highly distrustful of the U.S. and South Korean alliance. North Korea's missile launches have set up a confrontation between the United States and North Korea and between the United States and China.

What are the Strategic and Deterrence Objectives? U.S. leaders view the stakes for the United States to be very significant – it does not want to see its role, power, and credibility as a guarantor of security in the Indo-Pacific region undermined. China has made it clear that it will not stand by as the United States overthrows the North Korean regime or changes the political arrangements on the Peninsula, especially they may involve reunification under South Korean control. China is

prepared to implement an anti-access/area denial strategy to limit U.S. military influence in the Asia-Pacific region, to include use of ASAT forces.

What are the National and Leadership Characteristics Applicable to the Functioning of Deterrence? National and leadership characteristics can vary from country to country, impact decision-making, and reflect fears and cultural proclivities that must be factored into the deterrence and counter-deterrence calculations of U.S. leaders. A number of factors here must be considered. How rational and predictable is the Chinese leadership? What can we say about their leadership determination and motivations and their attitudes towards the use of force? What political and psychological factors may be involved? What is China's understanding of the United States? What military options are available to Chinese leaders? What is China's belief about the costs the United States could incur if the U.S. deterrence threats are executed? And which leaders should the United States engage?

Considering U.S. Space Deterrence Options

An understanding of Chinese military actions and signaling behavior is necessary to determine, to the extent feasible, the purpose behind apparently aggressive action. Chinese strategists believe that China must display the use of force or show its determination to use force to compel the enemy to submit or refrain from taking hostile actions. Chinese viewpoints should be the basis for forming a sound U.S. space deterrence strategy against China. For U.S. space deterrence strategy to work, Beijing must care greatly about the threat the United States poses and believe that Washington would be willing to execute it. The challenge for U.S. defense planners is to understand why China's leaders might believe they are free to interfere with U.S. space systems and then design and execute a deterrence strategy to change Beijing's calculations.

Understanding the effects of attacks on space assets is critical to determining whether responses in different domains are proportionate or escalatory. Cross-domain combat operations are already built into U.S. military thinking and planning, and this will be no different if it involves space. U.S. deterrence threats aimed at protecting U.S. space assets should include holding at risk targets of comparable value in space and in other domains.

The credibility of U.S. threats is a key component of a successful deterrence strategy. Public declarations supported by actions help build credibility *regardless of domain*. Clear statements by U.S. officials of how Washington would respond to Chinese counter-space actions would help bolster the credibility of U.S. deterrence. Deployed defenses and interoperability demonstrations with regional allies also can bolster the credibility of the U.S. threat to respond to North Korean provocations.

There are special challenges associated with a space deterrence strategy. These questions must be answered: Who did what and how quickly can we know it? What are the retaliatory threat options most effective for deterrence, recognizing that a response may be issued in a domain other than space? And how quickly can the response be executed? It is important to take into account the type of weapon used, the type of target, and the situation on earth at the time.

It appears that a prudent strategy would consider both deterrence threats to prevent *non-destructive or reversible* counter-space operations by China and possible deterrence threats to

prevent permanent or massive counter-space operations. The job of a space deterrence strategist must be to determine what China values and how to hold it at risk in a fashion deemed credible by the adversary. The threat should be based on specific and meaningful military objectives and appear credible to the opponent. Specific and appropriate military actions threatened in anticipation of an attack could help build credibility in the threat and help convince Chinese leaders that their plan of action ought not to be viewed as a *fait accompli*. Chinese leaders must be made to understand that the significant stake of the United States in space is not a vehicle for Chinese coercion of the United States, but rather a factor that will drive the United States to take appropriate actions to protect its interests there.

Introduction

A robust space deterrence strategy not only would contribute to the protection of U.S. satellites, but it would also help ensure general stability in the space domain. Classical deterrence theory, noted General William L. Shelton, USAF (Ret.) in testimony before Congress, fails us when our actions are not observable and known to potential adversaries. Indeed, what happens in space is not visible to people on earth absent the use of advanced sensors, and anonymity as an aggressor may be easy to achieve. “Mutual Assured Destruction” will not work in space because there are some countries whose leaders do not have the same respect as the United States for the space environment, and they might not care for or accept many of the norms followed by the majority of nations. According to General Shelton, “we need an intellectual framework ...[to] deter use of space and cyber weapons, while continuing to deter use of nuclear weapons.”¹

The purpose of this report is to provide a framework for thinking about deterrence and the protection of U.S. space assets against a particular adversary—China. It is important to particularize the adversary when thinking about deterrence strategy because, to the extent one can tailor the strategy, one can increase the likelihood that it will be credible and effective. Deterrence strategy may be “customized” by taking into account the unique characteristics of diverse adversaries and circumstances. This, of course, makes development of a deterrence strategy even more of a complex and involved undertaking—a formulaic, back-of-the-envelope sketch of a deterrence strategy would be likely to miss unique features tailored to a specific adversary. By addressing in some detail the particulars, this study also helps to illustrate why successful deterrence strategies, regardless of domain, cannot be based solely on presumed universal principles applicable to all countries and all types of threats, and in all times and circumstances.

It is not the purpose of this study to offer a comprehensive strategy or provide a refined set of deterrence options for deterring China in space. Rather, it offers a structure for an in-depth study of space deterrence and China, to include the identification of key questions to be considered, key issues that need to be highlighted, and parameters that need to be understood in the development of a deterrence strategy focused on China. This scenario-based guide for thinking about space deterrence poses questions that one must attempt to answer to the best of one’s ability. The study provides a preliminary look at options for a possible space deterrence strategy targeting China to support, in the hypothetical scenario presented here, U.S. military actions against North Korea, a Chinese ally. This is a first step, not a final step, in the development of a space deterrence strategy.

U.S. space systems are the backbone of the U.S. economy and national security and can be threatened and harmed today. Chinese counter-space weapon developments promise to make the protection mission ever more challenging. Military actions in space are not necessarily bloodless. Although war that extends into space might not involve *direct* fatalities, it could create debris that could cause more harm to U.S. satellites and, therefore, to the United States than it would to any other nation and thereby lead to fatalities, damaged infrastructure, and military

¹ General William L. Shelton, USAF (Ret.), “Threats to Space Assets and Implications for Homeland Security,” *Statement before the House Armed Services Subcommittee on Strategic Forces and House Homeland Security Subcommittee on Emergency Preparedness, Response and Communications*, March 29, 2017.

losses on earth. For this reason, the United States should strive to deter war in space. There are significant challenges to deterring China from aggressive behavior in space, and for this reason U.S. policy makers and defense planners must start planning now for a possible future military confrontation involving China that also may involve military space contingencies.

Chapter 1

Deterrence and Space

Military actions in space are not necessarily bloodless. Although war that extends into space might not involve *direct* fatalities, it could create debris that might cause more harm to U.S. satellites and, therefore, to the United States than it would to any other nation and thereby lead to fatalities, damaged infrastructure, and military losses for the United States on earth. Given the significant investment in its space infrastructure benefiting the military, civilian, and commercial sectors, the country must strive for conditions that make debris-producing kinetic operations in space unlikely. War, in general, regardless of domain, is something to be avoided. Deterrence can help create those conditions.

In all domains, an adversary is deterred from attack when it decides that the costs from the contemplated aggression are likely to outweigh the benefits. Deterrence strategies that are, to the extent possible, tailored to the unique characteristics of diverse adversaries and circumstances are more likely to prove effective than strategies uninformed by the particularities of adversaries. However: “understanding how to adjust the character of deterrence strategies in practice across different adversaries and contexts is a significant challenge. Doing so is complicated by adversaries’ divergent worldviews, values, goals, priorities, risk tolerances, motivations, levels of pragmatism and determination, channels of communication, and perceptions of US credibility.”²

For this reason, developing an effective, credible deterrence strategy is a complex and highly involved undertaking, regardless of the domain. The effectiveness of U.S. deterrence strategy will hinge on Washington’s ability to understand and manipulate foreign decision-makers. Yet, in many countries, such as China, the decision-making process is difficult to understand. According to Michael Pillsbury, a leading expert on Chinese defense and foreign policy, it is highly challenging “to assess the unique cultural environment of Chinese military strategists....” Yet understanding the motivations and anticipating the actions and reactions of the adversary are critical parts of deterrence. Fundamentally agreeing with Payne, Pillsbury writes that “[w]hile notionally government by rational analysis, the behavior of most strategic actors is highly influenced by their psychological peculiarities: factors such as emotions, culture and fears.”³

Were the United States to be at war or entrenched in a high stakes crisis with China, U.S. national space assets would be at risk.⁴ Because U.S. efforts to assure peace in space have not prevented China from developing ASAT weapons, it is imperative that Washington examine future space protection options, to include changing its approach from nearly complete reliance on deterrence-

² Keith B. Payne, “Nuclear Deterrence in a New Era: Applying ‘Tailored Deterrence,’” National Institute for Public Policy Information Series No. 431, May 21, 2018.

³ Michael Pillsbury, “The Sixteen Fears: China’s Strategic Psychology,” *Survival*, Vol. 54, No. 5 (2012), pp. 151, 52.

⁴ Kenneth Rapuano, Assistant Secretary of Defense for Homeland Defense & Global Security, *Statement before the Subcommittee on Strategic Forces, House Armed Services Committee*, March 15, 2018; General John E. Hyten, “National Security Space Budget for FY17: Presentation to the Subcommittee on Strategic Forces,” *115th U.S. Congress*, House Armed Services Committee, March 15, 2016, p. 8.

by-denial (or passive defenses) to one that includes offensive retaliation capabilities.⁵ Since war may extend into space, the first step toward this goal is to change the mindset from one that makes deterrence of war via the preparation for war in space a taboo.⁶ Effective deterrence of war in space will require, not only making U.S. satellites as safe from attack as possible, but also potentially placing at risk assets valued by the attacker, to include satellites and terrestrial assets.

Exploitable vulnerabilities can invite attack—which is wholly contrary to the goal of deterrence. The reality is that there is no way to protect a single satellite against a determined attack, especially if that satellite is in a fixed geostationary orbit (GEO).⁷ So space deterrence is critical. The underlying assumption of this study is that by merely threatening to attack U.S. space systems unprotected by a strong deterrent or defenses, a country (in this study’s scenario, China) might be able to deter, or significantly alter the manner of the United States’ entry into a conflict, or even willingness to enter a conflict (in this study’s scenario, it is the potential conflict centered on North Korea that sparks the confrontation with China). China’s counter-space capabilities are particularly worrisome (see Chapter 2); therefore, when it comes to a possible conflict involving China, space cannot be considered a sanctuary from war. U.S. leaders and planners understand this and have begun to take steps to bolster passive defenses that make U.S. satellites “hard to find, hard to catch, hard to hit, hard to kill.”⁸

As suggested above, the current U.S. approach to deterrence of attacks in space is to deny the adversary victory by reducing the likelihood of success, that is, deterrence by denial. If an adversary were to decide that an attack against a disaggregated or proliferated satellite system were too expensive or difficult, it is assumed that this would lead the adversary to decide not to attack at all.⁹ This deterrence-by-denial strategy involves the use of different orbits, mobility, hardening, deception, satellite backups, decentralizing functions critical to national security, and distributed architectures, all of which are considered to be traditional passive defense measures that can make U.S. space architectures resilient and ensure they do not present attractive targets. Deterrence-by-denial strives to make Global Positioning System (GPS) satellites, military satellite communications, and early warning satellites resilient and capable of surviving attack. The United States also has pushed to grow international “buy-in” to space systems, the idea that we can make space systems something all countries use, so that damage to one nation’s space systems would also harm the interests of other nations, potentially complicating calculations for the attacker.¹⁰

Consider now the possibility that attempted deterrence-by-denial in space may not actually deter attempts to disrupt satellite operations and may, in fact, *invite* a limited attack on space systems.

⁵ For U.S. reliance on deterrence by denial strategy, see Douglas L. Loverro, Former Deputy Assistant Secretary of Defense for Space Policy, “Space Warfighting Readiness: Policies, Authorities, and Capabilities,” *Statement before the House Armed Services Committee*, March 14, 2018.

⁶ President George Washington, in his January 8, 1790 annual message to Congress: “To be prepared for war is one of the most effectual means of preserving peace.”

⁷ Loverro, Former Deputy Assistant Secretary of Defense for Space Policy, “Space Warfighting Readiness: Policies, Authorities, and Capabilities,” *Statement before the House Armed Services Committee*, March 14, 2018.

⁸ Bob Work, *Remarks at the Space Symposium*, *Defense.gov*, April 12, 2016, available at <https://www.defense.gov/News/Speeches/Speech-View/Article/723498/remarks-at-the-space-symposium>; Sandra Erwin, “In the Trump Administration, deep mistrust of Chinese, Russian motives in space,” *Space News*, April 12, 2018.

⁹ Several arguments in this section were presented in Steve Lambakis, *Foreign Space Capabilities: Implications for U.S. National Security* (Fairfax, VA: National Institute Press, 2017), pp. 64-71.

¹⁰ Interview with Maj Gen Nina Armagno, Air Force Space Command, February 27, 2017.

For example, we already have examples of such interference (e.g., jamming) involving GPS satellites. When there are many, dispersed satellites in operation (performing the same function, such as GPS), the adversary may not believe it can knock out the entire network.¹¹ Yet he might feel free to conduct low-level aggressive actions against individual satellites without fear of punishment as a way to frustrate U.S. operators, test tactics and measure results.

Although “deterrence by denial” may deter aggressors from acting, it might not be sufficient against an aggressive and determined adversary. The nation also needs a more comprehensive deterrence-by-punishment approach to have a truly effective deterrence strategy. China has made significant investments in counter-space strategy, organization, and capabilities, and might be in a position to mount a disruptive counter-space campaign that is *effective enough* either to: 1) deter the United States (in this study’s scenario, the U.S. entry into a conflict with North Korea), or 2) impair the effectiveness of the military forces of the United States and its allies sufficiently to achieve China’s possible objective (in this study’s scenario, the protection of the North Korea regime and reduction of U.S. influence in the region). For U.S. space deterrence to be as broad as possible, a space aggressor must perceive and fear that unacceptable costs will be imposed following an attack and that he will not adequately achieve expected goals by aggressive action in space (no matter how temporary).

This two-pronged deterrence approach would be the most comprehensive, in other words, given the diversity of possible opponents and threats. Because the stakes in space are so high, U.S. officials want to prevent even one major space deterrence failure. A more comprehensive deterrence strategy—specifically the combination of denial and punitive approaches, coupled with the deployment of offensive retaliatory capabilities—may be the most effective to convince China that the costs of initiating an attack would outweigh the benefits and the likelihood of success would be low.

Being manifestly prepared to defend space assets and to respond punitively would likely go a long way to influencing the calculations of any enemy who otherwise might decide to do the United States harm. This means having actual retaliatory capabilities that may be employed in space or on earth. These capabilities must be known to the adversary. In some situations, it might be desirable to avoid being explicit about the likely response, but opponents’ anticipation of deterring consequences is necessary for deterrence.

Unique Space Deterrence Challenges

Deterrence of attacks on space systems presents a special problem, but not an unsolvable one. For deterrence of attacks against U.S. space systems, operators must be able to provide answers to several questions following an attack. Who did what and how quickly can we know that? What is the appropriate response, considering a response may be issued in a domain other than space? And how quickly can the response be issued? Deterrence of attacks against allied or commercial space systems might be an even more complicated matter. Punitive responses in the case of interference with allied space systems opens up the possibility of follow-on attacks against U.S. space systems. The conditions under which the United States might execute a deterrent threat—

¹¹ Loverro.

in peacetime, crisis, or war—add yet additional layers of complexity. Presumably punitive actions undertaken in times of war would be less problematic than those undertaken during peacetime.

Not all countries have the same respect for the space domain as countries that rely heavily on space systems for their economy and security. The greater powers in the world look increasingly to space to conduct critical military, commercial, and civilian functions, which enhances their respective strengths. The lesser powers, such as North Korea, do not leverage the space domain to the same extent and hence can afford not to respect it. China, given its growing position in space, can be assumed to have greater respect for the space domain than North Korea, but perhaps not as great as the United States.

Retaliation, or punishment for aggressive action in space, also presents a special problem. For the United States, *retaliation in-kind* for a destructive ASAT attack may be akin to shooting itself in the foot. Given that the United States relies very heavily on integrated space capabilities and that proliferating orbital debris may do a degree of damage to U.S. spacecraft, the threat of a retaliatory strike on enemy space systems (at least one that results in the kinetic destruction of a satellite), may not appear to be credible to an adversary. The kinetic destruction of space systems might be part of an offensive package, however, when the stakes at hand are greater than any concern over the proliferation of space debris; but when it comes to deterrence in peacetime, such a threat (especially by itself) may be considered highly suspect. So threats to retaliate in-kind for an attack on U.S. satellites may not work against an adversary that does not rely on space systems to the same degree as the United States. In-kind threats against a state that does not depend on space may provide little deterrent effect. Additionally, for potential adversaries who do not depend greatly on space, U.S. counter-space attacks are unlikely to significantly affect civil or military realities on the ground.

When considering space systems and deterrence in crises, it is also important to take into account the type of weapon used (e.g., does it produce reversible or irreversible effects?), the type of target (e.g., commercial satellite or nuclear command and control satellite), and the situation on earth at the time. Not all satellites are created equal – disruption of commercial satellite operations may not have the same effect as the disruption of GPS or early warning satellites. As with just about every decision involving the use of military force, it is situational. Electronic jamming of communications satellites occurs all the time in the Middle East. These attacks are mainly efforts by state leaders to block information flow *into* the state.¹² Should a nation rely on commercial communications satellites for military communications, their disruption could significantly affect that same nation's defense interests. What is happening on earth, in other words, is a key determining factor in a response to such a disruption.

Another special challenge is deterring non-destructive, reversible interference, which, although having temporary effects, could have far-reaching and deadly consequences when done at critical moments in a military campaign. Cyber-attacks might also fall into this temporary interference category. Reversible interference avoids the termination of a space system. However, who needs permanent destruction when the strategic effects of the moment can be realized by temporary interference, which might enable the adversary to achieve a strategically meaningful goal? For example, GPS satellites may be jammed or interfered with over a particular region and

¹² See, for example, James P. Finch, "Bringing Space Crisis Stability Down to Earth," *Joint Forces Quarterly*, Issue 76, 1st Quarter, December 30, 2014, available at http://ndupress.ndu.edu/Portals/68/Documents/jfq/jfq-76/jfq-75_15-20_Finch.pdf.

only over a short time span, but that period of interference may result in sporadic disruption in the use of GPS-guided weapons against time-sensitive targets (GPS-guided cruise missiles, perhaps) that fail to accomplish their mission. It matters little that the jamming ceases once the offensive operation has failed. This sort of counter-space action is reversible, but the strategic consequences may be enormous and irreversible. In other words, temporary should not be equated with benign.

How might the United States deter counter-space actions? A U.S. deterrent threat based on threatening to strike an aggressor's homeland might not appear credible, especially during a crisis or in the absence of a serious provocation on the ground. Who the aggressor is, and the circumstances on the ground, will matter a great deal. It is one thing to threaten a punishing strike campaign to destroy infrastructure and military assets within countries such as Syria or North Korea, and it is quite another to threaten a similar campaign within countries with large interiors that also possess a robust nuclear weapons force, such as China. In such cases, demonstrating U.S. capabilities to disable a network of satellites through incapacitation operations in space, using cyber-attacks or active measures on the ground, may be a basis for establishing deterrent threats that appear credible to enemies.

An adversary, especially one that is at a conventional disadvantage with the United States, may look upon the disruption or denial of U.S. space systems during a crisis as a risk worth taking. "Killing" space systems is not the same as drawing blood on earth (though the indirect effects may be quite deadly), which may be a key variable when considering the credibility of U.S. retaliatory threat options to the aggression. Moreover, while there is a taboo against using nuclear weapons (though one may legitimately question the degree to which this taboo has sway in China), there is no equivalent taboo against the use of counter-space weapons. Certainly, it would appear to be easier and less provocative to use temporary or reversible effects to counter satellites (such as jammers or dazzlers) than it would be to use destructive kinetic weapons. There may be less pressure for the United States to retaliate against a state that disrupted a U.S. satellite for a short time as opposed to disabling it (although, again, it depends on what is happening on earth).

Identifying the adversary and the aggressive action is the first step required for a punitive retaliatory response. To deter aggressive behavior, the aggressor must believe the United States is aware of the provocation and the identity of the aggressor. This requires a capability to attribute those aggressive actions to a particular actor and respond on a relevant timeline. The possibility that attribution will not be possible on a timely basis may undercut the credibility of the U.S. deterrent threat, especially if that possibility is suspected by opponents.

Given that the nation's leaders may not know exactly why and how a space weapon was used, the use of counter-space weapons could lead to miscalculation. This is certainly the case in all domains. There will always be activities that are open to interpretation, and pressing timelines for making decisions may be expected to further complicate matters. This should underscore the importance of space situational awareness capabilities for deterrence purposes.

Efforts must be made to communicate with the adversarial leadership what the United States intends to do in retaliation for an aggressive action in space and to enhance the perception of U.S. capabilities to detect an attack, attribute it to an actor, and affirm the intention to hold that actor accountable. Communication also should confirm perceptions about the strength of U.S.

passive and active defenses, preventive measures, and damage limitation strategies;¹³ this will contribute to the potential for deterrence-by-denial effects. For the strongest possible deterrence, the adversary should have a good understanding that its own highly valued assets would be at risk as a consequence of attacking the United States, be they in space, on land, or at sea.

The credibility of U.S. deterrence threats may be difficult to establish before a conflict has begun. Would the United States strike another state's targets using military forces before a war has broken out? There is a case to be made that, yes, depending on the severity of the prospective space attack, a potential adversary should and could be made to expect such a response.¹⁴ It would be up to U.S. leaders to ensure this deterrence strategy is enforced across the national security enterprise and appropriate follow-up responses to actual attempts to interfere with U.S. space systems are conducted.

Considering Deterrence and China

Historically, deterring China has been a challenge – largely because Beijing's motives and its willingness to use force are difficult to gauge. The U.S. misperception of China during the Korean War in the early 1950s prevented Washington from developing an adequate deterrence strategy, which was a very costly mistake. According to RAND analyst Abram Shulsky, "Mao's acceptance of the notion of an inevitable (ideologically based) U.S. antagonism to a communist China changed his calculus of the gain and risks of intervening in Korea in a way not understood in Washington."¹⁵ Mao's insecurity and his constant fear of foreign and domestic enemies made him willing to act early and aggressively, characteristics that can make deterrence difficult.

Two basic tenets of deterrence are the perceived capability and the willingness to threaten an adversary's highly valued assets. And, necessarily, the thought process must consider whether the adversary has the capability and will to inflict punishment on the United States in response. These dynamics apply to any potential conflict, including the space environment. Space cannot be separated out as its own isolated domain. There is no such thing as a space war, there is only war.

Western expectations about what will or will not deter an adversary have on past occasions been based on the presumption that enemies have the same rationality and reasoning processes, judgments, goals, tolerances, values, and priorities as U.S. leaders. If this were true, it would make deterrence relatively predictable. Yet, given the great potential variation in these factors among leaderships, this expectation of rational actors with shared world views is very likely to create unwarranted expectations about the decision-making of foreign leaders, and thus lead to

¹³ Keith Payne discusses this in the context of nuclear deterrence, but the basic principles may be applied to space deterrence. Payne, *The Great American Gamble: Deterrence Theory and Practice from the Cold War to the Twenty-First Century*, (Fairfax, VA: National Institute Press, 2008), pp. 372, 73.

¹⁴ "Any response to an attack in space will have to take into account the totality of U.S. interests, not just those directly affected by space. This approach can help to better identify and plan against those circumstances in which the country's own processes deny it the full benefit of its capabilities by posing barriers to effective implementation of deterrence messaging or actions. Categorizing and prioritizing risks in space and creating closer whole-of-government response plans are likely to have more value than drawing redlines in space." National Academies of Sciences, Engineering, and Medicine, *National Security Space Defense and Protection: Public Report*, (Washington, DC: The National Academies Press, 2016), p. 26, available at <https://www.nap.edu/catalog/23594/national-security-space-defense-and-protection-public-report>. The National Academies Report provides an excellent comprehensive look at the transformation of the space environment, especially as it has become more integral to the commercial sector, a sector the authors believe will lead space developments in the future.

¹⁵ Abram N. Shulsky, *Deterrence Theory and Chinese Behavior* (Santa Monica, CA: RAND Corporation, 2000), p. 35.

surprises and possibly war.¹⁶ To be as effective as possible, deterrence must be tailored to specific opponents and contexts. One cannot have an informed basis for discussing the deterrence of aggressive acts in space until one examines the leaders and contingencies that need to be deterred.

¹⁶ This distinction between expectations based on “rational” and “reasonable” foreign decision making in response to U.S strategies of deterrence is discussed in, Keith B. Payne, *The Fallacies of Cold War Deterrence* (Lexington, KY: University Press of Kentucky, 2001), pp. 7-15; Keith B. Payne, *The Great American Gamble*, p. 368.

Chapter 2

China—Deterrence, Warfighting, and Counter-Space Capabilities

The Chinese place a high value on deterrence through military strength. In their view, the objective of deterrence is to achieve momentum over the enemy. Chinese doctrine emphasizes that “the preparation of strength is the essential and most reliable preparation in all war control preparations,” and that “the objective of war control is to prevent the occurrence of war.”¹⁷ Chinese leaders envision “a hundred years march” (one that began in 1949) to superiority and great rejuvenation of the Chinese nation and are creating a capable military force to support this vision and protect its core interests.¹⁸ Beijing publicly declares that China’s rise in world power is a peaceful one, a message that is often contradicted by its actions in the region. China has engaged in coercion against its neighbors and the United States to expand its territorial sovereignty in the South China Sea. For example, China has precipitated clashes over the true boundaries of its exclusive economic zones and air defense identification zones, and it has seized territory and built military bases on artificial islands to entrench its presence in international waters.

Beijing has invested significantly in expanding its military capabilities (that is, the growth of nuclear and anti-ship, anti-air, and ASAT capabilities) to support an aggressive active defense strategy.¹⁹ China continues to develop its nuclear capabilities and survivable road-mobile, silo-based, and sea-based ballistic missile forces, enhancing its ability to project power and threaten the United States and its interests.²⁰ The United States refers to these collective capabilities for active defense as “anti-access/area denial.”

These capabilities also pose a significant cyber and space threat to the United States. According to the Director for National Intelligence, Daniel Coats, China continues to pursue anti-satellite weapons to reduce the military effectiveness of U.S. and allied forces that will reach operational capability “in the next few years.” Writes Coats, “[w]e assess that if a future conflict were to occur involving Russia or China, either country would justify attacks against US and allied satellites as necessary to offset any perceived US military advantage derived from military, civil, or commercial

¹⁷ Cited in Dennis J. Blasko, “Peace through Strength: Deterrence in Chinese Military Doctrine,” *warontherocks.com*, March 15, 2017, available at <https://warontherocks.com/2017/03/peace-through-strength-deterrence-in-chinese-military-doctrine/>.

¹⁸ Michael Pillsbury, *The Hundred-Year Marathon: China’s Secret Strategy to Replace America as the Global Superpower*, (New York: St. Martin’s Griffin, 2016); For an excellent summary of China’s strategic weapons, see Elsa B. Kania, “China’s strategic arsenals in a new era,” *Bulletin of the Atomic Scientists*, April 20, 2018, available at <https://thebulletin.org/china%E2%80%99s-strategic-arsenals-new-era11716>; see also Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People’s Republic of China 2018*, Washington, D.C.: U.S. Department of Defense, 2018, p. 59, available at <https://media.defense.gov/2018/Aug/16/2001955282/-1/-1/1/2018-CHINA-MILITARY-POWER-REPORT.PDF>. See also Lee Kuan Yew as quoted in Graham Allison and Robert D. Blackwill, with Ali Wyne, *Lee Kuan Yew: The Grand Master’s Insights on China, the United States, and the World*, (Cambridge, MA: The MIT Press, 2013), pp. 4, 5, and 13. According to Lee Kuan Yew, internally China needs stability, and externally peace. “China’s emphasis is on expanding their influence through the economy,” without having to use force (pp. 6, 7).

¹⁹ Office of the Secretary of Defense, *Military and Security Developments Involving the People’s Republic of China 2018*, pp. 59-78; Andrew F. Krepinevich, Jr., “How to Deter China: The Case for Archipelagic Defense,” *Foreign Affairs*, March/April 2015.

²⁰ Mark B. Schneider, “The U.S. Nuclear Deterrent and the Russian and Chinese Nuclear Threat,” *Secure Freedom Quarterly*, 2nd Quarter 2017, pp. 1-9.

space systems.”²¹ The Director also reports that China continues to form military units and perform operational training with counter-space capabilities.

Modern deterrence and warfighting capabilities increasingly involve information warfare. In the words of Chinese strategist Chang Mengxiong who commented early in the age of information warfare:

[E]ven if two adversaries are generally equal in hard weapons, unless the party with a weakened information capability is able effectively to weaken the information capability of the adversary, it has very little possibility of winning the war. Conversely, if one side can effectively weaken the information capability of the other side, even if its capability in other ways is less, the other side will dare not take any ill-considered action. These situations constitute ‘information deterrence.’ It can prevent war from breaking out. Adroit strategic employment of one’s own information deterrence capabilities constitutes an information deterrence strategy.²²

China, like other nations, relies on the threat of military force to compel the enemy to submit to its will and objectives. Chinese military leaders, moreover, believe that deceiving the enemy and being unpredictable can enhance deterrence and have operational advantages when deterrence fails.²³ Warfighting is to be preferred only when deterrence fails. Some examples of Chinese deterrence actions have included military reviews and exercises, military deployments and military tests. Space, information, and cyber deterrence, like nuclear deterrence, are forms of strategic deterrence, which seek to deter and deny victory to a superior adversary. The use of all forces and capabilities in all domains would be considered in the pursuit of victory. The idea is that fighting a small war may be necessary to avoid a large war; it is the use of limited force to achieve a larger victory. China’s military strategy involves the use of coercive tactics short of armed conflict in order to advance China’s interests.²⁴ A brief war in space, in other words, may be justified as a way of preventing a larger, more violent and bloody contest with the United States.

The Chinese concept of deterrence embodies the ideas of both dissuasion and coercion. With respect to deterrence in space, according to Dean Cheng, “the Chinese are not necessarily interested so much in deterrence in the space environment or cyber environments, but rather are interested in the use of space and/or cyber as means to effect deterrence, including coercion”—that is, they are interested in exploiting space to achieve deterrence and coercion in other warfighting domains.²⁵ Indeed, Cheng argues, the Chinese view the use of space weapons as

²¹ Daniel R. Coats, Director for National Intelligence, Statement for the Record, *Worldwide Threat Assessment of the US Intelligence Community*, February 13, 2018, available at <https://www.dni.gov/index.php/newsroom/congressional-testimonies/item/1845-statement-for-the-record-worldwide-threat-assessment-of-the-us-intelligence-community>; See also Defense Intelligence Agency (DIA), *Challenges to Security in Space*, (Washington DC: DIA, February 2019, p. 14 available at http://www.dia.mil/Portals/27/Documents/News/Military%20Power%20Publications/Space_Threat_V14_020119_sm.pdf -- According to this DIA assessment, China is making advances in space technology and is likely to turn to space early on in any major military conflict to cripple its adversaries. See also Joseph Menn, “China-based campaign breached satellite, defense companies – Symantec,” Reuters, June 19, 2018, available at <https://www.reuters.com/article/china-usa-cyber/china-based-campaign-breached-satellite-defense-companies-symantec-idUSL1N1TL1K1>.

²² Chang Mengxiong, “Weapons of the 21st Century,” in Michael Pillsbury, ed., *Chinese Views of Future Warfare* (Honolulu, HI: University Press of the Pacific, 2002), p. 255. This paper first appeared in *China Military Science*, Spring 1995.

²³ Alastair Iain Johnston, “Three Contradictions in Trump’s China Policy (Thus Far),” *Fairbank Center Blog*, January 18, 2017, <https://medium.com/fairbank-center/three-contradictions-in-trumps-china-policy-thus-far-c34e8288cca6>

²⁴ *Military and Security Developments Involving the People’s Republic of China 2018*, p. 45.

²⁵ Dean Cheng, “Prospects for Extended Deterrence in Space and Cyber: The Case of the PRC,” *Heritage.org*, January 21, 2016, p. 3, available at <https://www.heritage.org/defense/report/prospects-extended-deterrence-space-and-cyber-the-case-the-prc>. Cheng

the “highest rung” on the escalation ladder of deterrence. It is within Chinese military doctrine, in other words, to consider attacks in space to defend its core interests. Counter-space operations prior to the start of conflict would be viewed as defensive in nature (see Chapter 5).

Military modernization, to include military applications of artificial intelligence and the ability to challenge U.S. information supremacy, have been high on China’s priority list, and China’s space and counter-space assets clearly have contributed to the realization of both.²⁶ Indeed, they view the relationship between information dominance and space dominance to be very close – “without battlefield information dominance, there can be no battlefield space dominance.”²⁷ In 2015, China’s leaders directed the Peoples Liberation Army (PLA) to be ready to win “informationized local wars.”²⁸ The Chinese want the PLA to be able to use information technology and communications systems to gain an operational advantage over the enemy. Chinese military strategists saw this revolution in military affairs taking place in the mid-1990s. According to Chang Mengxiong:

The C³I system is the nerve center for all information-intensified weapons and military units. When summarizing the lessons of experience of the Gulf War, every country concluded that the C³I system will have a tremendous role in future warfare. They emphasize that a dispersed C³I system that resists destruction is the orientation for development. Satellite space telecommunications, reconnaissance, monitoring, navigation, and locator systems are the important component parts of the C³I.²⁹

Attention to increasingly sophisticated space-based sensors and communications and counter-space capabilities is a critical element in China’s strategy for deterrence and warfighting.³⁰ For the same reason that the United States requires space assets to operate within the vast Asia-Pacific battlefield, so does China. China has roughly 875,000 nautical square miles that it aspires to monitor and exercise control over, an area that expands to 1.5 million nautical square miles when the Philippine Sea is included. China’s modernization of its military air, sea, and space capabilities is designed to improve its capability to prevail in regional conflicts, to include conflicts involving Taiwan, neighboring North Korea, and in the East and South China Seas.

(p. 14): “Beijing will look to American actions in the aggregate, including naval movements and air and ground force deployments, as well as activities in outer space and the cyber environment in assessing American commitments – the essence of ‘extended deterrence.’” See also Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People’s Republic of China 2017*, (Washington, D.C.: U.S. Department of Defense, 2017), p. 40.

²⁶Dennis C. Shea, et al., *2016 Report to Congress of the U.S. China Economic and Security Review Commission*, (Washington, D.C.: Government Printing Office, 2016), p. 272, available at https://www.uscc.gov/sites/default/files/annual_reports/2016%20Annual%20Report%20to%20Congress.pdf.

²⁷ Cited in Cheng, p. 12.

²⁸ Office of the Secretary of Defense, *Military and Security Developments Involving the People’s Republic of China 2018*, p. 45.

²⁹ Chang Mengxiong, p. 252. This paper first appeared in *China Military Science*, Spring 1995. C³I is command, control, communications, and intelligence.

³⁰ Shea, et al., *2016 Report to Congress of the U.S. China Economic and Security Review Commission*, pp. 218-221, 270-271; Bill Gertz, “Report: China’s Military Capabilities Are Growing at a Shocking Speed,” *The National Interest*, November 7, 2016, available at <http://nationalinterest.org/blog/the-buzz/report-chinas-military-capabilities-are-growing-shocking-18316?page=show>; Kania, op. cit.

China's Growing Reliance on Space

China's economy and military forces are becoming more reliant on space systems.³¹ China reportedly has about 250 satellites on orbit, with plans to develop more advanced space systems.³² China continues to improve the capabilities of its military and intelligence satellites. China's 38 launches for 2018 were a record that finished ahead of the United States and Russia.³³ In other words, China is making technological strides to close the space gap with the United States.³⁴

China's military modernization program is designed to improve its capability to prevail in regional conflicts. China has been steadily building up air, sea, and space capabilities to succeed in operational environments that are not necessarily adjacent to Chinese territory, to include combat insertions, island landing operations, humanitarian operations, and evacuations. These capabilities also will strengthen China's traditional warfighting capabilities.³⁵ Military modernization and the ability to challenge U.S. information supremacy have been high on China's priority list, and space assets clearly have contributed to the realization of both.³⁶

From the perspective of China's leaders, dependence on foreign satellite capabilities has enabled foreign domination and must not be permitted. China addressed this with the development of a comprehensive space program, especially in the areas of rocket launch and satellite development for telecommunications, remote sensing, meteorology, and navigation. Though not nearly as advanced as the United States, China's space capabilities are advancing and expanding to aid military modernization and drive economic and technological advances, all of which would allow China to challenge U.S. information superiority. According to the U.S. Department of Defense, "China is seeking to utilize space systems to establish a real-time and accurate surveillance, reconnaissance, and warning system, and to enhance command and control in joint operations."³⁷ The PLA also has at its disposal China's civilian and commercial satellite systems to do

³¹ Namrata Goswami, "Waking Up to China's Space Dream," *The Diplomat*, October 15, 2018, [www.https://thediplomat.com/2018/10/waking-up-to-chinas-space-dream/](https://thediplomat.com/2018/10/waking-up-to-chinas-space-dream/).

³² DIA, *Challenges to Security in Space*, p. 18; Union of Concerned Scientists, "UCS Satellite Database," *Union of Concerned Scientists*, August 10, 2018, available at <https://www.uscusa.org/nuclear-weapons/space-weapons/satellite-database>

³³ Andrew Jones, "China sends secretive satellite towards geostationary orbit with 38th launch of 2018," *GBTimes.com* (Finland), December 24, 2018. Speculation is that this classified payload could be an early warning satellite similar to the U.S. SBIRS to detect and track ballistic missiles.

³⁴ One significant way China is attempting to stay on top of cutting-edge space technology is by leveraging the intellectual property and satellite designs of U.S. industries, to include attempting to get access to export restricted technologies. Brian Spegele and Kate O'Keeffe, "China Maneuvers to Snag Top-Secret Boeing Satellite Technology," *The Wall Street Journal*, December 4, 2018, available at https://www.wsj.com/articles/china-maneuvers-to-snap-top-secret-boeing-satellite-technology-1543943490?mod=hp_lead_pos5. Boeing subsequently terminated a controversial satellite order financed by a Chinese government-owned firm.

³⁵ Dennis C. Shea, et al., *2016 Report to Congress of the U.S. China Economic and Security Review Commission*, (Washington, D.C.: Government Printing Office, 2016), pp. 218-221, 270-271, available at https://www.uscc.gov/sites/default/files/annual_reports/2016%20Annual%20Report%20to%20Congress.pdf.; Bill Gertz, "Report: China's Military Capabilities Are Growing at a Shocking Speed," *The National Interest*, November 7, 2016, available at <http://nationalinterest.org/blog/the-buzz/report-chinas-military-capabilities-are-growing-shocking-18316?page=show>.

³⁶ Shea, et al., p. 272. See also Tian Shaohui, "Backgrounder: Xi Jinping's vision for China's space development," *Xinhuanet*, April 24, 2017, available at http://www.xinhuanet.com/english/2017-04/24/c_136232642.htm.

³⁷ Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2015* (Washington, D.C.: Department of Defense, April 2015), p. 35, available at https://www.defense.gov/Portals/1/Documents/pubs/2015_China_Military_Power_Report.pdf.

reconnaissance, communications, and command and control. China's BeiDou navigation satellites are expanding its global presence and enhancing precision strike capability.³⁸

China is also improving its space launch capabilities, making them more capable and reliable.³⁹ China reportedly has been developing a cheap and mobile launch capability based on its Intercontinental (ICBM) and medium-range ballistic missile (MRBM) technology that would allow it to replace satellites in orbit during an armed conflict.⁴⁰ China's commercial space launch capabilities are expanding and it is pressing ahead with the development of more advanced systems, such as the Long March 7.⁴¹ China also has an evolving manned space program.

Views of Space Warfare

Although China publicly states its belief in the peaceful uses of space, this should not disguise the fact that China's behavior and past statements support the idea that space is a warfighting domain. PLA Air Force Commander General Xu Qilang is on record as stating his belief that the militarization of space is a "historic inevitability."⁴² General John Hyten, the Commander of U.S. Strategic Command, noted that while China is a vocal supporter of the Peaceful Uses of Outer Space, "at the same time they're the most aggressive nation in the world, building weapons that will challenge the United States in space in the future."⁴³ Those who believe that China will follow "rules of the road" when the stakes are high need only look at China's behavior in proximity to U.S. vessels on the high seas, where it sometimes flouts the internationally agreed-upon rules of the road.⁴⁴

Chinese military strategists today view space as a military domain essential to China's defense and general security, a position that has been ratified in China's National Security Law.⁴⁵ Given the significant reliance the United States places on space-based military intelligence and communications assets, some Chinese analysts believe their loss would deny the United States military victory in a regional conflict.⁴⁶ According to Chinese strategist Wang Hucheng almost 20 years ago, "...for countries that can never win a war with the United States by using the method

³⁸ Anthony H. Cordesman and Joseph Kendall, "How China Plans to Utilize Space for A2/AD in the Pacific," *The National Interest*, August 17, 2016, available at <http://nationalinterest.org/blog/the-buzz/how-china-plans-utilize-space-a2-ad-the-pacific-17383?page=show>.

³⁹ DIA, *Challenges to Security in Space*, p. 16.

⁴⁰ Vasily Kashin interview with Sputnik China, "New Reality: Future Space Weapons Will Be Able to Destroy Enemy Satellites," *Sputnik News*, October 26, 2016, available at <https://sputniknews.com/world/201610261046758894-russia-united-states-satellites-development/>.

⁴¹ Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2018*, pp. 39-40.

⁴² Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2015* (Washington, D.C.: Department of Defense, April 2015), p. 35, available at https://www.defense.gov/Portals/1/Documents/pubs/2015_China_Military_Power_Report.pdf.

⁴³ Cheryl Pellerin, "Hyten: Deterrence in Space Means No War Will be Fought There," *DoD News*, January 26, 2017, available at <https://www.defense.gov/News/Article/Article/1061833/hyten-deterrence-in-space-means-no-war-will-be-fought-there/>.

⁴⁴ Bill Gertz, "Chinese Submarine Practiced Missile Attack on USS Reagan," *The Washington Free Beacon*, December 15, 2015, available at <http://freebeacon.com/national-security/chinese-submarine-practiced-missile-attack-on-uss-reagan/>.

⁴⁵ Brian Weeden and Victoria Samson, *Global Counterspace Capabilities: An Open Source Assessment*, April 2018, p. 20, available at https://swfound.org/media/206118/swf_global_counterspace_april2018.pdf.

⁴⁶ Weeden and Samson, p. 21; see also Edwin Mora, "Expert: U.S. Military 'Over a Decade' Behind China, Russia on Space Defense," *Breitbart*, March 14, 2018, available at <http://www.breitbart.com/national-security/2018/03/14/expert-u-s-military-decade-china-russia-space-defense/>.

of tanks and planes, attacking the U.S. space system may be an irresistible and most tempting choice.”⁴⁷

To support this approach, the PLA has developed over the years a range of capabilities for flexible and precise deterrence against threats to its core interests. A critical part of the anti-access/area denial strategy (called “Active Defense” by China) pursued by China is the ability to oppose other military forces that have entered their sphere of influence by denying command, control and communications as well as the operability of airbases and ports, which would not be possible without the aid of space.⁴⁸ As part of its “active defense” concept, defensive counterattacks may be used to respond to an attack or disrupt an adversary’s preparations to attack.⁴⁹ The strategy of denying access requires counterforce targeting, which includes target detection, delivery of weapons precisely on target, and tracking and conducting hit assessment (understanding what is happening on the battlefield). This requires a significant command, control, communications network and intelligence, surveillance, and reconnaissance capabilities, much of which is reliant on space systems.

According to two analysts for the PLA, “[a]nti-satellite weapons can be developed at low cost and can strike at the enemy’s enormously expensive yet vulnerable space systems that will become an important option...to deter...powerful enemies....”⁵⁰ China understands the importance of space to pursuing strategic objectives and has learned from the lessons of wars and conflicts fought by the United States. Chinese military analysts understand that space superiority should be the goal of any military operation, and that, where possible, efforts should be made to deny the enemy information from its space-based assets. Indeed, they write, space is now the center of gravity in military operations, and heavy emphasis is placed on gaining the initiative at the outset of a conflict, potentially striving “to attack first at the campaign and tactical level in order to maintain the space battlefield initiative.”⁵¹ In this way, gaining the initiative in space can allow the conduct of a quick war that is decisive and less than full-scale. Having the ability to destroy or disable enemy satellites can act as a deterrent against the use of force in general. Chinese analysts believe that this capability can deter a country from even becoming involved in conflict, which is a premise we explore in Chapter 4.⁵²

China’s Counter-Space Systems

According to General Hyten, China is further along than Russia in advancing counter-space warfighting capabilities.⁵³ China is developing and has demonstrated a wide range of counter-space technologies and is believed to be very close to having operational systems.⁵⁴ It will

⁴⁷ Cited in Loverro, “Space Warfighting Readiness: Policies, Authorities, and Capabilities,” *Statement Before the House Armed Services Committee*, March 14, 2018. Mr. Loverro, former Deputy Assistant Secretary of Defense for Space Policy, remarked that Hucheng’s observation became the “firm basis for China’s and Russia’s anti-access, area denial strategy....”

⁴⁸ Office of the Secretary of Defense, *Military and Security Developments Involving the People’s Republic of China 2015*, p. 33.

⁴⁹ Office of the Secretary of Defense, *Military and Security Developments Involving the People’s Republic of China 2018*, p. 46.

⁵⁰ PLA Analysts Li Hechun and Chen Youong “Sky War - A New form of War That Might Erupt in the Future,” *Liberation Army Daily* (online), 17 January 2001. See Christopher Stone, “Reversing the Tao: A Framework for Credible Space Deterrence,” Missouri State University, Masters Thesis, available at <https://bearworks.missouristate.edu/cgi/viewcontent.cgi?article=2506&context=theses>.

⁵¹ Weeden and Samson, p. 22.

⁵² Weeden and Samson, p. 21.

⁵³ Bill Gertz, “China Carries Out Flight Test of Anti-Satellite Missile,” *Washington Free Beacon*, August 2, 2017, available at: <http://www.freebeacon.com/national-security/china-carries-flight-test-anti-satellite-missile/>.

⁵⁴ DIA, *Challenges to Security in Space*, pp. 20, 21; Mora.

increasingly be able to hold at risk U.S. satellites in all orbits and is developing a multi-dimensional ASAT capability supporting its anti-access/area denial strategies, with its most recent ASAT activities appearing to be focused on the refinement of its kinetic space weapons.

Active defense operations would likely start with the disruption and destruction of command and control and intelligence collection capabilities using cyber and kinetic attacks on satellites and ground assets in support of other Chinese kinetic capabilities. Chinese counter-space developments include ground-launched ASAT missiles, sophisticated on-orbit activities, and directed-energy weapons with ASAT functions.⁵⁵ This could be followed by large raid size ballistic missile attacks on regional bases and potentially on carrier battle groups. Signaling the importance of space to the PLA, China established in 2015 the Strategic Support Forces as a separate military service that is also responsible for cyber and electronic warfare. The Strategic Support Forces centralize the space, cyber, and electronic warfare missions to seize and maintain battlefield information control.⁵⁶

Direct-Ascent ASAT

China is developing ballistic missile defense (BMD) and ASAT systems.⁵⁷ The main difference between these systems is the software used to detect, track and target either a missile warhead or a satellite. China reportedly has imported missile defense systems from Russia, such as the S-300 and S-400 systems, and is developing domestic BMD systems.⁵⁸ China reportedly has two deployed mobile ground-launched ASAT interceptors and may be fielding two additional larger third-generation ASAT systems, which may be based on four-stage mobile space launch vehicles or ICBMs.⁵⁹ Others report that China may be developing as many as three direct-ascent ASAT systems.⁶⁰ Secrecy is a way of protecting ASAT capabilities, which the Chinese fear could become a target. That fear could lead China to deploy its ASATs on more secure platforms, such as submarines.⁶¹

With the first known non-intercept tests of the direct-ascent ASAT taking place in 2005 and 2006, China's kinetic destruction in January 2007 of a defunct Chinese weather satellite marked a milestone in the program. That test increased the amount of low-earth orbital debris by ten percent and strained relations with the rest of the world. Initially, strategists thought these weapons should be developed in secret to protect China's image. This earlier concern about its image was validated in that 2007 intercept test. According to General John Hyten, China continues to test that 2007 capability "at multiple regime orbits," and that in the "not too distant future," it will "be able to use that capability to threaten every spacecraft we have...."⁶² China's most recent hit-to-kill and direct-ascent ASAT tests took place in January 2010, January 2013,

⁵⁵ Coats, *Worldwide Threat Assessment*, 2018.

⁵⁶ Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2018*, p. 39.

⁵⁷ Office of the Secretary of Defense, *Missile Defense Review 2018*.

⁵⁸ Davis Florick, "Beijing's Anti-Satellite and Missile Defense Systems: A Threat to its Neighbors," National Institute for Public Policy Information Series No. 428, March 23, 2018.

⁵⁹ Bill Gertz, "China Prepares for Anti-Satellite Missile Test," *Washington Free Beacon*, December 9, 2016, available at <http://freebeacon.com/national-security/china-prepares-satellite-missile-test/>.

⁶⁰ Weeden and Samson, p. 12; Florick.

⁶¹ Michael Pillsbury, "The Sixteen Fears," pp. 159-160.

⁶² Phillip Swarts, "Hyten: U.S. must deter Chinese aggression in space," *Space News*, January 31, 2017, available at <http://spacenews.com/hyten-u-s-must-deter-chinese-aggression-in-space/>.

July 2014, and October 2015, using the same tracking, targeting, and guidance systems as the interceptor tested in 2007. This string of tests did not result in satellite destruction or create orbital debris, but the tests have been evaluated as having contributed to China's knowledge of its ASAT capabilities.⁶³

A paper published by the U.S.-China Economic and Security Commission reports that China also may have tested a high altitude ASAT aimed at attacking GPS satellites.⁶⁴ In May 2013 China launched an object into space on a ballistic trajectory that took it near GEO where the United States operates critical early warning, signals intelligence, and communications satellites. It is possible, according to the U.S. Department of Defense, that this was a test of counter-space technologies in geostationary orbit.⁶⁵ Such a system also could place a kinetic kill vehicle in the path of satellites in medium earth orbit (MEO), where GPS satellites are placed, or in highly elliptical orbit (HEO), where the U.S. operates infrared missile detection and warning satellites.

The U.S. government believes that China tested a kinetic kill ASAT system in 2014 when it launched a non-destructive payload that remained suborbital and did not appear to have a target on earth.⁶⁶ Additional suborbital tests involving a new interceptor took place in 2015, 2016, 2017, and 2018. U.S. officials believe the ASAT demonstration conducted in February 2018 was disguised as a missile defense test.⁶⁷ Reportedly based on the solid-fueled DF-21 MRBM, this interceptor could strike low earth orbit (LEO) satellites as well as attain an altitude of 22,000 miles and be capable of reaching GEO satellites.⁶⁸

With this full range of direct-ascent ASAT capabilities, China may be capable of using hit-to-kill technologies to target and destroy surveillance satellites in LEO, GPS satellites in MEO, and communications and early warning satellites in GEO.⁶⁹ In addition to these capabilities, use of a single nuclear warhead in an ASAT role has the potential to decimate low altitude satellites. A 2005 report found on a Hong Kong website (owned by China's official news agency) quoted an unidentified Chinese official as saying that China might not only stage two electro-magnetic pulse (EMP) attacks against Taiwan, but also might "conduct an announced nuclear EMP 'test' 1,200

⁶³ Eric Heginbotham, et.al., *The U.S.-China Military Scorecard: Forces, Geography, and the Evolving Balance of Power, 1996-2017* (Santa Monica, CA: RAND Corporation, 2015), p. 248, available at http://www.rand.org/content/dam/rand/pubs/research_reports/RR300/RR392/RAND_RR392.pdf.

⁶⁴ Craig Murray, "China Missile Launch May Have Tested Part of a New Anti-Satellite Capability," (Washington, D.C.: U.S.-China Economic and Security Review Commission, May 22, 2013), available at http://origin.www.uscc.gov/sites/default/files/Research/China%20Missile%20Launch%20May%20Have%20Tested%20Part%20of%20a%20New%20Anti-Satellite%20Capability_05.22.13.pdf.

⁶⁵ Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2015*, p. 35.

⁶⁶ Mike Gruss, "U.S. State Department: China Tested Anti-satellite Weapon," *SpaceNews*, July 28, 2014, available at <http://spacenews.com/41413us-state-department-china-tested-anti-satellite-weapon/>.

⁶⁷ Zachary Keck, "China Claims That It Has Tested a Mid-Course Missile Defense System," *National Interest*, February 11, 2018, available at <http://nationalinterest.org/blog/the-buzz/china-claims-it-has-tested-mid-course-missile-defense-system-24434>.

⁶⁸ Weeden and Samson, p. 18. See also Harsh Vasani, "How China Is Weaponizing Outer Space: Many of China's space capabilities are designed to counter U.S. military advantages," *The Diplomat*, January 19, 2017, available at <https://thediplomat.com/2017/01/how-china-is-weaponizing-outer-space/>; Bill Gertz, "China ASAT Test Part Of Growing Space War Threat: DNI Outlines Growing Danger To Satellites From Beijing's Missiles, Lasers & Robot Spacecraft," *Fortuna's Corner*, February 23, 2018, available at <https://fortunascorner.com/2018/02/23/china-asat-test-part-of-growing-space-war-threat-dni-outlines-growing-danger-to-satellites-from-beijings-missiles-lasers-robot-spacecraft/>; Jeffrey Lin and P.W. Singer, "China shot down another missile in space," *Popular Science*, February 13, 2018.

⁶⁹ Bill Gertz, "China, Russia Building Super-EMP Bobs for 'Blackout Warfare,'" *Washington Free Beacon*, January 24, 2019, available at <https://freebeacon.com/national-security/china-russia-building-super-emp-bombs-for-blackout-warfare/>.

km east of Taiwan to keep US forces at bay.”⁷⁰ A secondary impact of such a “test” would be to destroy large numbers of low attitude satellites.

Maneuvering Satellites and Spacecraft

China is developing new space-based weapons, according to Lt. Gen. Robert Ashley, the head of the Defense Intelligence Agency (DIA). The Chinese are developing new technologies and undertaking satellite interdiction experiments to advance counter-space capabilities.⁷¹ China is reportedly developing co-orbital proximity capabilities to potentially use on-orbit ASATs to maneuver near and destroy U.S. systems.⁷² Beijing has experimented with maneuvering satellites, conducting rendezvous demonstrations involving deliberate changes to orbital trajectory since at least 2010.⁷³ China reportedly inserted three covertly deployed ASAT-capable vehicles in orbit in 2013 that conducted rendezvous, surveillance, and grabbing demonstrations.⁷⁴ In 2016 China launched two satellites to GEO, where one of the satellites maneuvered to place itself in proximity with another Chinese satellite and circle it.⁷⁵ Future co-orbital ASAT systems could include jammers, robotic arms based on space planes or satellite platforms, kinetic kill vehicles, lasers, and explosive satellites. Although there have been no reported destructive intercept tests by China using co-orbital ASATs, the military utility of such operations is self-evident. They may be used to destroy an enemy satellite and get close enough to jam communications, and, unlike the direct ascent ASAT that would give hours of warning before striking, on-orbit counter-space assets could do so with little or no warning.

There are also reports that China is developing and using a small “peaceful” spacecraft, the stated mission of which is to clean up space junk, or on-orbit grappling. The Aolong-1, or “Roaming Dragon,” craft uses a robotic arm to pick up large debris, to include old satellites.⁷⁶ China has reportedly proposed developing a space-based laser to reduce space junk by burning it.⁷⁷ A spacecraft capable of “clean-up” operations, satellite inspection, refueling and repair also would have the potential to be used for offensive military purposes or to develop other craft useful for military applications in the role of an on-orbit ASAT weapon. These on-orbit systems may be used to bend antennae, break or distort solar panels, sabotage a fuel tank, or undertake any

⁷⁰ Dr. Mark Schneider, *The Emerging EMP Threat to The United States*, (Fairfax VA: National Institute Press, November 2007), available at <http://www.nipp.org/wp-content/uploads/2014/12/EMP-Paper-Final-November07.pdf>.

⁷¹ Patrick Tucker, “Pentagon Intelligence Chief: Russia and China Will Have Weapons in Space ‘In the Near Future,’” *Defense One*, June 27, 2018.

⁷² Office of the Secretary of Defense, *Military and Security Developments Involving the People’s Republic of China 2015*, p. 35; William A. Reinsch, et. al., *2015 Annual Report to Congress* (Washington, D.C.: U.S.-China Economic and Security Review Commission, November 17, 2015), p. 292, available at http://www.uscc.gov/Annual_Reports/2015-annual-report-congress. “China is pursuing a broad and robust array of counterspace capabilities, which includes direct-ascent antisatellite missiles, co-orbital antisatellite systems, computer network operations, ground-based satellite jammers, and directed energy weapons. China’s nuclear arsenal also provides an inherent antisatellite capability.”

⁷³ Weeden and Samson, p. 2.

⁷⁴ Leonard David, “Mysterious Actions of Chinese Satellites Have Experts Guessing,” *Space.com*, September 9, 2013, available at <http://www.space.com/22707-china-satellite-activities-perplex-experts.html>. Bill Gertz, “China Testing New Space Weapons,” *Washington Free Beacon*, October 2, 2013, available at <http://freebeacon.com/national-security/china-testing-new-space-weapons/>.

⁷⁵ Weeden and Samson, p. 8.

⁷⁶ Stephen Chen, “Is China militarizing space? Experts say new junk collector could be used as anti-satellite weapon,” *South China Morning Post*, June 28, 2016, available at <http://www.scmp.com/news/china/diplomacy-defence/article/1982526/china-militarising-space-experts-say-new-junk-collector>. The European Space Agency reportedly has a similar project underway, as does the U.S. Defense Advanced Research Projects Agency (2020 launch anticipated). The United States once had this capability with the Space Shuttle program, which was terminated. Stuart Clark, “China: the new space superpower,” *The Guardian*, August 28, 2016.

⁷⁷ Kyle Mizokami, “China Proposes Orbiting Laser to Combat Space Junk,” *Popular Mechanics*, February 20, 2018.

number of other malicious actions.⁷⁸ These “peaceful” satellites may be used as a deterrent or an active offensive or inspection capability, one that could also result in gaining insight into the technical capabilities of opponents’ satellites. The benefit of such a weapon is that it is “clean,” when compared to the debris-generating capacity of a kinetic-kill ASAT missile, meaning that its use in a counter-space role might not carry the same level of international opprobrium as the direct-ascent kinetic kill weapon.

China is also engaged in human spaceflight missions, which could be used to support counter-space missions. Beijing launched its second experimental space laboratory, Tiangong 2, in September 2016. China has the goal of operating this space station by 2022.⁷⁹ The ability to track and identify satellites is enhanced by technologies developed for the manned and lunar programs. According to the Director for National Intelligence, China’s space station could eventually launch small harder-to-detect co-orbital satellites.⁸⁰

Non-Kinetic Interference

China is making technological progress with radio-frequency jammers and directed energy weapons that could pose risks to GPS and U.S. communications satellites. Chinese researchers, according to the Director of National Intelligence, are investigating enhanced robust jamming capabilities to attack commonly used frequencies in communications and global navigation satellite systems.⁸¹ The Chinese also may embark on a project to develop a space-based laser to reduce space junk by destroying or disabling satellites, altering the flight path or burning off chunks of the spacecraft.⁸²

China fired lasers in 2006 at U.S. reconnaissance satellites, which operate in LEO. China claimed that it was merely conducting laser range-finding (or “illuminating”) and not attempting to blind the satellite. In any case, the satellite’s sensors apparently suffered no permanent damage.⁸³ China’s research into these and related areas is continuing. China has fixed laser ranging stations at five locations. It may be possible for China to scale up the power at these sites to the point where it could dazzle or do damage to satellite optics.⁸⁴ These laser rangefinders also could be used to locate and precisely target orbiting satellites. China continues to modernize its space program to achieve near-real-time tracking of objects in space, command and control of deployed forces, and strike targets with precision.⁸⁵ The U.S. Defense Intelligence Agency believes that China is likely

⁷⁸ Brian G. Chow and Henry Sokolski, “Growing U.S. satellite vulnerability: The silent ‘Apocalypse Next,’” *SpaceNews*, August 22, 2018, available at <https://spacenews.com/growing-w-w-satellite-vulnerability-the-silent-apocalypse-next/>.

⁷⁹ Bloomberg News, “China Sends Astronauts Into Space for Longest Mission Yet,” *Bloomberg News*, October 16, 2016, available at <https://www.bloomberg.com/news/articles/2016-10-16/china-sends-astronauts-into-space-with-plans-for-longest-mission>.

⁸⁰ Bill Gertz, “China ASAT Test Part of Growing Space War Threat.”

⁸¹ Coats, *Worldwide Threat Assessment of the US Intelligence Community*, February 13, 2018; Daniel R. Coats, *Worldwide Threat Assessment of the US Intelligence Community*, Before the Senate Select Committee on Intelligence, May 11, 2017, available at <https://www.dni.gov/index.php/newsroom/congressional-testimonies/item/1757-statement-for-the-record-worldwide-threat-assessment-of-the-u-s-intelligence-community-before-the-ssci>.

⁸² Mizokami.

⁸³ Glenn Kessler, “Bachmann’s claim that China ‘blinded’ U.S. satellites,” *The Washington Post*, October 4, 2011, available at https://www.washingtonpost.com/blogs/fact-checker/post/bachmanns-claim-that-china-blinded-us-satellites/2011/10/03/gIQAHvm7IL_blog.html?utm_term=.b425569bd9a0.

⁸⁴ Heginbotham, et al., p. 247.

⁸⁵ David J. Buck, “Statement of Lieutenant General David J. Buck, Commander, Joint Functional Component Command for Space,” *114th U.S. Congress*, House Armed Services Committee, March 15, 2016, p. 5, available at <http://docs.house.gov/meetings/AS/AS29/20160315/104620/HHRG-114-AS29-Wstate-BuckD-20160315.pdf>.

pursuing laser weapons to counter low-orbiting sensors by 2020, with higher power systems that may do damage to satellite structures by the mid-to-late 2020s.⁸⁶

China is also honing its cyber assault skills and putting them into practice.⁸⁷ Digital attacks are like bombings. They have the ability to shut down a system, close down a factory, destroy electrical, financial, transportation infrastructure at all levels of society, including those levels that contribute to national defense. Denial of service, loss of system performance can mean denial or loss of capability, which means such attacks have the same impact as a kinetic assault on defense and economic assets that rely on digital systems. Space systems, which are part of the information network that relies entirely on digital systems and data flow and on software and radio-frequency links, are vulnerable to such attacks.

China is developing cyber-attack forces that may be used to penetrate military and civilian communications and operations ground control stations.⁸⁸ Chinese hackers use cyber-attacks to prepare for military conflicts and plan to seize information dominance in the beginning by attacking command and control centers, satellites, and communications networks.⁸⁹ The reason for the aggressive pursuit of cyber warfighting capabilities is simple. If you can hack your way into the logic of a satellite's control system, it would be possible to turn the satellite off or have it do things it was not intended to do, such as turning solar panels towards the sun to burn them or maneuvering the satellite into the path of other satellites. There is also the challenge of identifying the attackers. If the United States cannot identify the trouble-makers, how can it deter them or respond to them?

Space Force Application

With respect to space force application, China continues to make large investments in ballistic missile systems, improving range, lethality, and capability for evading U.S. missile defense systems.⁹⁰ China already has systems that evade missile defenses, to include technologies for multiple reentry vehicles, maneuvering reentry vehicles, hypersonic glide vehicles,⁹¹ cruise missiles, and midcourse missile defense countermeasures, such as decoys. These forces may be used to attack U.S. space and ground targets.

The modernization of China's strategic forces has been intense, with the development of new intermediate-range and long-range systems as well as submarines that can strike targets from the open water some 5,000 miles away. Unconstrained by arms control limits, China's nuclear weapons and ballistic missile delivery capabilities are growing in terms of sophistication and quantity. China reportedly has between 75 and 100 ICBMs, with 20 nuclear armed, liquid-

⁸⁶ DIA, *Challenges to Security in Space*, p. 20.

⁸⁷ According to U.S. intelligence chiefs, more than 30 countries are developing offensive cyber-attack capabilities. Steve Ranger, "US intelligence: 30 countries building cyber attack capabilities," *ZDNet*, January 5, 2017, available at <http://www.zdnet.com/article/us-intelligence-30-countries-building-cyber-attack-capabilities/>.

⁸⁸ Bill Gertz, "China ASAT Test Part of Growing Space War Threat."

⁸⁹ Adam Segal, "How China is preparing for cyberwar," *Christian Science Monitor*, March 20, 2017, available at <https://www.csmonitor.com/World/Passcode/Passcode-Voices/2017/0326/How-China-is-preparing-for-cyberwar>.

⁹⁰ See Office of the Secretary of Defense, *Nuclear Posture Review 2018*, February 2018, p. 11 available at <https://media.defense.gov/2018/Feb/02/2001872877/-1/-1/1/EXECUTIVE-SUMMARY.PDF>; Coats, *Worldwide Threat Assessment of the US Intelligence Community*; Kania, "China's strategic arsenals in a new era."

⁹¹ For an extensive review of China's hypersonic glide vehicle program, see Guy Norris, "China Takes Wraps Off National Hypersonic Plan," *Aviation Week*, April 10, 2017, available at <http://aviationweek.com/technology/china-takes-wraps-national-hypersonic-plan>.

propellant CSS-4 (DF-5) ICBMs capable of reaching the United States.⁹² China has deployed MIRV warheads on the CSS-4 Mod 3 (DF-5B).⁹³ It is also modernizing its nuclear forces by adding more survivable, road-mobile delivery systems. China has deployed the road-mobile CSS-10 Mod 1 and 2 ICBMs (DF-31 and DF-31A).⁹⁴ China is developing a new generation of mobile missiles and is undertaking efforts to maintain the viability of its offensive forces, including new command, control and communications capabilities for its nuclear ICBM forces. China has just deployed an advanced ICBM, the DF-41, with an expected range of up to 14,500km, capable of striking the United States in around 30 minutes time.⁹⁵ This ICBM would be deployed on easy-to-conceal rail cars.⁹⁶ China is also producing the JIN-class strategic ballistic missile submarine, with three delivered and up to two under construction to carry the JL-2 submarine launched ballistic missile (7,400km range).

China reportedly will continue to work on a range of technologies to counter U.S. ballistic missile defense systems, including maneuverable reentry vehicles (MaRVs), MIRVs, decoys, chaff, jamming, and anti-satellite weapons.⁹⁷ It also reportedly is working on a hypersonic craft that appears designed to be launched atop ballistic missiles and then glide and maneuver at speeds of up to 10 times the speed of sound from near space towards the target.⁹⁸ The glide vehicle, capable of extreme maneuvers, reportedly has been detected traveling between 4,000 and 7,000 miles per hour and would make for a very challenging target for current U.S. missile defenses, which would be our last line of defense against such a force application attack from space.

⁹² Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2018*, Washington, D.C.: U.S. Department of Defense, 2018, p. 36.

⁹³ Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2016*, (Washington, DC: Department of Defense, April 26, 2016), available at <https://dod.defense.gov/Portals/1/Documents/pubs/2016%20China%20Military%20Power%20Report.pdf>, p. 25.

⁹⁴ Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China 2016*, p. 25.

⁹⁵ "Reported DF-41 Deployment: China 'Responding to US Missile Defense in Asia'," *Sputnik*, available at <https://sputniknews.com/military/201701241049956101-china-us-df41/> "Dongfeng-41 will bring China more respect," *Global Times*, <http://www.globaltimes.cn/content/1030353.shtml>.

⁹⁶ Minnie Chan, "China's top new long range missile 'may be deployed this year,' putting the US within striking distance, report says," *South China Morning Post*, March 30, 2016, available at <http://www.scmp.com/news/china/diplomacy-defence/article/1931652/chinas-top-new-long-range-missile-may-be-deployed-year>.

⁹⁷ Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments involving the People's Republic of China 2013*, (Washington, D.C.: Department of Defense, 2013), pp. 29-31, available at http://archive.defense.gov/pubs/2013_China_Report_FINAL.pdf; National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat* (Washington, D.C.: Office of the Director of National Intelligence, 2013), p. 18, 19, available at https://fas.org/programs/ssp/nukes/nuclearweapons/NASIC2013_050813.pdf. China has acknowledged the existence of a new ICBM capable of carrying multiple nuclear warheads, the DF-41. Agence France-Presse, "China Says It Has Intercontinental Missile Capable of Carrying Nukes to US," *Firstpost*, August 1, 2014, available at <http://www.firstpost.com/world/china-says-it-has-intercontinental-missile-capable-of-carrying-nukes-to-us-1644559.html> Anti-satellite weapons and ballistic missile defense systems utilize similar technologies to achieve the destruction of the target using kinetic kill mechanism (hit-to-kill and blast fragmentation technologies) or directed energy.

⁹⁸ Bill Gertz, "Hypersonic arms race: China tests high-speed missile to beat U.S. defenses," *The Washington Times*, January 13, 2014, available at <http://www.washingtontimes.com/news/2014/jan/13/hypersonic-arms-race-china-tests-high-speed-missile/>; "China military affairs specialists said the hypersonic vehicle test is a significant milestone and appears to be part of China's development of asymmetric warfare weaponry that Beijing calls "assassin's mace" weapons—high-technology arms that would assist China's overall weaker military forces to defeat the more technologically advanced U.S. military." Franz-Stefan Gady, "Russia Test Fires Nuclear-Capable Hypersonic Glider Warhead," *The Diplomat*, October 28, 2016, available at <http://thediplomat.com/2016/10/russia-test-fires-nuclear-capable-hypersonic-glider-warhead/>; Bill Gertz, "China Successfully Tests Hypersonic Missile: Seventh test of new DF-ZF glider tracked over northern China," *The Washington Free Beacon*, April 27, 2016, available at <http://freebeacon.com/national-security/china-successfully-tests-hypersonic-missile/>.

Chapter 3

U.S. Counter-Counter-Space: Policy and Capabilities

This chapter attempts to answer two fundamental questions. First, what is the ability of the United States to overcome possible Chinese aggression against U.S. space assets? We will assess China's leverage over the United States in the space domain as well as potential U.S. vulnerabilities and possible defensive counteractions. Second, what is the capability of the United States to inflict pain on China as part of its own strategy to deter China from harming U.S. space interests and challenging U.S. freedom of action in space? We will examine some of the deterrence tools the United States has at its disposal.

U.S. Vulnerability to Chinese Deterrence Threats

One may measure a country's vulnerability in a particular security situation by both its willingness to engage the adversary in battle and the susceptibility of its military systems to countermeasures. In a contest between two states, one of the first questions one should ask is which country has more at stake? Or which country has more to lose? This ultimately gets to the question, how willing is the United States to go to war and potentially suffer great losses? It is generally assumed that the United States is not inclined to enter a conflict when it may lead to high costs in terms of American lives (U.S. soldiers and citizens) and foreign civilian lives. For example, a conflict on the Korean Peninsula likely would involve tactical air- and sea-strike forces as well as U.S. satellite assets and cyber operations. A more significant operation would involve U.S. ground and special operations forces. Significant civilian populations in South Korea also would be at risk. Such an operation would demand that the U.S. political leadership take into account strong political resistance at home. Chinese officials are convinced the United States today is unlikely to risk significant casualties in any military conflict, especially one that is half way around the world, a factor that could lessen the credibility of U.S. deterrent threats against Chinese intervention.⁹⁹ Because they hold this belief, Beijing also may think that China has the ability to deter U.S. military involvement in its own sphere of influence.

That said, throughout the past century, the United States has not flinched when forced to consider whether to enter into conflicts in faraway lands to defend its interests, to include a very costly conflict on the Korean Peninsula in the middle of the last century. In several cases, Washington decided to become militarily involved to stop the expansion or advancement of totalitarian or communist ideology, which U.S. policy-makers viewed as detrimental to U.S. national security interests. In all cases, a judgment was made that it would have been worse for the United States to remain isolated from events rather than get involved militarily.

So China cannot assume the United States would not become militarily engaged and enter a conflict in defense of U.S. interests. There may be reasons for Chinese leaders to believe that the United States may not be deterred, especially when it comes to securing U.S. interests on the Korean Peninsula. After all, the United States currently deploys more than 20,000 soldiers,

⁹⁹ Payne, *The Fallacies of Cold War Deterrence*, pp. 155, 56; Barton Gellman, "U.S. and China Nearly Came to Blows in 1996," *The Washington Post*, June 21, 1996.

sailors, airmen and Marines in South Korea, has significant military infrastructure, and has engaged in military exercises and tests with its regional military allies. This presence in the region is a key manifestation of its willingness to defend U.S. and United Nations interests there and uphold the 1953 Armistice Agreement. The United States also has significant economic and security agreements with South Korea, to include a mutual defense treaty. The U.S. Congress has passed a resolution demonstrating U.S. security commitments on the peninsula and U.S. resolve to respond forcefully to North Korean missile provocations, a commitment that stands today, the June 2018 U.S.-North Korea Summit notwithstanding.¹⁰⁰ For these reasons, China should be more wary about the effectiveness of its deterrent threats when it comes to the future of the Korean Peninsula in comparison to other possible flash points, such as the South China Sea.

Who the U.S. President is at the moment of crisis also will matter. Under President Donald Trump, bombing actions in Syria and Afghanistan put the entire world on-notice regarding the U.S. willingness to back-up its deterrent threats and support its security agreements. Demonstrations by a resolute Administration would add credibility to the probable U.S. intervention on the Peninsula in a moment of crisis.

U.S. Vulnerabilities in Space

America is vulnerable in space. Indeed, the Chinese are calling space America's Achilles Heel.¹⁰¹ Beijing may believe that, in order to go into a crisis with the strongest possible position, the best approach to deter U.S. intervention may require counter-space demonstrations or actions. Therefore, it is imperative that the U.S. leaders understand U.S. vulnerabilities in space, particularly given the rapidity of China's rise in space and the relative lethargy with which the United States has acted to correct this security imbalance.¹⁰² Most recently, the warning signs about Chinese ambitions have come in the form of maritime expansionism, illegal island-building, and a clear military build-up, to include a robust military space program.

Outside of images we might see, space assets are by and large invisible to us, and it is therefore difficult to get a vivid understanding of the possible damage that may be done against the United States. Space represents a militarily, economically and commercially burgeoning global enterprise.¹⁰³ The economic impact of loss of satellites would be very significant.¹⁰⁴ Space-reliant national security activities and functions include the execution of combat operations, command and control of forces and critical nuclear and missile defense systems, targeting and offensive

¹⁰⁰ See for example House Resolution 92, *Condemning North Korea's development of multiple intercontinental ballistic missiles, and for other purposes*, 115th Congress (2017-2018). In part, the House of Representatives resolution "supports continued bilateral security cooperation between the United States and South Korea and the consideration of additional measures to strengthen the alliance, including expanded foreign military sales, joint exercises, and other actions as appropriate."

¹⁰¹ National Aeronautics and Space Administration (NASA) Administrator Jim Bridenstine, see Alison Snyder and Andrew Freedman, "NASA Administrator throws support behind Trump's 'Space Force,'" *Axios.com*, June 27, 2018, available at <https://www.axios.com/nasa-administrator-supports-trumps-space-force-7a4bba61-6184-4503-b2c3-07d158f2dbd9.html>.

¹⁰² Hal Brands, "The Chinese Century?" *The National Interest*, March-April 2018, available at <http://nationalinterest.org/feature/the-chinese-century-24557>. According to Brands, "Since the Taiwan Strait Crisis in 1995–96, moreover, there have been accumulating signs that Beijing is not a status quo power, but rather one determined to reshape the East Asian order. For decades, then, there has been no shortage of warnings about the emerging China challenge."

¹⁰³ For a brief look at how innovations and the spread of intelligent devices is leading the expansion of space infrastructure, see Editors, "Brave new worlds," *The Economist*, August 27, 2016, available at <http://www.economist.com/news/leaders/21705825-new-discoveries-intelligent-devices-and-irrepressible-dreamers-are-once-again-making-space>.

¹⁰⁴ Doug Lamborn, "Time to get serious about space threats," *The Hill*, May 14, 2015, available at <http://thehill.com/opinion/oped/241933-time-to-get-serious-about-space-threats>.

operations, and logistics and humanitarian support.¹⁰⁵ Other activities of society dependent on space include trade and commerce, banking, other financial transactions, food production and distribution, communications, transportation, power and water infrastructure, and weather monitoring and assessment.¹⁰⁶

There is evidence within the Trump Administration National Security Strategy and National Defense Strategy, however, that U.S. officials are approaching the requirement for space protection with a greater sense of urgency, a process that began during the Obama Administration.¹⁰⁷ There is a growing awareness among U.S. officials and analysts that all nodes within U.S. space architectures are vulnerable to attack from China. U.S. defense officials are now deeply concerned about the U.S. ability to operate freely in space and deliver “space effects.” According to the Joint Chiefs of Staff, “the next two decades will see adversaries building the capacity to control approaches to their homelands through the commons, and later, translating command of the nearby commons into the connective architecture for their own power projection capabilities.”¹⁰⁸ According to a DIA report, “Chinese and Russian military leaders understand the unique information advantages afforded by space systems and are developing capabilities to deny U.S. use of space in the event of a conflict.”¹⁰⁹ According to Air Force Major General Nina Armagno, “Russia and China, by the year 2025, will be able to hold at risk every one of our satellites in any orbit.”¹¹⁰

How disruptive an attack on satellite systems would be for the United States and the risk posed to national security would depend on the type of satellite destroyed and the redundancy in the space system network. The collection and distribution of this information may be denied, disrupted or degraded using tactics such as jamming of radio transmitters or blinding of satellite sensors using lasers. Satellite functions also could be denied or degraded through physical attack using an ASAT, which in effect takes out an element of a node in the information network, which, depending on the resilience of the network, may or may not have a catastrophic effect.¹¹¹

The implications of a loss in space capability for the U.S. ability to wage war competently are significant.¹¹² Interference with or destruction of U.S. reconnaissance satellites would draw down the opportunities to assess enemy force strength and degrade the employment of operational

¹⁰⁵ Joseph Nimmich, *Written testimony for a Joint House Armed Services, Subcommittee on Strategic Forces; and, House Homeland Security, Subcommittee on Emergency Preparedness, Response and Communications*, hearing titled “Threats to Space Assets and Implications for Homeland Security,” March 29, 2017, available at <https://armedservices.house.gov/legislation/hearings/threats-space-assets-and-implications-homeland-security>.

¹⁰⁶ National Academies of Sciences, Engineering, and Medicine, *National Security Space Defense and Protection: Public Report*, (Washington, DC: The National Academies Press, 2016), p. 2, available at <https://www.nap.edu/catalog/23594/national-security-space-defense-and-protection-public-report>.

¹⁰⁷ Courtney Albon, “National Defense Strategy driving space resiliency requirements, planning,” *Inside Defense*, April 27, 2018, <https://insidedefense.com/inside-air-force/national-defense-strategy-driving-space-resiliency-requirements-planning>

¹⁰⁸ Joint Chiefs of Staff, *Joint Operating Environment: The Joint Force in a Contested and Disordered World* (Washington, D.C.: Joint Chiefs of Staff, July 14, 2016), p. 33, available at http://www.dtic.mil/doctrine/concepts/joe/joe_2035_july16.pdf.

¹⁰⁹ Lt. General Vincent R. Stewart, “Worldwide Threat Assessment Armed Services Committee,” (Washington, D.C.: Defense Intelligence Agency, February 3, 2015), available at <http://www.dia.mil/News/SpeechesandTestimonies/tabid/7031/Article/13225/worldwide-threat-assessment.aspx>.

¹¹⁰ Cheryl Pellerin, “Advanced Space Surveillance Telescope Has Critical Military Applications,” *Defense.gov*, October 22, 2016, available at <https://www.defense.gov/News/Article/Article/983007/advanced-space-surveillance-telescope-has-critical-military-applications>.

¹¹¹ National Academies of Sciences, Engineering, and Medicine, p. 8.

¹¹² As quoted in Phillip Swarts, “Space Wars: The Air Force Awakens,” *Air Force Times*, February 15, 2016, available at <https://www.airforcetimes.com/story/military/2016/02/15/space-wars-air-force-awakens/79804228>.

weapon systems. The loss of critical situational awareness capabilities would leave U.S. forces vulnerable to surprise. Loss of weather satellites would reduce the ability to perform military planning for battlefield operations. Impairment of missile launch early warning satellites in GEO, by blinding or dazzling the infrared sensors, would seriously degrade the ability to detect and provide initial track information on ballistic missile launches from points around the world and critically affect the performance of the Ballistic Missile Defense System. Impairment of mobile communications satellites in LEO would disrupt troop movements and logistics in a region. There are also communications satellites in geosynchronous orbit that are critical to command and control of nuclear forces and the ability to operate a communications architecture that has global reach. Navigation satellites are relied on to move troops and operate forces on land, sea, and in the air. Loss or impairment of GPS satellites also could degrade the employment of some precision-guided munitions.

Acknowledging that the United States needs to take steps to stay competitive in the space domain, President Trump directed in 2018 the establishment of a Space Force, potentially a Service apart from the Air Force or a military branch within the Air Force, to secure the nation's space systems. This bold move, if authorized through legislation, may be expected to increase the focus on national security space policy and issues in the Department and give energy to those who advocate for new space capabilities. According to a July 2018 memo drafted by Deputy Secretary of Defense Patrick Shanahan, the Department must establish this force to "protect our economy through deterrence of malicious activities, ensure our space systems meet national security requirements and provide vital capabilities to joint and coalition forces across the spectrum of conflict." The memo went on to underscore that the Department "will usher in a new age of space technology and field new systems in order to deter, and if necessary degrade, deny, disrupt, destroy and manipulate adversary capabilities..."¹¹³ The Under Secretary of Defense for Acquisition and Sustainment, Ellen Lord, advocated for a separate space service to bring "focus and clarity" to space investments.¹¹⁴ The Department established an eleventh unified combatant command, U.S. Space Command, to execute this mission and oversee space forces across the armed forces, and it announced a new vision for changing the acquisition organization and culture to emphasize speed and experimentation in the acquisition of new capabilities. The Air Force Secretary, Heather Wilson, observed that "we are shifting to a war fighting culture" in space in recognition that it is a warfighting domain.¹¹⁵

Tools for Crafting a Space Deterrence Strategy Targeting China

The United States for decades has sought to promote responsible behavior through agreements among nations, such as codes of conduct and transparency measures, to "ensure" space remains a sanctuary.¹¹⁶ The United States has simultaneously developed passive defenses to complicate

¹¹³ Cited in Marcus Weisberger, "Pentagon to Start Creating Space Force – Even Before Congress Approves It," *DefenseOne*, July 30, 2018.

¹¹⁴ Sandra Erwin, "Pentagon procurement chief endorses Space Force," *Space News*, December 1, 2018.

¹¹⁵ In December 2018, President Trump ordered the creation of U.S. Space Command as a unified combatant command to conduct the warfighting mission. Sandra Erwin, "President Trump issues order to create U.S. Space Command," *Space News*, December 18, 2018.

¹¹⁶ See, for example, Robert M. Gates and James R. Clapper, *National Security Space Strategy 2011* (Washington, D.C.: Office of the Director of National Intelligence, 2011), available at https://www.dni.gov/files/documents/Newsroom/Reports%20and%20Pubs/2011_nationalsecurityspacestrategy.pdf; Christopher Stone, "Security through vulnerability? The false deterrence of the National Security Space Strategy," *The Space Review*, April 13, 2015, available at <http://www.thespacereview.com/article/2731/1>; See also Micah Zenko, *Dangerous Space Incidents: Contingency Planning Memorandum No. 21* (Washington, D.C.: Council on Foreign Relations, April 2014), available at

an adversary's aggressive actions in space. Yet these measures have not prevented other nations, to include China, from developing space weapons that may be used against U.S. systems.

The policy of the current Administration is to ensure a strategy that will “make America strong, competitive, and great.”¹¹⁷ As a “top priority,” the national space strategy seeks to leverage the national security, commercial and space sectors so that “the United States will continue to lead in the creation and maintenance of the crucial space systems that are essential to our prosperity, security, and way of life.” The Administration emphasizes peace through strength to protect vital interests in space and “ensure unfettered access to, and freedom to operate in space....” In line with previous Administrations, and believing that it has been the actions of U.S. adversaries and competitors that have turned space into a warfighting environment, the strategy affirms that “any harmful interference with or attack upon critical components of our space architecture that directly affects this vital interest will be met with a deliberate response at a time, place, manner, and domain of our choosing.”¹¹⁸ Indeed, according to President Trump, the United States now recognizes that “space is a new war-fighting domain.”¹¹⁹ In order to realize a stronger U.S. posture in space, the strategy recognizes four pillars:

1. Enhance space architecture resiliency, defenses, and ability to reconstitute impaired capabilities;
2. Strengthen U.S. and allied options to deter potential adversaries from extending conflict into space and, if necessary, counter those threats;
3. Ensure effective space operations through improved situational awareness, intelligence, and acquisition processes; and
4. Foster conducive domestic and international environments through improved support to commercial industry and improved bilateral and multilateral engagements.

Space Architecture Resiliency, Defenses, and Satellite Reconstitution

According to Air Force Chief of Staff, General David Goldfein, a proponent of multi-domain operations (the idea that advanced armed forces need to be able to fight in the air, land, sea, space, and cyber domains), “I believe we’re going to be fighting from space in a matter of years.”¹²⁰ Most U.S. military systems were not designed with threats in mind – they were designed for long-term functionality and efficiency.¹²¹ Yet today most recognize that we do not have a

<http://www.cfr.org/space/dangerous-space-incidents/p32790>. Sam Jones, “Satellite Wars,” *Financial Times*, November 20, 2015, available at <https://www.ft.com/content/637bf054-8e34-11e5-8be4-3506bf20cc2b>. Frank Rose, former US Assistant Secretary of State for Arms Control, Verification and Compliance stated “we don’t want conflict in outer space. But be assured, we will be able to operate in a degraded space environment.” While it is commendable to want to be able to operate without full access to space, retreat from space can become a self-fulfilling prophesy without the tools to reassert national influence in that arena.

¹¹⁷ The White House, “President Donald J. Trump is Unveiling an America First National Space Strategy,” White House Fact Sheet, March 23, 2018, <https://www.whitehouse.gov/briefings-statement/president-donald-j-trump--unveiling-america-first-national-space-strategy/>.

¹¹⁸ The White House, *National Security Strategy of the United States of America*, December 2017, p. 8.

¹¹⁹ The White House, “Remarks by President Trump and Vice President Pence Announcing the Missile Defense Review, January 17, 2019, available at <https://www.whitehouse.gov/briefings-statements/remarks-president-trump-vice-president-pence-announcing-missile-defense-review/>.

¹²⁰ Cited in Sandra Erwin, “Air Force Chief of Staff: ‘We’ll be fighting from space in a matter of years,’” *Space News*, February 24, 2018, available at <http://spacenews.com/air-force-chief-goldfein-well-be-fighting-from-space-in-a-matter-of-years/>.

¹²¹ Air Force Space Command Public Affairs, “Hyten announces Space Enterprise Vision,” *AF.mil*, April 13, 2016, available at <http://www.af.mil/News/ArticleDisplay/tabid/223/Article/719941/hyten-announces-space-enterprise-vision.aspx>.

benign space environment. While some measures may be taken in the political and diplomatic arena to protect U.S. interests in space, the U.S. capability to mount a thorough and active military response in space to protect space assets does not exist today.¹²² Indeed, according to one former defense official, “our current ability to withstand an adversary’s attack is based not so much on our space warfighting readiness, but rather their lack of a fully developed and operationalized threat.”¹²³ Adversaries have been undertaking counter-space capability development across all areas a priority, and the United States has not been responding fast enough.

Today, U.S. defense planners are focusing more on space architecture resiliency and space mission assurance to address the reality of growing threats to U.S. space systems. Over the last few years the United States has taken steps to improve the resiliency of its space systems by adopting passive defense techniques such as disaggregation, distribution, diversification, protection, proliferation, and deception.¹²⁴ Disaggregation involves leveraging allied and commercial assets to achieve military effects. This approach attempts to eliminate a single point of failure and improves survivability by removing single centers of gravity in space by increasing the number and diversity of potential targets. A good example of this is the shifting of tactical military communications to commercial communications satellites operating in LEO.¹²⁵ Disaggregation contributes to deterrence by raising the uncertainty in the enemy’s mind that he will be successful.¹²⁶ Other passive defense measures could involve the use of different orbits to improve overall surveillance coverage when new satellites are launched. Defense planners are also taking steps to ensure reliable and redundant strategic and tactical communications with the development of a joint architecture that can link all the services underneath it.¹²⁷

The United States is taking steps, passive defenses, to counter efforts to temporarily impede the functions of its satellites through the employment of resistant antenna designs, filters, surge arresters and fiber-optic components to counter jamming, dazzling and blinding.¹²⁸ Ocean surveillance satellites operate in LEO over wide ocean areas, making them less accessible to potential jammers, which are typically located on land. Also, signals intelligence (SIGINT) satellite payloads operate in highly elliptical orbit, which means they spend only a very brief time at low altitudes above earth and have very long dwell times at very high altitudes over targeted regions, which makes them very difficult to jam. Also SIGINT sensors quietly monitor signals without transmitting them, which would reveal their presence.¹²⁹ Missile launch warning satellites, such as the U.S. Space Based Infrared System (SBIRS) HEO and GEO satellites, also have received improved protection against lasing to blind or dazzle, to include the installation of sensors that

¹²² Current U.S. ballistic missile defenses are not configured to operate with agility and reliability in the counter-space role. See Mora.

¹²³ Loverro.

¹²⁴ Courtney Albon, “National Defense Strategy driving space resiliency requirements, planning,” *Inside Defense*, April 27, 2018, <https://insidedefense.com/inside-air-force/national-defense-strategy-driving-space-resiliency-requirements-planning>; Loverro.

¹²⁵ Quote is from Deanna Ryals, chief of the international military satellite communication division with the U.S. Air Force. Peter B. de Selding, “U.S. defense officials say partnership with allied satcom systems is a priority,” *Space News*, November 10, 2016, available at <http://spacenews.com/u-s-defense-officials-say-partnership-with-allied-satcom-systems-is-a-priority/>.

¹²⁶ Kris Osborn, “New Air Force Weapons Strategy Speeds Missile Warning, Hypersonics and F-35 Tech,” *TheMaven.net*, May 16, 2018, available at <http://www.foxnews.com/tech/2018/05/17/new-air-force-weapons-strategy-speeds-missile-warning-hypersonics-and-f-35-technology.html>.

¹²⁷ Patrick Tucker, “How the U.S. is Preparing to Match Chinese and Russian Technology Development,” *Defense One*, August 22, 2018.

¹²⁸ Omar Lamrani, “What the U.S. Military Fears Most: A Massive Space War,” *The National Interest*, May 18, 2016, available at <http://nationalinterest.org/blog/the-buzz/what-the-use-military-fears-most-massive-space-war-16248>.

¹²⁹ Heginbotham, pp. 252, 53.

would allow them to operate in multiple frequency bands. Operation in GEO and HEO, given the distance from earth, also complicates counter-space aggression.¹³⁰

There is official concern that U.S. GPS satellites are vulnerable to attack from Chinese lasers.¹³¹ GPS III next-generation satellites are introducing new capabilities to meet higher military demands and reduce the chance of counter-space attacks (especially downlink jamming by Russian or Chinese systems against satellites and attacks against terrestrial GPS receivers to protect against intrusion and misdirection). Once operational, these satellites will have greater signal strength and better accuracy, which will make jamming more difficult.¹³²

Today the United States is not able to respond with agility to destructive space threats, at least not within the space environment. The defensive capabilities available could be located in space or on earth. At present, space warfighters can only watch what happens in the space battlefield or possibly move some assets around, given enough warning. Depending on how low they are in orbit, there are options available today for defending U.S. satellites using U.S. missile defense assets. In order to defeat threatening co-orbital satellites in LEO and direct-ascent ASAT weapons, which are similar to ballistic missile launch vehicles, the United States could leverage the progress it has made to refine these missile defense assets for the satellite-defense mission.

The U.S. Defense Department identifies the ability to reconstitute space capabilities to reestablish lost functionality as a critical priority.¹³³ The first condition necessary for the successful exploitation of space for national security purposes is the ability to provide reliable access to space.¹³⁴ Reconstitution of space assets may be required should there be a need to position satellites over uncovered geographic areas, to overcome interference with satellites that have resulted in an attrition within the architecture (especially if those satellite assets are critical to the warfighting effort), or to execute U.S. counter-space operations (requiring the deployment of assets on orbit) to deny freedom of action to an enemy.

To be effective, space force reconstitution must be timely if it is to affect the battle or crisis at hand. Like its satellites, U.S. reconstitution infrastructure also may come under attack and will need to be protected. The United States is nowhere near where it needs to be to have a truly responsive space reconstitution capability, but there has been some notable progress. Over time, the United States has gradually taken NASA and the Air Force out of the space logistics business and has turned to private industry to take over such missions. Today the U.S. Air Force relies on industry to provide the launch infrastructure, and industry is accordingly investing in the development of new engines, launch vehicles, reusable launch technologies, and associated infrastructure. The commercial launch market is expanding, with at least ten rocket companies internationally vying for satellite customers. The cost of launch should come down as a result of competition and innovation among private launch providers, which, when redundant multiple launch providers is calculated in, also carries the promise of making national launch capabilities

¹³⁰ Heginbotham, pp. 255, 56.

¹³¹ Bill Gertz, "Air Force: GPS Satellites Vulnerable to Attack," *Washington Free Beacon*, March 16, 2018.

¹³² The first of ten GPS III satellites initially ordered by the U.S. Air Force was launched in December 2018, Ed Adamcyk, "First GPS III satellite launched, moving toward operational orbit," *United Press International*, December 26, 2018.

¹³³ Rapuano, p.7.

¹³⁴ Lt Gen Sam Greaves, USAF program executive officer for space, cited in Justin Ray, "Missile warning satellite launch slips into 2017 due to thruster concerns," *Spaceflight Now*, September 26, 2016, available at <https://spaceflightnow.com/2016/09/26/missile-warning-satellite-launch-slips-into-2017-due-to-thruster-concerns/>.

more responsive. The Defense Department is also exploring on-orbit satellite servicing capabilities to support reconstitution following the loss of satellite functionality.

U.S. Space Deterrence Capabilities

Space deterrence is the sum of all U.S. military capabilities, because the United States will never simply fight a “space war.” Rather, it will fight a war that may escalate to involve the space domain. The fact is, the U.S. military is able to shape the battlefield in all domains using its superior land, sea, and air forces (although China would have important military advantages in the seas and land regions surround it). Deterrence must not be thought of as occurring in a single domain. Losing space will have implications for warfighting effectiveness in the land, sea, and air domains. The survival of U.S. space assets is, therefore, critical to the ability of forces in other domains and, therefore, deterrence to succeed.¹³⁵

Today space control capabilities are very limited or at least not very public.¹³⁶ This is particularly true with the U.S. ability to physically destroy or incapacitate foreign satellites. Yet one does not need to be able to execute strikes in space to hold an adversary’s space assets at risk. There are non-kinetic counter-space means available, such a cyber-attack, as well as operationally available military land-, sea, and air forces to strike at space assets on the ground. Cyber warfare may be used to crack a satellite’s control signal encoding and encryption. Cyber-attacks on critical U.S. infrastructure can take place when the country is not at war, although these attacks may be viewed as acts of war. In reality, the United States has established a pattern of tolerating and not retaliating against cyber attacks.¹³⁷

There may be future instances in which the United States will need to use lethal force to eliminate threatening satellites. Although the United States has not focused on policies and technical capabilities to physically destroy or incapacitate foreign satellites, it possesses some technologies and capabilities that could serve in this role. In 1985, the United States used an F-15 fighter to destroy an old LEO military satellite. As noted earlier, while the United States has not invested in an arsenal of kinetic kill capabilities to destroy adversary satellites, it does have capabilities to strike LEO satellites, given the proper software modifications, using its missile defense systems. Space-based interceptors for missile defense, if developed and deployed, also could be used in extreme situations as a space control weapon. It may be possible to develop on-orbit disabling or capturing technologies to neutralize a particular satellite.

The United States demonstrated a kinetic kill capability in February 2008 when it modified a Standard Missile-3 missile defense interceptor launched from an Aegis Ballistic Missile Defense ship to destroy in very low earth orbit a non-functioning, out of control, but fully fueled U.S. government payload about to reenter earth’s atmosphere. The uncertainty of when and where the satellite would reenter and the near certainty that the fuel tank would survive reentry made this an urgent mission. The successful intercept of the satellite occurred, by design, at a very low altitude where its destruction would not add to orbital debris. Officials at the time made it clear

¹³⁵ Loverro.

¹³⁶ General Hyten believes that the United States has very effective space capabilities, but that they are very old and not built for a contested environment. Bill Gertz, “China Carries Out Flight Test of Anti-Satellite Missile.”

¹³⁷ Joel Gehrke, “Admiral: US tolerated cyber ‘acts of war’ over last decade,” *Washington Examiner*, September 14, 2017.

that this operation did not represent the sort of responsive and robust capability that would be needed to attack enemy space assets in wartime.¹³⁸

Given the range of current missile defense interceptor capabilities, intercept would likely have to occur in very low to low earth orbit. The Standard Missile-3 Block IA and IB and the Terminal High Altitude Area Defense (THAAD) interceptors would have this inherent capability and could be modified for the mission to intercept in very low earth orbit. The longer-range Standard Missile-3 Block IIA currently under development with Japan for deployment on Aegis BMD ships and at Aegis Ashore sites in Romania and Poland as well as the Ground Based Interceptors emplaced at Fort Greely, Alaska and Vandenberg, Air Force Base in California for homeland missile defense could also be modified for the counter-space mission. These interceptors would have a greater range and could probably reach further into LEO where imaging, ocean surveillance, and weather satellites are deployed, among other satellites. This is, however, not the interceptors' primary mission and, therefore, they do not offer a responsive or the most effective capability.

Directed energy weapons on airborne or space-based platforms could offer the capability and opportunity to destroy offensive missiles when they are most vulnerable in the boost phase soon after launch, or in the lower reaches of space. A mobile platform would be capable of deploying to any area of interest worldwide and provide an immediate deterrence and defensive capability. Work on directed energy weapons is being done not only by the Missile Defense Agency (MDA), but also by the U.S. military services and U.S. international partners.¹³⁹

Cyberspace is also becoming an important warfighting domain. Cyber-attacks, or intrusions into government and commercial computer networks, have the potential to create large-scale damage.¹⁴⁰ U.S. cyberspace operations are run out of U.S. Cyber Command in Fort Meade, Maryland. Part of the command's mission is to provide integrated cyber capabilities to support military operations. Offensive capabilities will be a critical part of warfare in the future.¹⁴¹

Cyber operations essentially exploit enemy software using malicious code. If you can hack your way into the logic of a satellite's control system, for example, it would be possible to turn the satellite off or have it do things it was not intended to do, such as turning solar panels towards the sun to burn them or maneuvering the satellite into the path of other satellites. Space and cyber warfare are very similar in the functions they perform, that is, to provide information, or the channels and pathways for information, and to deny those information channels in a time of

¹³⁸ For example, see MDA Director Lt Gen Henry A. Obering, "Lieutenant General Henry A. Obering III, USAF, Director, Missile Defense Agency, Prepared Statement," *110th U.S. Congress*, House Armed Services Committee, April 17, 2008, pp. 3-4, available at <http://www.dod.mil/dodgc/olc/docs/testObering080417.pdf>.

¹³⁹ Daniel Goure, "DoD Needs To Light A Fire Under Directed Energy Programs," *Lexington Institute*, January 2, 2014, available at <http://lexingtoninstitute.org/dod-needs-to-light-a-fire-under-de-programs/>; and, NBC News, "Navy unveils powerful ship-mounted laser weapon," NBC News, April 8, 2013, available at http://usnews.nbcnews.com/_news/2013/04/08/17658147-navy-unveils-powerful-ship-mounted-laser-weapon?lite.; and Kris Osborn, "US Air Force Fighters & Drones Will Fire Laser Weapons by the 2020s," *Scout Warrior*, January 5, 2017, available at <http://www.scout.com/military/warrior/story/1666650-best-of-2016-air-force-arms-jets-with-lasers>.

¹⁴⁰ Andrew Griffin, "Cyber attacks on satellites could spark global catastrophe, experts warn," *The Independent*, September 22, 2016, available at <http://www.independent.co.uk/life-style/gadgets-and-tech/news/cyber-attacks-on-satellites-could-spark-global-catastrophe-experts-warn-a7321361.html>.

¹⁴¹ RC Porter, "America's Secret Arsenal: Cyber Weapons Of Mass Disruption," *Fortuna's Corner*, December 14, 2015, available at <http://fortunascorner.com/2015/12/14/americas-secret-arsenal-cyber-weapons-of-mass-disruption/>; Andy Greenberg, "Weapons of Mass Disruption," *Forbes*, April 8, 2010, available at <http://www.forbes.com/forbes/2010/0426/opinions-cyberwar-internet-security-nsa-ideas-opinions.html>. See also "Jacquelyn G. Schneider, "What War Games Tell Us About the Use of Cyber Weapons in a Crisis," <https://www.cfr.org/blog/what-war-games-tell-us-about-use-cyber-weapons-crisis>; Dustin Volz, "Trump Move to Loosen U.S. Use of Cyberweapons Prompts Intrigue," *The Wall Street Journal*, August 16, 2018.

conflict.¹⁴² They have the ability to shut down a system, close down a factory, destroy electrical, financial, transportation infrastructure at all levels of society, including those levels that contribute to national defense. Denial of service, loss of system performance can mean denial or loss of capability, which means such attacks have the same impact as a kinetic assault on defense and economic assets that rely on digital systems.¹⁴³ The continued development of cyber capabilities also means that potential adversaries will increasingly view counter-cyber activities as a weapon to use against the United States.¹⁴⁴ Nevertheless, there may be significant advantages for the United States in striking at the vulnerabilities of cyber-dependent capabilities.¹⁴⁵

Finally, the United States has been developing a pilotless military space plane. In May 2017, the X-37B space plane that had been in orbit for almost two years was brought back to earth; this was the program's fourth flight.¹⁴⁶ The Air Force first launched the X-37B in April 2010; these planes are designed to stay in orbit for a year or even longer. The space plane missions are a secret, but it is said to be a platform for testing advanced guidance, navigation and control, thermal protection, avionics, propulsion, autonomous flight, reentry and landing technologies, among others.¹⁴⁷ While its payloads and activities are classified, it is possible the plane could be quickly launched and used as a weapon, possibly even to deliver satellites to orbit or snatch them from orbit or even facilitate satellite repair.¹⁴⁸

Space Situational Awareness

The United States is pursuing capabilities to provide persistent surveillance of the space environment, which is imperative to detect, track, collect, disseminate, and characterize threat activity in all orbits. The nation has terrestrial and space systems that provide what defense officials call space situational awareness, or SSA. SSA is critical to defensive and offensive counter-space operations and is essential to space deterrence strategy.

Given the proliferation of small satellites and debris in orbit, the growing clutter of objects is making it harder to detect objects. In other words, it is becoming easier for a nation to cloak its

¹⁴² See Committee on Armed Services, United States Senate, "Hearing to Consider the Nomination of General John E. Hyten, USAF, for Reappointment to the Grade of General and to be Commander, United States Strategic Command," September 20, 2016, available at https://www.armed-services-senate.gov/imo/media/doc/16-70_9-20-16.pdf.

¹⁴³ National Academies of Sciences, Engineering, and Medicine, p. 9, available at <https://www.nap.edu/catalog/23594/national-security-space-defense-and-protection-public-report>.

¹⁴⁴ See for example a 2013 Defense Science Board report, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, *Resilient Military Systems and the Advanced Cyber Threat* (Washington, D.C.: Defense Science Board, January 2013), available at <http://www.acq.osd.mil/dsb/reports/2010s/ResilientMilitarySystemsCyberThreat.pdf>.

¹⁴⁵ An official appointment by China indicates how closely the relationship is between cyber threats and space. There is significant concern in the Defense Department about the use of Lenovo computer and other digital products within the Department, that they may be used to facilitate cyber intelligence-gathering against classified and unclassified system by covertly communicating with remote users. Roughly 27% of Lenovo Group Ltd is owned by the Chinese Academy of Science. In April 2016, a space expert from the Academy was appointed to a senior post in the Chinese military's Strategic Support Force, which is in charge of space, cyber, and electronic warfare. Bill Gertz, "Military Warns Chinese Computer Gear Poses Cyber Spy Threat," *The Washington Free Beacon*, October 24, 2016, available at <http://freebeacon.com/national-security/military-warns-chinese-computer-gear-poses-cyber-spy-threat/>.

¹⁴⁶ Marina Koren, "What Is America's Secret Space Shuttle For?" *The Atlantic*, May 9, 2017, available at <http://www.theatlantic.com/technology/archive/2017/05/why-so-secretive/525969/> Leonard David, "Air Force's X-37B Space Plane Mystery Mission Wings by 500 Days in Orbit," *Space.com*, October 10, 2016, available at <http://www.space.com/34343-x37b-space-plane-otv4-mission-passes-500-days.html>.

¹⁴⁷ Phillip Swarts, "Space Wars: The Air Force Awakens."

¹⁴⁸ Samantha Masunaga, "SpaceX will launch secretive X-37B spaceplane's next mission," *The Los Angeles Times*, June 7, 2017, available at <http://www.latimes.com/business/la-fi-spacex-x37b-20170607-story.html>.

activities in space.¹⁴⁹ The Joint Space Operations Center currently tracks about 23,000 objects in orbit. Space Fence, an Air Force system based at Kwajalein in the Pacific Ocean, scheduled to begin operations in 2019, will be part of a layered space sensor architecture (using terrestrial and space assets) that will allow better tracking of near-earth orbit debris in space, improving the ability to catalogue space objects from 23,000 to over 200,000 tracked objects.¹⁵⁰ The Air Force Space Fence uses ground-based radars to significantly improve the detection of space objects when compared to what was available from the existing Space Surveillance Network. It is intended to produce thousands of observations a day, track surprise events in space (such as threatening satellite maneuvers), and cover almost all orbital inclinations. This new capability will give visibility to unforeseen events, to include satellite maneuvers, and enable warfighters to search space to determine what an object is. This type of SSA capability, and the ability to share data with the intelligence community, commercial entities, and allied nations, is essential to any plan to employ or protect U.S. space assets. The United States also uses a Self-Awareness Space Situational Awareness system that reportedly enables operators to identify the source of a laser attack on its satellites.¹⁵¹

Geosynchronous orbit is home to critical communications and early warning satellites. To increase SSA in this region, the U.S. Defense Department launched two Geosynchronous Space Situational Awareness Program (GSSAP) satellites to observe activities in this orbital region.¹⁵² These satellites will monitor GEO above and below this belt to capture close-up views of events, to include the deployment of space mines and other capabilities to destroy satellites.¹⁵³ They will have enhanced maneuverability and be capable of rendezvous and proximity operations for the collection of intelligence.¹⁵⁴ Reportedly, an attack by a direct-ascent ASAT weapon would take four to six hours to reach that altitude, giving satellite operations critical time in which to react.¹⁵⁵ They can also inspect satellites experiencing problems and help determine whether the problems are accidental, caused by natural phenomenon, or caused by an adversary. Two more satellites in this four satellite constellation were launched in August 2016. GSSAP can be a deterrent to bad behavior and can help in the effort to maintain a safe, secure, and stable space environment. To supplement this capability, the Defense Department is also making investments in a Deep Space Advanced Radar, an all-weather, day and night, space surveillance and tracking capability for the entire GEO belt.¹⁵⁶

As a leader in space, the United States shares SSA information with other nations and commercial firms in order to reduce the chance of collisions. Sharing with other nations also builds U.S. data

¹⁴⁹ Joe Pappalardo, "Space Junk Could Provide a Perfect Hiding Spot for Tiny Spy Satellites," *Popular Mechanics*, November 30, 2018, <https://www.popularmechanics.com/military/research/a25349950/nro-satellite-space-junk/>.

¹⁵⁰ David J. Buck, "Statement of Lieutenant General David J. Buck, Commander, Joint Functional Component Command for Space," *115th U.S. Congress*, March 15, 2016, pp. 5-6; Debra Werner, "Lockheed Martin prepares to turn on U.S. Air Force Space Fence on Kwajalein Atoll," *SpaceNews*, May 3, 2018.

¹⁵¹ Lamrani.

¹⁵² Mike Gruss, "Haney: JICSpOC will prove U.S. is prepared for space threats," *Space News*, August 16, 2016, available at <https://spacenews.com/haney-jicspoc-will-prove-u-s-is-prepared-for-space-threats>.

¹⁵³ James Dean, "Delta IV blasts off with threat-detecting military satellites," *Florida Today*, August 19, 2016, available at <http://www.floridatoday.com/story/tech/science/space/2016/08/19/deltaiv-rocket-blasts-off-air-force-satellites-cape-canaveral-air-force-station-afspc6/88826330/>.

¹⁵⁴ General William Shelton as quoted in, Atlantic Council, "Transcript: The US Future in Space," *Atlantic Council*, July 23, 2014, available at <http://www.atlanticcouncil.org/news/transcripts/transcript-the-us-future-in-space>.

¹⁵⁵ Swarts, "Space Wars: The Air Force Awakens."

¹⁵⁶ Rapuano, p.8.

bases to strengthen U.S. awareness. The United States recently expanded its Combined Space Operations concept to include New Zealand, which represents a U.S. effort to improve SSA through enduring partnerships. Long-term goals are to integrate and leverage combined capabilities to support global synchronized operations, which requires interoperable battle management command and control systems. A converted space launch tracking radar has been deployed to Western Australia to watch the southern hemisphere. The United States Air Force recently activated one of its most sophisticated sensors, the Space Surveillance Telescope, which is a dedicated sensor in Australia and part of the Space Surveillance Network. The telescope reportedly is capable of searching an area in space larger than the continental United States and viewing more than 10,000 objects as small as a softball.¹⁵⁷

Early warning satellites are required to detect ballistic missile and direct-ascent ASAT launches. The United States still relies on the 1970s Defense Support Program (DSP) satellites, which work in tandem with the more recent SBIRS satellites parked in GEO and inserted into HEO to give early warning of missile launch events across the globe.

MDA has expressed the need to have a greater presence in space, to include a space-based sensor layer. Indeed, space provides the critical vantage point necessary to address advanced threats, such as the threats posed by hypersonic glide vehicles and maneuvering kill vehicles carried into space by ballistic missiles. According to MDA Director USAF Lieutenant General Sam Greaves, “a space-based sensor layer would enable the United States to use interceptor inventory more efficiently and effectively to counter a broad array of threats.”¹⁵⁸ With the Space-based Kill Assessment sensors, the United States will obtain a capability to improve knowledge of what is happening in space, thereby improving stability and increasing the efficiency of the Ballistic Missile Defense System by collecting information that will help operators understand when a ballistic missile warhead, and presumably a satellite, has been destroyed.¹⁵⁹

Acquisition

The Defense Department’s space system acquisition process is currently under reform. Compared to the speeds at which countries like China are developing and deploying new space systems and counter-space capabilities, U.S. space system acquisition has been slowed by bureaucracy. The result, according to Vice President Mike Pence, is that “over time, our ability to adapt to new and emerging threats has been stifled by needless layers of red tape.”¹⁶⁰ So while China has been putting out new generations of ASAT systems every three to five years, the United States is still working to respond to a first-generation threat.¹⁶¹

¹⁵⁷ Pellerin, “Advanced Space Surveillance Telescope Has Critical Military Applications, op. cit.

¹⁵⁸ Lt. Gen. Sam Greaves, USAF, *Statement before the Strategic Forces Subcommittee, House Armed Services Committee*, April 17, 2017, p. 21; see also Mike Gruss, “MDA’s Syring: Space-based sensors are a ‘must,’” *Space News*, August 17, 2016, available at <http://spacenews.com/mdas-syring-space-based-sensors-are-a-must/>. See also Jason Sherman, “MDA: Space-based Kill Assessment constellation nearly in place, set to deliver new capability,” *Inside Defense*, September 11, 2018.

¹⁵⁹ Missile Defense Agency, “Fact Sheet: Spacebased Kill Assessment,” February 16, 2017, available at <https://www.mda.mil/global/documents/pdf/ska.pdf>; Sherman.

¹⁶⁰ The White House, “Remarks by Vice President Pence on the Future of the U.S. Military in Space,” August 9, 2018, available at <https://www.whitehouse.gov/briefings-statements/remarks-vice-president-pence-future-u-s-military-in-space>.

¹⁶¹ Loverro, p. 10. See also Sandra Erwin, “Air Force Space Commander: ‘Our constellations are like slow kids in gym class that can’t run very fast,’” *SpaceNews*, September 19, 2018, available at <https://spacenews.com/air-force-space-commander-our-constellations-are-like-slow-kids-in-gym-class-that-cant-run-very-fast/>.

The Department has the goal of reducing development timelines for space systems from eight to three years. Yet in order to achieve this, it is going to have to get away from developing very large, expensive satellites that are not mass produced.¹⁶² The acquisition approach will have to change to enhance military power through better integration and new developments and upgrades.¹⁶³ The planned Space Development Agency or the Air Force's Space Rapid Capability Office (which may be evolved to undertake the new space acquisition mission), is intended to break free from the existing burdensome bureaucratic process and focus on innovation, experimentation, and developing new technologies to help the United States respond more effectively to space threats.¹⁶⁴

International Cooperation

The United States is expanding international cooperation in the area of space defense and desires to foster a cooperative space environment through partnerships. Given the asymmetrical advantages they can provide, alliances are critical to warfighting and deterrence.¹⁶⁵ According to Air Force Major General Nina Armagno, international space cooperation "benefits each of our respective nations [and] anyone who uses space across the globe. The United States simply can't do anything that we do in space without our allies, and the value of these partnerships will only continue to grow in the future."¹⁶⁶

There is significant opportunity for partners interested in working with the United States to develop and deploy more capable and more assured space security architectures. In fact, close cooperation with space allies, most of which are some of the most advanced space powers in the world, would be a critical part of the U.S. space resilience strategy were the United States to take more aggressive actions to pursue active space alliances.¹⁶⁷ The United States also desires to work with allies and partners to advance common and shared strategic and operational interests of deterrence and lethality.¹⁶⁸ Yet there is much work to be done to integrate the warfighting space capabilities of U.S. allies and U.S. operations.¹⁶⁹

There is a solid basis upon which to build. U.S. cooperative international relationships have existed for many years with certain countries, especially Canada, the United Kingdom, Australia, and New Zealand. The "Five-Eyes" partners have a space cooperation charter, signed in 2013. Cooperative relationships improve intelligence gathering, increase SSA, and help synchronize the space enterprise through improved communications and monitoring. Augmentation through international partnerships also can help to ensure persistent and complementary space capabilities that would make targeting only U.S. DoD or Intelligence satellites a mistake. This approach can complicate a decision by the adversary to aggressively act against the United

¹⁶² Loverro, p. 11.

¹⁶³ Rapuano.

¹⁶⁴ Department of Defense, *Report to Congressional Defense Committees: Final Report on Organizational and Management Structure for the National Security Space Components of the Department of Defense*, August 9, 2018, pp. 8, 9.

¹⁶⁵ The 2018 National Defense Strategy states that "by working together with allies and partners we amass the greatest possible strength for the long-term advancement of our interests, maintaining favorable balances of power that deter aggression and support the stability that generates economic growth." Department of Defense, *Summary of the 2018 National Defense Strategy of the United States of America*, January 2018, p. 8.

¹⁶⁶ Pellerin, "Advanced Space Surveillance Telescope Has Critical Military Applications."

¹⁶⁷ Loverro.

¹⁶⁸ Rapuano, p.9.

¹⁶⁹ Loverro, p. 12.

States in space, and thereby contribute to deterrence. International partnerships provide a very tangible role in assuring our allies and in providing and sustaining important military capabilities.

Approaches Avoiding the Use of Military Force

Deterrence, which leverages military strength to succeed, is not the only approach to prevent the extension of war into space. Arms control, using its own logic and sometimes different assumptions about adversary decision-making and goals, also attempts to avoid a power clash in space.¹⁷⁰ Arms control strategy lays some doubt on the efficacy of military strength and places a preponderance of faith on the assumption that all parties involved in the arms control activity share a similar vision about what motivates state behavior and have a similar goal.

There are pitfalls with the arms control approach. One key issue is that arms control may have an adverse impact on technologies that the United States has already determined are integral to its defense. A peacetime moratorium on direct-ascent ASATs, for example, would likely limit the development, testing, and potentially BMD operations. Another issue is that there are very serious definitional and verification problems associated with arms control ideas, including an ASAT agreement. ASAT weapons can be tested without the target vehicle actually being in orbit, as China has demonstrated.

Arms control treaties may be pursued by adversaries with the intent of hampering U.S. capabilities, while not allowing the restrictions to hobble their own pursuits. Indeed, one may argue that Chinese leaders view arms control as simply another tool to deceive the United States.¹⁷¹ China continues to push treaties, such as the Prevention of the Placement of Weapons in Outer Space Treaty (PPWT), to constrict the deployment of U.S. defenses to protect its space activities. The United States holds that such an agreement is unverifiable and does not deal with the threats posed by terrestrially-based ASAT weapons (electronic jammers and direct-ascent ASATs), already under development by other nations. The United States has refrained from committing to a space arms control agreement and argued more for voluntary commitments to agreed-upon transparency and confidence-building measures, such as the 2013 United Nations Group of Government Experts on Transparency and Confidence-Building Measures in Outer Space Activities.

There is no evidence to suggest that building a common diplomatic framework for dealing with activities in space and focusing on dialogue in peacetime, while they may have supplemental benefits, can give us a plausible route to the assurances we are seeking or the deterrence of provocative actions. Development of transparency and confidence-building measures may help to prevent misperceptions and provide situational awareness for everyone. But such dialogue is ultimately insufficient. Establishing rules of the road in space will work with some, but only for those who see decisive value in obeying rules rather than violating them when necessary or convenient. Everything in the rule-making business, however, hinges on the assumption that rules can be enforced, and that we are dealing with rational actors who have a stake in the current

¹⁷⁰ For an example of an apology for arms control and “sustaining a cooperative international effort to prevent a destructive space conflict” as the best approach for security U.S. (and collective) interests in space, see Paul Meyer, “Washington sparks a space spat at the United Nations,” *Bulletin of the Atomic Scientists*, December 11, 2018, available at <https://thebulletin.org/2018/12/washington-sparks-a-space-spat-at-the-united-nations/>.

¹⁷¹ See, for example, Richard D. Fisher, Jr. and Thor E. Ronay, “The Next China Military Threat: The World’s Biggest Mobile ICBM?” *National Interest*, January 8, 2019, available at <https://nationalinterest.org/blog/buzz/next-china-military-threat-worlds-biggest-mobile-icbm-40952>.

system and are willing to accept the commitments they have made, even when inconvenient and potentially costly.

In response to the relative strategic restraint demonstrated by the United States, China continues to build up and modernize its ballistic missile and counter-space capabilities. These activities not only demonstrate the desire to modernize and improve weapon systems to exploit U.S. and allied vulnerabilities, but, given experiences with other great powers such as Russia, they also highlight the limited nature, if not the futility, of arms control as it has often been practiced. We have witnessed over the past decade that the United States does not have to be involved in an arms race in space for other nations to focus their investment in the development of counter-space weapon technologies (which runs counter to the entire action-reaction hypothesis that undergirds and motivates arms control). Given the verification and compliance problems the United States has had with rival powers in the past, especially Russia, one can assume that unverifiable arms control agreements governing space weapons would be at least as likely to be violated by signing parties as the numerous other arms control agreements with which they are in noncompliance.¹⁷²

The United States has a significant stake in promoting a space environment that is secure and free to operate in since it deploys significant space assets to support national security, but this does not mean that by refraining from steps to defend its interests through force that space will not somehow become more of a battleground. Other nations will follow their security interests regardless of what the United States does. After all, China seems to understand that there may be a significant strategic payoff in having capabilities to deny other nations the use of space. U.S. leaders might have a vision for space that is completely free of conflict and weapons deployments, but that does not mean that others share that vision. If there are no steps taken to prepare for the breakdown of deterrence or diplomacy, then there is no margin for error at all. This approach (arms control and diplomacy), absent reliable and credible military responses to misbehavior, in other words, ultimately may not support U.S. and allied security interests.

¹⁷² Franklin C. Miller and Keith B. Payne, *No More US-Russian Arms Treaties Until Moscow Stops Violating Existing Treaties and Agreements*, National Institute for Public Policy Information Series No. 418 (Fairfax, VA: National Institute Press, March 9, 2017), available at <http://www.nipp.org/wp-content/uploads/2017/03/IS-418.pdf>; Mark Schneider, *Russian Violations of the INF and New START Treaties*, National Institute for Public Policy Information Series No. 410 (Fairfax, VA: National Institute Press, August 15, 2016), available at <http://www.nipp.org/wp-content/uploads/2016/08/IS-410-final.pdf>.

Chapter 4

A Framework for Thinking about Deterrence— The North Korean Crisis (2021)

Eschewing the idea that there can be a generic formula for deterrence directed against all potential adversaries (see Chapter 1), this chapter will lay out a framework for thinking about how to deter China from attacking U.S. space systems in the context of a specific scenario—a U.S.-North Korean crisis circa 2021. It will examine the challenges of forming and implementing a space deterrence strategy and develop questions and explain their importance in understanding what may be required to deter China from engaging in hostile actions against U.S. and allied space systems. Chapters 4 and 5 represent the first steps in a more extensive and in-depth process of developing a space deterrence strategy involving China. This chapter will identify the key questions that should be addressed, key issues that need to be highlighted, and parameters that need to be considered in the development of such a deterrence strategy.

A successful deterrence strategy depends greatly on specificity, obtaining as much precision as possible in the information about the targeted opponent and the context within which we intend to engage the opponent.¹⁷³ The goal is to reduce as much as possible our ignorance about the enemy. Sun Tzu, a fifth century B.C. Chinese strategist, believed war (and hence deterrence and coercion) to be of vital importance to the state, and that it demands study and analysis. His goal was to formulate a rational basis for defense planning and the execution of military operations because, he believed, careful planning based on sound information about the enemy is the key to military success. “Know the enemy and know yourself; in a hundred battles you will never be in peril,” he wrote. “When you are ignorant of the enemy but know yourself, your chances of winning or losing are equal. If ignorant both of your enemy and of yourself, you are certain in every battle to be in peril.”¹⁷⁴ For deterrence, knowledge of the enemy and oneself is no less key. Of course, while coming to terms with your own flaws and weaknesses can be challenging, knowing the enemy can be a very difficult thing. Indeed, knowing the enemy from top to bottom with precision and great confidence is impossible. The information one has will never be complete, and some important information may not even be knowable. And what one does know may be expected to change over time. Nevertheless, the effort to know the enemy is a step in the right direction and can only enhance the chance of deterrence success.

In order to ask questions and outline key considerations about deterrence, one needs a scenario wherein one can identify key specific characteristics, to include countries and leaders involved, decision-making systems, sources of contention and threats, political and security aims and contexts, stakes, and determination levels or will. These factors, upon analysis, will help determine the suitability of a particular deterrence threat or act of coercion as well as the military capabilities and other powers of the state required to carry out the threat. The objective is to get

¹⁷³ This chapter will leverage the framework for thinking about deterrence provided by Keith B. Payne, *The Fallacies of Cold War Deterrence and a New Direction*, pp. 97-114. According to Payne (p. 97): “Confident generalizations about the effectiveness of deterrence should wane with greater recognition that diverse leadership thought and beliefs can push rational decision-makers in surprising directions, and deterrence can fail unexpectedly as a result.”

¹⁷⁴ Sun Tzu, *The Art of War*, Translated by Samuel B. Griffith (London: Oxford University Press), 1982, p. 84.

inside the decision-making process of the adversary regarding a particular conflict context in order to better anticipate the adversary's behavior, his actions and likely responses to U.S. actions.

The fictional scenario below strongly parallels present-day national security realities. The analysis, also drawing from the realism of today's security environment and the U.S.-China strategic competition, invites one to consider diplomatic, information, military, and economic measures to secure U.S. space systems against Chinese attack.

Fictional Scenario: The 2021 North Korean Crisis

The year is 2021, and the uneasy peace that existed between North Korea and the United States and U.S. allies has unraveled. The great powers in this crisis are the United States and the People's Republic of China (PRC). The conflict is over the future of the North Korean regime, a nuclear and ballistic missile power with the capability to strike U.S. allies as well as the United States.

In this fictional scenario, North Korea has demonstrated a capability to launch a payload using a long-range ballistic missile and a reentry vehicle that can survive reentry to the target. It has been determined that North Korea has enough fissile material for up to 60 nuclear weapons. North Korea has demonstrated it can miniaturize warheads to fit on missiles. The U.S. intelligence community has concluded that there is a high probability that Kim Jong Un, North Korea's unpredictable leader, has mated nuclear weapons to several ballistic missiles, to include ballistic missiles capable of reaching allies, Guam and the United States. The U.S. 7th Fleet has six Aegis BMD ships in the region and Japan has six. Guam has a THAAD battery as does South Korea. The United States is protected by 44 Ground Based Interceptors on alert in Alaska and California.

U.S.-Chinese security relations have been tense, as the two countries have continued to clash over China's artificial island expansionism in the South China Sea, to include an incident at sea involving China's use of intimidation tactics, which resulted in a Chinese ship firing near a U.S. naval vessel as a warning. The U.S. destroyer intercepted the missile, but it also had indications that the missile would not have hit the ship.

North Korean leaders decide to take advantage of the tense U.S.-China relationship to convince Washington to sue for peace and curtail its military alliance with the Republic of Korea. Pyongyang fires multiple ballistic missiles intended to intimidate U.S. allies in the East Asian region, namely Japan and South Korea as well as the United States, by launching intermediate-range ballistic missiles that land near Guam. The THAAD missile defense battery on Guam successfully intercepts one of the missiles, which was projected to land near the coast in the sea, and it allowed the second ballistic missile to strike a point farther out in the Pacific Ocean. Neither ballistic missile carried a nuclear weapon. One of North Korea's missiles suffers a catastrophic failure over a South Korean town, causing fatalities and destroying buildings.

Given threats posed to the U.S. homeland and U.S. allies, Washington develops a U.S.-Japan-South Korean strategy to pressure Kim Jong-Un into submission or, as a last resort, use military force to fundamentally alter and denuclearize the North Korean regime. Over the past year, the United States had been pressuring China economically and diplomatically to

use its influence over Kim and the North Korea military to bring to heel the regime's leaders, who have taken provocative actions in order to gain favorable security and economic concessions out of the United States and its allies in the region. The United States, to no avail, has asked China to force North Korea to stand down. South Korea initially pressured the United States to enter into negotiations with Kim but has come around to the U.S. position that a forceful response is required.

U.S. military planners, in close cooperation with Japan and South Korea, are pushing the President to use massive conventional force operations to remove the ability of North Korea to launch ballistic missiles. The U.S. President is in agreement with his top national security advisors that the United States must use conventional military force to dismantle totally North Korea's nuclear weapons and ballistic missile capability. The President, who is convinced negotiations with Kim would be futile, decides to take military action to secure U.S. and allied security interests in the face of what the intelligence community estimates to be a highly dangerous North Korean ballistic missile threat. Further ballistic missile launches will not be tolerated.

The President sends a final ultimatum to Pyongyang, demanding total nuclear disarmament and a moratorium on missile launches. Washington warns Beijing not to interfere with U.S. operations, which will involve using air- and sea-launched conventional guided missiles and B1-B heavy bombers launched from Guam and fighter bombers off aircraft carriers to strike immediately and hard, disabling all electric power, using cyber-attacks against all North Korea's command and control and communications system, demolishing leadership sites and all known nuclear and missile facilities. The U.S. plan involves militarily assisting South Korea along the Demilitarized Zone to suffocate North Korean fire power and counter the missiles and artillery targeting Seoul, in an attempt to limit the damage to the capital's population.

Sensitive to China's interests in maintaining its North Korean buffer state, U.S. diplomats convey that the United States has no intention of occupying or deploying a major ground force presence in North Korea and that China's assistance in establishing a new government would be welcomed. U.S. diplomats also have alerted allied leaderships in the region of the impending military campaign and promised military support. The United States commits to assisting missile defense operations to protect Japanese and South Korean territories.

North Korea, in response, fires four more ballistic missiles. It simultaneously threatens to launch several ballistic missiles towards the continental United States if U.S. military forces do not back down. The United States successfully intercepts all ballistic missiles targeting Guam using multiple THAAD interceptors and Standard Missile-3 IB interceptors launched from an Aegis BMD destroyer stationed near Guam. Depletion of U.S. missile defense interceptor inventories is becoming a significant concern.

Crisis escalation involving China is a significant concern within the U.S. Joint Staff and the National Security Council. Given Chinese concepts of deterrence that could involve counter-space demonstrations and limited attacks against space systems (see Chapter 2), U.S. strategy for the planned campaign involves steps to counter Chinese attempts to deter U.S. military actions against North Korea and hinder U.S. access to the region by threatening to attack U.S. space-based command, control and intelligence, surveillance, and reconnaissance and its GPS satellites.

U.S. political and defense leaders see the need to take steps to hold at risk Chinese interests and assets specifically in this scenario in order to deter Beijing's actions against U.S. and allied space systems. The United States wants to ensure the capability to fully defeat the North Korean ability to strike the U.S. homeland using ballistic missiles and left-of-launch (pre-emptive strike) missile defeat tactics. This will allow the United States to operate militarily over North Korea to coerce Pyongyang without fear of intolerable damage to the U.S. homeland. This is a steep challenge because, given China's desire to deter U.S. counter-force operations in North Korea, the United States also wants to deter China from any escalation involving limited counter-space strikes against the United States and its allies.

China is dealing with several basic fears, including possible U.S. and South Korean occupation of the North and the appearance of China as weak on the world stage because it did not come to the defense of an ally. The confrontation with the United States may give China an opportunity and an excuse to degrade U.S. military and economic assets. China anticipates that, because its counter-space attacks are "bloodless" and out of public sight, they would amount to a very stern warning to U.S. officials, and the United States, fearing a war with escalating fatalities, would be reluctant to escalate the crisis any further by striking North Korean or Chinese assets. China, of course, continues to have recourse to conventional and nuclear forces, which it could use against U.S. forces and assets if Beijing believes the United States has crossed a line and that Chinese sovereignty and interests must be defended.

The United States wants to deter China from thinking that it could coerce the United States into paralysis with its threats to escalate horizontally (by drawing other nations in the region into the conflict) and vertically (by striking the United States homeland and military assets using conventional or nuclear weapons).

Deterrence Questions and Considerations

The framework below is intended to assist in the development of a preliminary general strategy to deter China from executing counter-space operations against U.S. satellites during U.S. military operations against North Korea.

What is the Strategic Context?

The United States and the PRC are the chief antagonists in a deterrence scenario that hinges on the behavior of a third antagonist to the United States, North Korea. The scenario is set in the near-future and reflects the present-day reality of North Korea's expanding long-range strike and nuclear capabilities. In the 2021 scenario, North Korea has demonstrated a capability to launch a payload using a long-range ballistic missile and a reentry vehicle that can survive reentry to the target. The United States views the North Korean regime as unstable and one posing the greatest near-term risk to its security, with ballistic missiles being the most likely means to use nuclear weapons against the U.S. homeland. At question in this scenario are the fate of the Kim Jong Un regime and the disposition of his increasingly capable nuclear and ballistic missile weapons. China is North Korea's closest strategic ally and, as a consequence, has diplomatic, economic, and financial leverage over the hermit nation. China views North Korea as a "buffer state" against U.S. forces in the Republic of Korea and is highly distrustful of the U.S. and South Korean alliance.

North Korea's reckless campaign of ballistic missile firings is the inciting incident that has caused an escalating crisis between the United States and China. North Korean bellicosity, to include threats against the U.S. homeland, has put Washington on a high state of alert and caused defense leaders to raise readiness conditions. Also threatened are U.S. forces deployed in Japan, South Korea, and Guam, while U.S. East Asian allies as well as U.S. economic and trade interests in the region are also held at risk. The United States has declared that its missile defenses are intended to defend against an attack and that the system will include the ability to defeat missile threats prior to launch.¹⁷⁵ The problem for the United States and its allies is that they lack a sufficient number of interceptors to match North Korea's short-, medium-, intermediate-, and long-range ballistic missiles. The United States has warned that it would not allow North Korea to fire ballistic missiles against the United States or its territories. Washington blames Beijing for refusing to change the behavior of its wayward ally. North Korea's missile launches have set up a confrontation between the United States and North Korea and between the United States and China.

What are the Strategic and Deterrence Objectives?

The United States. Top U.S. military officials have stated that a military solution to the North Korean missile crisis would be horrific. Yet allowing Pyongyang to maintain the capability to launch a nuclear attack on the United States would be unthinkable. The President has stated that "the United States is determined to defend itself and its allies from the growing threat." U.S. officials have warned North Korea publicly that the launch of nuclear weapons could lead to the end of the Kim regime. U.S. leaders view the stakes for the United States to be very significant – it does not want to see its role, power, and credibility as a guarantor of security in the Indo-Pacific region undermined.

U.S. strategic and deterrence goals in this crisis are to: 1) protect the U.S. homeland, overseas forces and installations, and its allied forces and populations from ballistic missile attacks that may involve nuclear, chemical and biological weapons; 2) eliminate the North Korean military capability to strike targets in the United States; 3) significantly reduce the North Korean military capability to strike targets in Japan, South Korea, and Guam; 4) preserve U.S. freedom of action in the region (a goal that is contrary to China's aims); 5) maintain its strategic position in the Indo-Pacific region, to include its bilateral alliances with South Korea and Japan; 6) deter China's intervention into the conflict with North Korea to limit or block U.S. access to the region; and 7) prevent the escalation of the conflict into a broader war in the region, but if necessary prevail in that conflict.

Specific to this scenario, the United States has a critical reliance on a command, control and battle management network that includes space assets, unmanned aerial vehicles, and fiber optic cables. It is imperative that the United States protect this network if it is to maintain military operational capabilities in the Indo-Pacific region.

China. China is North Korea's chief ally and economic lifeline. Since the 1950-53 Korean War, China has made it clear that it will not stand by as the United States overthrows the North Korean regime or changes the political pattern on the Peninsula, especially as it involves reunification under South Korean control. China views North Korea as a useful buffer state

¹⁷⁵ See, for example, The White House, *National Security Strategy of the United States of America*, December 2017, p. 8.

between it and U.S. forces in South Korea.¹⁷⁶ China also has long worried that a war could unleash a wave of refugees into its northeast, destabilizing the area, and has asked all parties to act cautiously to preserve peace and stability. If North Korea were to collapse, both the United States and China would likely send forces into the North to secure its nuclear weapons, heightening the risk of conflict between ground- and air-forces. China has an anti-access/area denial, or “active defense,” strategy to limit U.S. military influence in the Asia-Pacific region, to include operational ASAT forces.

China’s strategic and deterrence goals in this crisis, which are in line with President Xi’s “China Dream of national rejuvenation,” are to: 1) ensure the survival of the top Chinese leadership and the Communist Party and the political stability of China; 2) prevent the crisis from escalating to the point where the Kim regime falls and is replaced by a regime favorable to South Korea or the United States (i.e., retain the North Korean buffer state); 3) reduce tensions on the Korean Peninsula in a manner favorable to China’s interests; 4) defend China’s sovereignty and territorial integrity by preventing an uncontrolled crush of North Korea refugees into Chinese territory and ensure the security of China’s border with North Korea; 5) oppose a U.S. push to achieve a more dominant strategic position in the Indo-Pacific region; 6) if necessary, reduce U.S. military presence and capability in East Asia; and 7) maintain China’s status as a great power and its dominance in Asia.¹⁷⁷

What are the National and Leadership Characteristics Applicable to the Functioning of Deterrence?

National and leadership characteristics can vary from country to country, impact decision-making, and reflect fears that must be factored into the deterrence and counter-deterrence calculations of U.S. leaders.

How rational and predictable is the Chinese leadership? China may be said to have a predictable and rational leadership. Since the 1950 Korean War, Chinese conflict behavior has been judged to be highly calculated and consistent, an important attribute for anticipating how China is likely to respond in any given scenario.¹⁷⁸ In all discussions dealing with Taiwan and Tibet, for example, China has been very clear that sovereignty and territorial integrity are extremely sensitive subjects. One could also stretch the point to include border-states that have the capability to destabilize China’s neighboring regions. China has been very consistent in its understanding that North Korea is a *critical* buffer state.

China has declared in this hypothetical scenario, as it has on many occasions in the past, that it will attempt to resolve the crisis by political means and insist that all the parties avoid remarks and acts that may escalate the conflict. “Reckless” remarks, even as an act of deterrence, should be avoided. It is also clear that China desires to preserve the existence of an internally stable North Korea. Chinese leaders understand North Korea to be an unstable regime, one that engages in unpredictable behavior and walks on the margins of war. According to Alastair Iain Johnston, “Yet war on the peninsula would mean the regime’s collapse. This, in turn, would

¹⁷⁶ Ben Blanchard, “Chinese paper says China should stay neutral if North Korea attacks first,” Reuters, August 10, 2017, www.reuters.com/article/us-northkorea-missiles-china-media-idUSKBN1AR005

¹⁷⁷ Office of the Secretary of Defense, *Military and Security Developments Involving the People’s Republic of China 2018*, pp. 43 and 113.

¹⁷⁸ Payne, *The Fallacies of Cold War Deterrence and a New Direction*, p. 120.

threaten not only China's border security, but also the peaceful international environment necessary for China's economic development, the existence of a buffer against the United States. Thus, North Korea's survival is a question of China's national security."¹⁷⁹ China, it may be predicted, will be determined to preserve internal stability in North Korea and prevent violent disruptions in the political and military relationships with the United States.

It is well understood that the loss of Taiwan would cause Chinese political leaders to pay a steep price. It is reasonable to ask, what about North Korea? Would losing North Korea as a buffer state cause the Chinese leadership to pay a steep political price? Clearly, North Korea is not on par with Taiwan in terms of value to China, but China's decision in 1950 to cross the Yalu River and drive back advancing United Nations forces, led by the United States, speaks to the high value Beijing placed on "holding" North Korea.

China's 2013 Belt & Road initiative (China's program for underwriting billions of dollars in infrastructure investment in foreign countries) and its expansion throughout Asia and into Africa is part of its vision for a new world order. Beijing is successfully leveraging its investment ties with more than 60 countries to enforce its foreign policy objectives, and shape foreign interests to align with China's interests, deter confrontation and criticism of China, and in essence bully other countries through debt diplomacy.¹⁸⁰ Any U.S. military success in the Indo-Pacific region, particularly against an ally of China, would be a significant loss of face and a huge blow to not only China's international image, but also to its self-image.

In the scenario, the United States has betrayed no intention of invading North Korea and occupying it. Yet a rational actor like China might believe otherwise. Remove a nuclear North Korea from the scene and China may believe that Washington would gain economically, diplomatically, and militarily and that it would be in a better position to restrain Beijing's ambitions across Asia. Washington, in other words, would be able to exercise its strategy more freely.¹⁸¹ Chinese leaders see that U.S. military strikes might cause the North Korean regime to fold and a more reformist/revolutionary group to rise in strength in North Korea, a group that may be antagonistic towards China. Would such an event challenge the legitimacy of the Chinese Communist Party or its top leader? Would such an event challenge Chinese nationalism and thereby cause a military response? Could a campaign to destroy North Korea's nuclear and ballistic missile capabilities play on China's fear of "encirclement" or "danger from without," causing China to think several moves ahead and conclude that it cannot afford to allow the United States to advance to that level of conflict? China, in other words, may decide that it needs to deter U.S. intervention.

What can we say about Chinese leadership determination and motivations and what are the leadership's attitudes towards the use of force? Some thought should be given to Beijing's readiness to resist deterrence threats – that is, whether Chinese decision-makers will still want to achieve their goals once the United States has delivered its deterrence message. It is possible that the Chinese will conclude that a response to the U.S. deterrent threat is not

¹⁷⁹ Alastair Iain Johnston, "How New and Assertive Is China's New Assertiveness?" *International Security*, Vol 37, No. 4 (Spring 2013), p. 30.

¹⁸⁰ Adam Taylor, "Why countries might want out of China's Belt and Road," *The Washington Post*, August 22, 2018, https://www.washingtonpost.com/world/2018/08/22/why-countries-might-want-out-chinas-belt-road/?utm_term+.b5db6053ee08

¹⁸¹ Harry J. Kazianis, "Why a nuke-free North Korea is China's worst nightmare," *Foxnews.com*, March 12, 2018, <http://www.foxnews.com/opinion/2018/03/12/why-nuke-free-north-korea-is-chinas-worst-nightmare.html>.

worth the possible cost. It may also be the case that the U.S. message or military action would further stoke China's fears and lead to an escalation that now would involve the PLA in a conflict on the peninsula.

If the stakes are high (at the level of survival, for example), one can assume the readiness to resist would be strong. The stakes with North Korea may well be high, to be sure; but, one can reasonably ask whether Chinese decision-makers would not consider what happens on the peninsula to be existential in nature. Chinese leaders might debate what force to use in response and when to use it, but what risk would Beijing accept to prevent North Korea from falling and transforming into a regime that might radically change and line up against Beijing's interests? What is the willingness of China's leaders to start or escalate a war over a "buffer state"? One often hears how the Chinese reacted to the invasion of North Korea in 1950, but it is also true that the strategic circumstances involving China and the international security environment have changed dramatically in the seven decades since China crossed the Yalu. China is North Korea's only major ally and energy provider.¹⁸² Yet it is right to question whether Beijing sees the survival of the Kim regime as paramount and, therefore, worth the risk of damaging several trade and financial relationships with the United States, the strongest economic power in the world, and U.S. allies. Would it want to risk the expanded involvement of the militarily superior United States in a conflict that could actually damage China, its people, and its interests?

The type and urgency of the deterrence threat the United States delivers to China to protect its space systems depends on how one answers these questions. We do know that China traditionally is particularly assertive in its foreign and defense policies about sovereignty and territory issues. Moreover, over the past decade, China's leaders have taken rising nationalism in China into account when making foreign policy decisions.¹⁸³ With Xi's consolidation of power and the recent abolition of presidential term limits in China, his future may depend on how determined he is to uphold Chinese territorial integrity and enforce nationalistic foreign policy goals. With this in mind, while what happens on the Korean Peninsula has always been of extreme importance to China, one may argue that, because he now appears to be at the epicenter of decision-making, the stakes for Xi just got higher.

China has threatened repeatedly to use force to prevent Taiwanese independence. Would they do the same to prevent the independence of North Korea? The answer seems to be situation-dependent. In the event of an attack on North Korea, China in fact has threatened to intervene with force to prevent the overthrow of the regime. According to the state-run *Global Times*, published by the Communist Party's *People's Daily*, with respect to North Korea, "[i]t [Beijing] needs to make clear its stance to all sides and make them understand that when their actions jeopardize China's interests, China will respond with a firm hand." The 1961 mutual assistance treaty between China and North Korea makes clear the commitment to protect each other against aggression from external forces. "If the U.S. and South Korea carry out strikes and try to overthrow the North Korean regime and change the political pattern of the Korean Peninsula, China will prevent them from doing so. The Korean Peninsula is where the strategic interests of

¹⁸² Gillian Wong and Kim Tong-Hyung, "Kim, Xi portray strong ties after NKorea leader's China trip," Associated Press, March 28, 2018, <http://abcnews.go.com/International/wireStory/kim-xi-portray-strong-ties-korean-leaders-visit-54062411>.

¹⁸³ Johnston, "How New and Assertive Is China's New Assertiveness?" pp. 9, 37.

all sides converge, and no side should try to be the absolute dominator of the region.”¹⁸⁴ China, in that instance, and in spite of the reality of North Korea’s nuclear weapons, would support UN efforts to stop the U.S. attacks and intervene on the peninsula with forces if necessary as called for by the 1961 treaty. The PLA likely would not tolerate U.S. forces directly across the Yalu River.¹⁸⁵

A state-run organization stated that “China should also make clear that if North Korea launches missiles that threaten U.S. soil first and the U.S. retaliates, China will stay neutral.”¹⁸⁶ When taken together as a whole, this message from this state-run organization constitutes a clear deterrence threat aimed at North Korea *and* the United States. Moreover, some see that China may no longer see itself bound by the 1961 treaty, a possibility that introduces additional ambiguity into the scenario. It is also possible that China, while not endorsing the U.S. action, would hold back if it understands that North Korea is prepared to launch an attack on the United States. China’s involvement, in this view, would depend solely on Chinese interests.

According to some observers, Chinese leaders are prone to deal with realities before making commitments to abstractions. That is, they are highly sensitive to the existing circumstances and are less inclined, during the moment, to focus on abstractions and grand designs. “The Chinese tendency is to slip into highly aggressive tactical moves while adhering to a much less aggressive strategic approach. The need to deal with what exists and to discount the uncertainties of the future tends to encourage overstatement and exaggerated actions.”¹⁸⁷ There may be an inclination among Chinese leaders, in other words, to act forcefully and with determination and in unexpected ways to counter immediate U.S. moves to undermine or destroy North Korea. With the U.S. military heavily involved, China might fear that the United States would have an advantage in reunifying the Korean Peninsula on U.S. and South Korean terms (despite U.S. words to the contrary), and so perhaps in the event of U.S. strikes in response to dangerous North Korean ballistic missile launches, we should expect China to take action to maintain the *status quo*.¹⁸⁸

China has the missile, sea, and air forces to use against the U.S. military in this scenario, which would be fighting a war far from home. Chinese ambiguity with regard to the use of its nuclear forces and its apparent integration of nuclear capabilities into its warfighting posture could reinforce Washington’s worst-case scenario, which could lower the nuclear threshold and lead to a supreme failure in U.S. and Chinese deterrence strategies.¹⁸⁹ Or it could cause the United States to conciliate. China’s limited warfighting posture (the use of nuclear forces for victory denial) requires a survivable missile force (which they have and are continuing to improve upon) as well as capabilities to destroy space-based targets in order to de-escalate. As discussed in

¹⁸⁴ Cited by Ben Blanchard, “Chinese paper says China should stay neutral if North Korea attacks first,” *Reuters.com*, August 10, 2017, <https://www.reuters.com/article/us-northkorea-missiles-china-media/chinese-paper-says-china-should-stay-neutral-if-north-korea-attacks-first-idUSKBN1AR005>.

¹⁸⁵ Shen Dingli and Bonnie S. Glaser, “Comments: September 21, 2017,” *Chinafile.com*, available at <http://www.chinafile.com/conversation/what-will-china-do-if-us-attacks-north-korea>.

¹⁸⁶ Blanchard.

¹⁸⁷ Lucian W. Pye and Nathan Leites, “Nuances in Chinese Political Culture,” *Asian Survey*, Vol. 22, No. 12 (December 1982), p. 1161. Given the enduring characteristics of national culture, the author believes that Pye and Leites offer deep insights into Chinese behavior, despite the passage of many decades. The reader will see several references to this work throughout the study.

¹⁸⁸ David Tweed and Ting Shi, “There’s One North Korea Taboo China’s Leaders Won’t Talk About,” *bloomberg.com*, September 26, 2017, <https://www.bloomberg.com/news/articles/2017-09-26/china-s-biggest-taboo-on-north-korea-discussing-life-after-kim>.

¹⁸⁹ For a statement of the U.S. strategy for China, see Department of Defense, *Nuclear Posture Review 2018*.

Chapter 2, China is rapidly modernizing its nuclear forces, and it is developing counter-space forces for operational use. China's offensive space capabilities are fused into its nuclear deterrent posture.

The use of force in North Korea by China would risk drawing in South Korea, whose constitution addresses the entire peninsula. It is reasonable to assume that Beijing believes every effort must be made to avoid war and the extreme instability that would result. The early use of force may be useful in preventing this chaos. According to Foreign Ministry spokesman Geng Shuang, "China has always maintained that the Korean Peninsula issue should be settled through dialogue and negotiation."¹⁹⁰ However, as we have seen, China also believes that belligerence and provocation can be a useful deterrent. "The Chinese regard the use—not merely the demonstration—of force as an important means for crisis management."¹⁹¹

According to some observers, as Chinese writings depict space operations as part of an effort to achieve its goals, China is interested in the use of space to effect deterrence, including coercion. In other words, if China believes that the U.S. strike campaign is a step towards changing the political pattern of the Korean Peninsula, it might take demonstration shots at U.S. space assets to deter further U.S. military action. For the Chinese, "actual use of space weapons is the highest rung of what seems to be an 'escalation ladder' of deterrent actions."¹⁹² ASAT demonstrations or attacks against U.S. space systems might be considered to prevent U.S. punishment or destruction of North Korea. While in the past China has conducted "demonstration" shots using its own space assets as targets, one may argue that the next best way to "demonstrate" China's commitment to its security goals is to show what it can do against U.S. satellites or the satellites of U.S. allies. This particular use of force in the counter-space role might not only have a deterrent effect, it might also degrade U.S. space capabilities in the event the United States were inclined to meet China's escalation and take this local conflict to the next level. By displaying its kinetic or non-kinetic counter-space capabilities, "the PRC would hope to induce doubt and fear in an opponent so that they would either abandon their goals or else limit the scale, intensity, and types of operations." Perhaps such attacks could scare U.S. decision-makers and compel Washington to back down. Such strikes would be seen as the "highest and final technique (zuigao xingshi he zui hou shouduan) in seeking to deter and dissuade an opponent."¹⁹³

Traditional Chinese military doctrine, dating back to Sun Tzu, emphasizes surprise and deception. This doctrine is oriented more towards the failure of the enemy, inducing the enemy to act in a way that is harmful to its prosecution of the war, rather than protecting one's own military plans. Western emphases on deception, on the other hand, focus on success of the self.¹⁹⁴ Chinese proclamations of intentions should not be held at face value, but rather they should be viewed as attempts to provoke enemy behavior or to change perceptions. Verbalized policy commitments

¹⁹⁰ Simon Denyar, "Dodging blame, China urges U.S. to stop hurling threats at North Korea," *The Washington Post*, August 10, 2017, available at https://www.washingtonpost.com/world/dodging-blame-china-urges-us-to-stop-hurling-threats-at-north-korea/2017/08/10/46d1d5aa-7d3d-11e7-b2b1-aeba62854dfa_story.html?utm_term=.10836b5c7cbb.

¹⁹¹ Shu Guang Zhang, *Deterrence and Strategic Culture: Chinese-American Confrontations, 1949-1958* (Ithaca, NY: Cornell University Press, 1992), p. 280, cited in Payne, p. 135.

¹⁹² Cheng.

¹⁹³ Cheng.

¹⁹⁴ Pye and Leites, pp. 1147, 48.

may be abandoned at a moment's notice. With good reason, Chinese declarations of its commitments to the peaceful uses of space should be viewed with caution.

What Political and Psychological Factors Must Be Considered? Political and psychological factors are important considerations, although they may not be very accessible to investigation in this case since public information may not be available to construct leadership profiles. How much do we really know about China's leaders and how their personalities may affect decision-making?

In general, most experts view the Chinese decision-making process as obscure. Looking at Chinese fears, culture, and their psychological characteristics is one way to assess possible strategic behavior.¹⁹⁵ The Chinese have long feared the idea of being cut off and deprived of materials required for the health and prosperity of the nation—for example, through a blockade by a foreign power, loss of maritime resources because of weakness in naval power, and the choking of the sea lines of communication. Fear of land invasion, air strikes from aircraft carriers or land locations, and territorial dismemberment influences Chinese military thinking and, given North Korea's proximity to China, may be near the heart of the scenario in this study. Of course, U.S. satellites would play a vital role in any land invasion, dismemberment undertaking, or military strike campaign, and would make logical targets for the Chinese military in a direct confrontation.

Chinese military writings also stress the importance of maintaining control, to include the need for control in the conduct of information warfare, particularly as it might impact command and control. Threats to information networks from cyber-attacks, for example, could undermine Chinese armed forces. According to Michael Pillsbury, "means of maintaining control include deploying unexpected 'assassin's mace' weapons and throwing the opponent off balance at a critical point...."¹⁹⁶ The assassin's mace is a tool that may be used by an inferior opponent to overcome a more powerful adversary. An ASAT weapon might be a very useful tool, and potentially cheap means, for gaining an advantage and accomplishing this objective.¹⁹⁷

Beijing, of course, is not subjected to the same political influences as is Washington. Chinese leaders are not as sensitive to domestic public opinion as U.S. leaders. Yet China will have its own political challenges to contend with. In recent years, President Xi has built up a cult of personality around "Xi Jinping thought," and he has consolidated his power as the supreme ruler in China.¹⁹⁸ Xi is allowed to keep power indefinitely (going back to the way things were under Mao), which means Xi has been given time to centralize party control. On the one hand, dissenting is becoming riskier, and the room for debate narrower than it has been in the last couple of decades. On the other hand, the risk of a policy mistake could now be higher, and correcting a

¹⁹⁵ Pillsbury, "The Sixteen Fears," pp. 149-182.

¹⁹⁶ Pillsbury, "The Sixteen Fears," p. 158.

¹⁹⁷ See for example David Hambling, "China Looks To Undermine U.S. Power, With 'Assassin's Mace'," *Wired.com*, July 2, 2009, available at <https://www.wired.com/2009/07/china-looks-to-undermine-us-power-with-assassins-mace/>; and Joshua Philipp, "China Makes Advances in Space Lasers, Microwave Weapons," *The Epoch Times*, March 22, 2017, available at https://www.theepochtimes.com/china-advances-assassins-mace-warfare-program_2234510.html.

¹⁹⁸ Matthew Continetti, "Xi who must be obeyed," *Commentary Magazine.com*, March 15, 2018, available at <https://www.commentarymagazine.com/articles/xi-must-obeyed/>. China is also stepping up the use of technology to control its diverse ethnic populations and constrain human freedom. Editorial Board, "China's Orwellian tools of high-tech repression," *The Washington Post*, September 17, 2018.

flawed policy could take longer.¹⁹⁹ Perceived weakness in foreign policy could encourage elite and mass criticism of Xi and the regime, thus undermining the leader's legacy and weakening the Chinese Communist Party rule.²⁰⁰ Xi's failures could be viewed as stemming from his foolishness, confusion, or susceptibility to deception. These political considerations could serve to push the Chinese leadership towards an aggressive deterrent strategy involving space weapons in an effort to preclude U.S. military and political gains in the region.

What is China's understanding of the United States? China's perception of the United States will help shape its decision-making. Whether Chinese leaders view U.S. leaders to be weak or strong, or whether they observe the political conditions within the United States to be such that they favor forceful action, could influence the behavior of Chinese leaders and their interpretation of signals from the United States. How well do Chinese leaders understand U.S. threats and gestures of strength or conciliation? Will Chinese decision-makers understand U.S. actions and know what was intended? Will they recognize what the United States wants them to recognize? Do they believe that the United States has a strategy to undermine or encircle China, dismember China, or subvert the Chinese Communist Party? Mao thought the United States would use North Korea as a staging area to invade China; what does President Xi think?

Many of these questions cannot be answered with certainty, of course. With Beijing's goals of creating a capable military force to secure its core interests in the Indo-Pacific region, a goal similar to that of the United States, there will always be some distrust and competition and potential for conflict between the two nations. Even though China would not want to see major damage to trading relationships, China sees the United States as a competitor to its national objectives and has structured its military forces and deterrence concepts accordingly.²⁰¹ We also can assume that Beijing knows that the United States is committed to the security and economic well-being of its allies in the Asia-Pacific region. It knows the United States is committed to enforcing freedom of navigation in international waters, and it has seen U.S. naval forces consistently upholding freedom of the seas principles in the waters around China.²⁰²

China is not "like us." Those who believe that China will follow "rules of the road" when the stakes are high need only look at China's disdainful response to international legal findings against it with regard to its island-making activities in the East China Sea, or its aggressive behavior in proximity to U.S. vessels on the high seas. In 2015, the Chinese Navy acted provocatively toward the U.S. Navy, simulating a missile attack. According to U.S. Representative Randy Forbes, "coming on the heels of anti-satellite and other demonstrations, this latest incident should be a reminder of the destabilizing course that China is on and the challenges we face in maintaining a stable military balance in the Asia-Pacific region."²⁰³

¹⁹⁹ Dandan Li, Dong Lyu, Hui Li, and Keith Zhai "China Scraps Presidential Term Limits, Clearing Way for Xi's Indefinite Rule," *Bloomberg News*, March 11, 2018, available at <https://www.bloomberg.com/news/articles/2018-03-11/china-ties-future-to-xi-as-congress-scraps-president-term-limits>.

²⁰⁰ Johnston, "How New and Assertive Is China's New Assertiveness?" p. 38.

²⁰¹ See for example, "Vice President Mike Pence's Remarks on the Administration's Policy Towards China," October 4, 2018, available at <https://www.hudson.org/events/1610-vice-president-mike-pence-s-remarks-on-the-administration-s-policy-towards-china102018>. "China wants nothing less than to push the United States from the western Pacific...."

²⁰² Bill Gertz, "Navy Warship Passage Challenges Beijing Control of S. China Sea Islands," *Washington Free Beacon*, January 7, 2019, <https://freebeacon.com/national-security/navy-warship-passage-challenges-beijing-control-of-s-china-sea-islands/>

²⁰³ Bill Gertz, "Chinese Submarine Practiced Missile Attack on USS Reagan."

The United States also has consistently pronounced a policy of freedom of action in space since the start of the space age, a policy that has been reinforced by the Trump administration (see Chapter 3). We can assume that China is well aware of this. Indeed, U.S. policy makers have responded very forcefully with policy pronouncements and plans for capability developments.²⁰⁴ Are U.S. space policy statements credible in the eyes of China's rulers? Of course, U.S. behavior in response to violations of freedom of space principles will give shape to Beijing's understanding of the credibility of U.S. deterrent threats, which in turn will shape how China might choose to utilize its counter-space tools (see Chapter 5).

What is the cost-/risk-tolerance of China's leadership with regard to the crisis? China presumably would seek to avoid harming its economic growth and modernization efforts, which likely would result from a military contest with the United States.²⁰⁵ Such a conflict could become global in scale and result in damage to trade relationships with the United States and its allies, infrastructure damage, reconstruction costs, and a significantly expanded defense burden. One could argue, in other words, that China has the highest incentives to avoid embarking on war with the United States.

Yet understanding China's behavior and its willingness to take risk is not so simple. Historically China has viewed the outside world as threatening, such that any U.S. attempt to prevent China's use of force against Taiwan, for example, would be viewed by China's leaders as a hostile act, one with an aim of separating Taiwan from China permanently. One must understand that China calculates its interests differently from the United States—something any insightful observer should conclude upon seeing how China supports the North Korean tyrannical system of government, how it claims territory, and intimidates its neighbors.²⁰⁶ On several occasions China has intimidated U.S. naval vessels and aircraft within its sphere of influence. In 1995 and 1996 it engaged in a series of missile firings, which were in part meant to intimidate or challenge U.S. support for Taiwan and influence in the region. There is evidence, in other words, that China at times is willing to put the relationship with the United States at risk. And this may be in keeping with China's strategic style, where there is a general acceptance of appropriate *tactical* risk-taking.²⁰⁷ As mentioned in Chapter 2, the Chinese are accustomed to seeing crisis as both danger for the nation and Party and opportunity for strategic gain. Some have argued that, in 2019, the Chinese military has reached a point of confidence "where they now feel that in combat, the People's Liberation Army can match competitors."²⁰⁸

In general, Chinese leaders respond to crises in a systematic and relatively controlled manner.²⁰⁹ As discussed earlier, one can assume that Chinese decision-makers will assess cost and risk with a high degree of rationality – not that they would make the same assessments U.S. decision-makers would make, but that there would be some inherent logic and sober analysis involved. One would have every reason to suspect, for example, that the Chinese calculate costs differently

²⁰⁴ The White House, *National Security Strategy of the United States of America*, December 2017, p. 31.

²⁰⁵ Graham Allison and Robert D. Blackwill, with Ali Wyne, *Lee Kuan Yew: The Grand Master's Insights on China, the United States, and the World* (Cambridge, MA: The MIT Press, 2013), pp. 4, 5.

²⁰⁶ Gordon G. Chang, "Why China Should Fear Donald Trump's Tweets," *National Review*, July 30, 2017, available at <http://nationalinterest.org/feature/why-china-should-fear-donald-trumps-tweets-21725>.

²⁰⁷ Payne, *The Fallacies of Cold War Deterrence*, p. 145.

²⁰⁸ Tara Copp and Aaron Mehta, "New defense intelligence assessment warns China nears critical military milestone," *Defense News*, January 16, 2019, available at <https://www.defensenews.com/news/your-military/2019/01/15/new-defense-intelligence-assessment-warns-china-nears-critical-military-milestone/>.

²⁰⁹ Johnston, "How New and Assertive Is China's New Assertiveness?" p. 23.

from the United States, whose leaders are highly sensitive to civilian and military casualties. The rationale for China's way of decision-making, we may assume, would involve a steady effort to retain control – control over the regime, the Party, Chinese citizens, foreign involvement in the region, and over any military engagements that might ensue. Control may also be said to be a primary goal in warfighting. The Chinese have evolved their thinking on war control by using military intimidation or bargaining, with an acceptable military approach that may include fighting a small war to prevent a large war. A brief war in space, in other words, may be justified as a way of preventing a larger, more violent, risky, and bloody contest with the United States.

What are the military options available to the adversary? Do they have freedom to conciliate or provoke? If it appears that armed conflict is likely, there may be incentives by China to use its offensive cyber and counter-space capabilities at the outset in order to: 1) coerce the United States to back down, and 2) negate the U.S. military advantage, which depends on information technology and space-based assets to navigate and position forces, collect and disseminate intelligence, and ensure command and control and communications. They may believe they are faced with a use or lose situation. This may be particularly the case should the United States appear to be resolute about its actions. This, some analysts believe, would leave open the possibility that the Chinese might use a demonstration or a very limited use of force (for example, conduct a limited counter-space operation) to press its position to show China's capabilities, its willingness to press the issue, and possibly to force Washington to reveal its hand. This type of behavior may be very difficult to deter. Indeed, if China's objective is to create tension in a situation (to convey the sense to American leaders and public opinion that the possibility of war is very real), a tit-for-tat use of limited force by both sides may play into China's hand. China may choose to pursue a strategy of controlling the level of tension and risk of escalation rather than avoiding those risks altogether.²¹⁰ China could use the tension to force the United States to resolve the issue at hand – in this case, prevent the United States from military interference in North Korea. Given the possibilities for limited actions that may not violate U.S. perceptions of fundamental interests, space may be the battleground for this type of provocative, coercive behavior.

In general terms, what is China's belief about the costs the United States will incur if the U.S. deterrent threat(s) are executed? The problem facing Washington, should it seek to deter low levels of violence by China, is that China may believe that it has greater stakes involved and is now capable of escalating a conflict to a major conventional war or, at the extreme, a war involving nuclear strikes. China is aware of traditional U.S. concerns about engaging in war, especially major war. It is aware of sensitivity of U.S. leaders and the American public to the risk of casualties.²¹¹ Less clear is China's awareness of how a space war may escalate to include conventional or nuclear military responses (indeed, U.S. leaders may have uncertainties of their own).

²¹⁰ Shulsky, p. 39.

²¹¹ See, for example, Jamie Seidel, "'Sink two aircraft carriers': Chinese Admiral's chilling recipe to dominate the South China Sea," *News Corp Australia Network*, January 2, 2019, available at <https://www.news.com.au/technology/innovation/military/sink-two-aircraft-carriers-chinese-admirals-chilling-recipe-to-dominate-the-south-china-sea/news-story/aaa8c33d57da62e7d5e28e791aa26e0f> Reportedly, Admiral Lou declared: "What the United States fears the most is taking casualties," as he talked about the possibility of sinking two aircraft carriers, each carrying 5,000 service men and women. He identified "fear of adversaries" as a "cornerstone" of the United States open to exploitation, and that China should use its strength to attack the enemy's shortcomings.

U.S. leaders have consistently maintained that space is a vital interest to the country, yet one may legitimately ask whether Washington would be prepared to escalate a conflict to the major conventional or nuclear level should its most significant national security satellites come under attack. The United States may choose to demonstrate to China that it is a mistake to doubt the U.S. commitment to freedom of space principles, and undertake devastating actions against China's interests. A threat of nuclear retaliation, however, may not be very credible in this case.

There may be sufficient levels of ambiguity here to give China's leaders pause before assaulting U.S. interests in space, although ambiguity in U.S. deterrence threats may not be the best way to proceed. It may be the case the China would choose to exploit this ambiguity to attempt to achieve an advantage on the escalation ladder. China's use of demonstrations or attacking peripheral space systems may be one way to probe U.S. resolve and intentions. It also may be a way for China to weaken U.S. resolve and capabilities, impose significant costs, and peel away domestic support for U.S. policy and actions in China's sphere of influence.

What is the best way to communicate with China's leadership? China's leaders do not put much stock in public statements: "Politically, the Chinese feel freer than Westerners to profess their intentions, for statements of intentions do not commit one too much, and it is expected that intentions will change with circumstances and in response to the behavior of the enemy."²¹² So, for the Chinese, declarations of intentions can be tools of deception and designed to probe or provoke behavior. Whereas Westerners focus on the importance of clear, unambiguous communications, the Chinese tend to look at such thinking as a ruse or an act of simple mindedness. Put simply, "the Chinese do not attach a moral character to declarations about goals of policy."²¹³ Policy can be abandoned at a moment's notice.

Given this understanding, the Chinese are highly sensitive to deception tactics and will be reluctant to take a face value what the adversary is presenting or saying.²¹⁴ Historically, Chinese leaders going back to Mao have viewed U.S. declarations and information with deep skepticism. President Harry Truman's attempts to deter Chinese intervention into the Korean War failed because Mao believed that U.S. successes on the peninsula would incite it to go further and threaten China's border and possibly invade the relatively young Communist country. Truman's messages contradicted the Chinese leader's preexisting belief about what the United States was prepared to do. This failure to communicate may have also been exacerbated by inconsistent messages delivered by U.S. military leaders at the time that implied the possibility of American aggression in the furtherance of peace. In this case, the Chinese drew from the selection of information that supported their pre-existing beliefs about America's true intentions.²¹⁵ This military opposition on the Korean Peninsula contrasted sharply with successful U.S. deterrence threats and reassurance towards China when it came to the defense of Taiwan. China could perceive sunk U.S. costs in Taiwan and corresponding messages from Truman that indicated a firm commitment to defend it.

²¹² Pye and Leites, p. 1148.

²¹³ Pye and Leites, p. 1148, 49; Johnston, "How New and Assertive Is China's New Assertiveness?" p. 22.

²¹⁴ Pye and Leites, p. 1148.

²¹⁵ For a nice summary of this episode in U.S. history, see Erik D. French, "Motivated Reasoning in US-China Deterrence and Reassurance—Past, Present, and Future," *Strategic Studies Quarterly*, Winter 2014.

These two cases argue against ambiguity in the issuance of deterrence threats and reassurances when communicating with Chinese leaders, lest the preconceptions of weakness or lack of commitment receive reinforcement. It would also appear that, when dealing with China, consistency and repetition in messages and actions would pay dividends and reinforce the importance of extreme clarity in communications. Of course, any words the United States may use to influence Chinese actions regarding North Korea will be viewed with suspicion if they are inconsistent with obvious actions.

Which leaders within China should be engaged? It is important to determine who the decision-makers are as well as the decision-making chains. This is a critical step in determining how and whether China would be susceptible to U.S. deterrence tools. Whom we are addressing can affect how the deterrence messaging should be tailored.

The leaders of the party and state in the PRC hold national and vice-national administrative rank in the Chinese Communist Party (CCP) and the state. Typically, these leaders are shuffled around every five years, but this pattern changed after the last Party Congress when President Xi Jinping held onto the presidency for at least another five years. The Politburo Standing Committee of the Central Committee of the CCP holds the ultimate power in the PRC, both of which are headed by Xi Jinping, the “core” of the current party leadership (a title also used to describe Jiang Zemin, but not Hu Jintao). Each member of the Politburo Standing Committee also oversees a specific area of government, with Xi Jinping having chief control over Policy Advisory, Foreign Policy, and Military.²¹⁶

Over the past couple of decades there has been greater political space in public commentary about China’s foreign policy (to include more nationalistic and militaristic voices). That can mean that sometimes the PLA voices are only representing themselves on issues of territorial security.²¹⁷ However, there is a cult of personality developing around Chinese president Xi Jinping to mirror his growing power.²¹⁸ China has made a significant move towards transforming the country into a one-man system that will probably “streamline” decision-making and allow Xi greater influence on foreign and defense policies. Beijing has increased censorship and has clamped down on dissent since Xi assumed power in 2012, which means academics and officials might be more reluctant to voice opposition views. There is a risk that there will be growth in the culture that rewards sycophancy.²¹⁹ This consolidation of power also means greater risk for Xi. His mishandling of a crisis or economic instability could cause internal opposition to emerge against him personally.

²¹⁶ Elizabeth J. Perry, “Infographic: How the CCP Rules, a Guide to China’s Leaders of Party and State,” Fairbank Center Blog, October 11, 2017, available at <http://fairbank.fas.harvard.edu/infographic-how-the-ccp-rules-a-guide-to-chinas-leaders-of-party-and-state/>.

²¹⁷ Johnston, “How New and Assertive Is China’s New Assertiveness?” p. 43.

²¹⁸ Ben Doherty, “Admiral warns US must prepare for possibility of war with China,” *The Guardian*, February 16, 2018, available at <https://www.theguardian.com/world/2018/feb/16/admiral-warns-us-must-prepare-for-possibility-of-war-with-china>.

²¹⁹ Charlie Campbell, “China’s Lurch Toward One-Man Rule Under Xi Jinping Should Worry Us All,” *Time*, February 26, 2018, available at <http://time.com/5175215/xi-jinping-china-term-limits/>.

Chapter 5

Considering U.S. Space Deterrence Options

When China acts to coerce or deter, its actions may be misperceived by the United States as possible preparation for regional or even global war. Consequently, an understanding of Chinese military actions and signaling activities is necessary to determine, to the extent feasible, the purpose behind apparently aggressive action.²²⁰ On the one hand, Chinese leaders might talk aggressively and act cautiously.²²¹ On the other hand, Chinese deterrence strategy towards the United States might involve the employment of counter-space weapons, which would be seen by the United States as aggression. Chinese strategists believe that China must display the use of force or show its determination to use force to compel the enemy to submit or refrain from taking hostile actions. In China's view, warfighting would follow the failure of coercive or deterrence efforts.²²² These Chinese viewpoints should be the basis for forming a sound U.S. space deterrence strategy against China. Words, policies, and threats mean little to the Chinese leaders compared to the capabilities that they see arrayed against them and the actions the United States may take in other domains to enforce deterrence. Actions and capabilities will talk unambiguously. It is what China understands, and it is what U.S. leaders should understand can be effective.

For U.S. space deterrence strategy to work, Beijing must care greatly about the threat the United States poses and believe that Washington would be willing to execute it. As we read in Chapter 1, this is the heart of deterrence. "A deterrence threat that misses what an opponent uniquely cares about most, or a deterrent threat that an opponent does not believe because of its unique circumstances will not deter much, whatever the threat or domain."²²³ The challenge for U.S. defense planners is to understand why China's leaders might believe they are free to interfere with U.S. space systems and then design and execute a deterrence strategy to change Beijing's calculations. To create a credible threat, the United States must develop and have on hand the means to cripple or destroy those high-value assets.

To prevent attacks on U.S. space systems, one of the first steps is determining what threats the United States can present to China that would impose costs greater than the costs Beijing might perceive it would suffer following North Korea's loss of its missile and nuclear forces or, potentially, following a change in North Korea's regime. Chinese decision-makers must be compelled to weigh the risks of attacking U.S. space systems with the following questions in mind. Would China be willing to risk, for example, damage to its own space systems, territory and infrastructure by attacking U.S. space systems for the sake of preserving the North Korean state or the North Korean nuclear and missile arsenal? How important is a nuclear-capable, missile-capable North Korea led by the Kim dynasty to the political survival of China's leadership and to its stature in the world? U.S. threats will be measured against these considerations. Understanding the effects of

²²⁰ Blasko.

²²¹ Pye and Leites, p. 1157.

²²² Blasko.

²²³ Keith B. Payne, "Deterrence: The 2018 NPR, Deterrence Theory and Policy," National Institute for Public Policy Information Series No. 432, August 9, 2018.

attacks on space assets is critical to determining whether responses in different domains are proportionate or escalatory.²²⁴

Clearly, in crafting a deterrence strategy, the United States will want to weigh carefully whether retaliation against Chinese space systems would be advantageous, recognizing that China may not value its space assets as much as the United States values its space assets. In addition, unless the attack on U.S. space systems is significant, a cross-domain attack that involves major Chinese infrastructure sites could be viewed as overly escalatory. In choosing which deterrence threats to issue, the United States will have to weigh the risk of escalating or broadening the conflict, which could increase the number of military and civilian casualties (an outcome that U.S. leaders would strive to avoid). How the United States chooses to proceed with its threats would likely depend on many factors, including the stakes involved, which satellites China had interfered with, and whether the interference was temporary or involved permanent destruction. The United States may want to identify a two-tiered package of deterrence threats: first, a threat response triggered by temporary (yet potentially consequential) interference with national security space systems, and second, a more forceful kinetic and/or non-kinetic response triggered by the permanent disabling of a U.S. national security satellite or space system. For such a tailored deterrence strategy to be effective, sensors for distinguishing between temporary and permanent disabling will be required.

Think Cross-Domain

The traditional U.S. approach to waging war incorporates capabilities to strike land- and sea-targets from the air, sea-targets from the air and land, and air-targets from the sea and land. In other words, cross-domain combat operations are already built into U.S. military thinking and planning. Because the value countries attribute to space capabilities varies greatly, the threat of striking enemy space targets will also vary greatly for the functioning of deterrence. Consequently, the idea that space deterrence must involve cross-domain operations appears to be self-evident. It may involve making retaliatory threats in the land-, sea-, air- and cyber-domains. Cross-domain deterrence threats may enable the United States to leverage its strengths against the enemy's vulnerabilities to produce advantageous deterrence and, if necessary, operational effects.

As China's reliance on satellites grows, for example to exert domestic population control or locate and target U.S. carrier task forces as a way of enforcing its anti-access and area denial strategy, the United States might be able to manifestly hold at risk China's reconnaissance, surveillance and navigation satellites to deter attacks on U.S. space systems. Given China's strong reliance on these space systems, in the event of war the United States probably would desire to initiate the destruction or disruption of these satellites to further U.S. war aims in the region. However, U.S. deterrence threats aimed at protecting U.S. space assets should also include holding at risk targets of comparable value in other domains, which are likely to be in and around the Chinese homeland.²²⁵ The goal should be to threaten the imposition of costs on China in retaliation for

²²⁴ Vincent Manzo, "Deterrence and Escalation in Cross-domain Operations: Where do Space and Cyberspace Fit?" Institute for National Strategic Studies, *Strategic Forum*, No. 272 (December 2011), p. 7, available at <http://inss.ndu.edu/Portals/68/Documents/stratforum/SF-272.pdf>

²²⁵ For another discussion of this subject, see James Scouras, Edward Smyth, Thomas Mahnken, *Cross-Domain Deterrence in US-China Strategy*, (Laurel, MD: Johns Hopkins Applied Physics Laboratory, 2017), p. 46, available at <http://www.jhuapl.edu/Content/documents/CrossDomainWeb.pdf>

space attacks, irrespective of domain and mode of retaliation. The threatened costs must be sufficient to deter, according to Chinese perceptions, again irrespective of domain and mode of retaliation.

Build Credibility

The credibility of U.S. threats is a key component of a successful deterrence strategy. Public declarations supported by actions help build credibility *regardless of domain*. Given the strong parallels between the real world and the hypothetical scenario outlined in this study, one can leverage real-world actions, rhetoric and responses to give life to the scenario. Mirrored to the real-world situation, the U.S. President in this scenario has declared to leaders in North Korea and China that “the United States is determined to defend itself and our allies from the growing threat.” He also has indicated to Beijing and Pyongyang that, because North Korean provocations amounted to a direct threat to the U.S. homeland, the United States is not obligated to consult first with South Korea before taking defensive or preemptive strike actions. To be sure, if it can be helped, the United States would want to avoid acting alone.

Prior to the 2018 U.S.-North Korean Summit, when tensions ran very high, one could make the real-world case that allied support for punishing actions against North Korea would likely be there. South Korean President Moon Jae-in stated: “I think the North perfecting an ICBM, loading an atomic warhead on it and weaponizing it is a red line. North Korea is nearing a threshold for the red line.”²²⁶ In other words, many, including U.S. allies in the region, believe and understand that North Korea’s deployment of ICBMs and nuclear forces is likely to be a redline leading to U.S. strikes. This would support a larger U.S. strategy that involves deterrence threats delivered to China, namely, that Washington would execute punishing actions in retaliation for China’s interference with U.S. space operations before, during, and after its military efforts to mitigate the North Korean threat to U.S. territories and homeland.

Clear statements by U.S. officials of how Washington would respond to Chinese counter-space actions would no doubt help to bolster the credibility of U.S. deterrence. The Trump Administration took actions in 2018 to strengthen the nation’s space posture. In his August 9, 2018 speech on the Administration’s desire to establish a Space Force, Vice President Mike Pence cited the work of U.S. adversaries to bring new weapons of war into space to justify the proposed birth of a new military branch. He specifically called out China’s aggressive developments to prioritize its warfighting capabilities in space.²²⁷ If Beijing were to view the Trump Administration’s language and actions as credible, does that mean that U.S. deterrent threats are likely to be more effective?

History may be a guide here. President Trump’s 2017 threats in response to provocative North Korean missile launches—“will be met with fire and fury”—could be said to have jolted China into action and sanctions enforcement, such as the suspension of North Korean coal imports,²²⁸

²²⁶ Christopher Bodeen, Hyung-Jin Kim and Kim Tong-Hyung, “US: War would be ‘horrific’ but NKorea nukes ‘unimaginable,’ Associated Press, August 17, 2017, available at <http://abcnews.go.com/amp/Politics/wireStory/us-war-horrific-nkorea-nukes-unimaginable-49267357>.

²²⁷ “Remarks by Vice President Pence on the Future of the U.S. Military in Space,” August 9, 2018, <https://www.whitehouse.gov/briefings-statements/remarks-vice-president-pence-future-u-s-military-in-space>.

²²⁸ Office of the Secretary of Defense, *Military and Security Developments Involving the People’s Republic of China 2018*, p. 113.

although, again, we know too that China does not want to weaken North Korea to the point where it collapses. According to President Trump:

America does not seek conflict or confrontation, but we will never run from it. History is filled with discarded regimes that have foolishly tested America's resolve. Anyone who doubts the strength or determination of the United States should look to our past, and you will doubt it no longer. We will not permit America or our allies to be blackmailed or attacked. We will not allow American cities to be threatened with destruction. We will not be intimidated. And we will not let the worst atrocities in history be repeated here, on this ground (the Korean Peninsula), we fought and died so hard to secure.²²⁹

The President made it clear that the U.S. goal is the complete denuclearization of North Korea.

U.S. military leaders have made similar declarations that were no doubt intended to reach the ears of North Korea's and China's leaders. General Joseph Dunford, Chairman of the U.S. Joint Chiefs of Staff, is on record stating that it would be "absolutely horrific if there would be a military solution to this problem [North Korean missile threats], there's no question about it."²³⁰ Deployments and exercises by the U.S. armed forces have supported the public statements. The deployment of the THAAD missile defense system in South Korea and missile defense integration in the region changes what North Korea can hold at risk in the southern portion of the peninsula. Moreover, the U.S. Ballistic Missile Defense System would provide a significant damage limitation capability for the U.S. homeland, increasing the odds that Kim would fail in an attempted missile strike against the United States. Deployed defenses and interoperability demonstrations with regional allies can bolster the credibility of the U.S. threat to respond to North Korean provocations, which should give Chinese leaders pause if they had doubts about the seriousness of the U.S. commitment to protect its interests in the region and defend its homeland. This commitment and show of force also would help to build the credibility of U.S. deterrence threats by reducing U.S. risks and costs in making those deterrence threats.

The history of U.S. military actions under President Trump support this rhetoric, and may be said to bolster the view that U.S. threats against rogue states dealing in weapons of mass destruction need to be taken seriously. President Trump has been consistent about following up with punishing actions once his "red lines" have been crossed. The April 2017 and April 2018 U.S. bombing campaigns against chemical weapons deployment and manufacturing facilities undertaken to punish Bashar al-Assad, the President of Syria, for his use of chemical weapons (chlorine and sarin) against his own people had an impact around the world, including North Korea and China.²³¹ In the 2018 bombing campaign, the United States also had the active military support of two of its allies, the United Kingdom and France. The primary objective of the strikes was to warn Damascus that any repetition would be met with another punitive strike. According to the U.S. Ambassador to the United Nations, Nikki Haley, President Trump has stated that: "If

²²⁹ President Donald Trump, "Remarks by President Trump to the National Assembly of the Republic of Korea," Seoul, South Korea, November 7, 2017.

²³⁰ Christopher Bodeen, Hyung-Jin Kim and Kim Tong-Hyung, "US: War would be 'horrific' but NKorea nukes 'unimaginable,'" *Associated Press*, August 17, 2017 available at <http://abcnews.go.com/amp/Politics/wireStory/us-war-horrific-nkorea-nukes-unimaginable-49267357>.

²³¹ Editorial, "If Syria's despot is not punished, others will use chemical weapons," *The Economist*, April 14, 2018, available at <https://www.economist.com/leaders/2018/04/14/if-syrias-despot-is-not-punished-others-will-use-chemical-weapons>.

the Syrian regime uses this poisonous gas again, the United States is locked and loaded.”²³² One can reasonably argue that these bombings will not ensure the deterrence of Syrian chemical weapons use in the future. Yet the United States likely has changed Syrian calculations in this regard and increased the credibility of U.S. deterrence threats.

Moreover, the action against Syrian chemical weapons facilities came despite warnings from Russia, an ally of Assad, not to conduct the military strikes. There are some interesting parallels with the scenario outlined in this study. While Russia is the patron of a volatile nation, Syria, that deals in and uses weapons of mass destruction, China is the patron of another volatile nation, North Korea, which manufactures missiles and weapons of mass destruction, to include nuclear weapons.

Possible Space Deterrence Options

There are special challenges associated with a space deterrence strategy. These questions must be answered: Who did what and how quickly can we know it? What are the retaliatory threat options most effective for deterrence, recognizing that a response may be issued in a domain other than space? And how quickly can the response be executed? These are critical questions, with the question of attribution perhaps being the most urgent. If the United States cannot threaten to strike back at the aggressor because it does not have the space situational awareness (the sensors and command, control and communications) capabilities in place to identify the aggressor, the prospects for an effective deterrence strategy are dim, especially if an inability to attribute is known to opponents.

We also established that, for the United States, in most situations, retaliation *in kind* for a destructive ASAT attack may be akin to shooting itself in the foot. We have established that successful deterrence requires targeting what the potential aggressor values and that the valued assets may be in a domain other than space. When considering space systems and deterrence in crises, it is important to take into account the type of weapon used (e.g., yielding either reversible or irreversible effects), the type of target (e.g., commercial satellite versus nuclear command and control satellite), and the situation on earth at the time. A kinetic attack need not involve a retaliatory kinetic attack, since non-kinetic attacks involving cyberwarfare, for example, can achieve effects similar to a kinetic retaliation (e.g., the disruption of enemy infrastructures and operational capabilities).

As part of a long-term strategy for bolstering space deterrence, the United States may embark on consultations with China and other potential adversaries or unilaterally announce the establishment of keep-out zones or rules for establishing self-defense thresholds around its satellites.²³³ These keep-out zones may be expanded during times of crisis or war. U.S. leaders would use these zones to warn China against the possible use of on-orbit ASAT weapons that may be used, upon crossing the established threshold, to sidle up to a U.S. satellite with little or no warning and undertake malicious counter-space actions. This approach to deterrence would require, of course, exquisite SSA in the different orbital regions. Upon observing a break through

²³² Thomas Watkins, “Trump, allies praise Syria strikes as Moscow seethes,” *Yahoo.com*, April 15, 2018, available at <https://www.yahoo.com/news/us-france-britain-launch-strikes-syria-064012636.html>.

²³³ Chow and Sokolski. See also Steve Lambakis, *On the Edge of Earth: The Future of American Space Power* (Lexington, KY: The University Press of Kentucky, 2001), pp. 134-35.

the established thresholds (regardless of the stated peaceful or aggressive purposes of the satellite), the United States could respond militarily before the attack occurs.

Technological innovation in the area of space control should be a high priority in the U.S. Department of Defense. Researchers should focus on new developments in offensive capabilities that would permit (non-destructive) assertive responses in the space domain. While China may not place as much value on its space operations as does the United States, China's growing reliance on space to execute its defense strategy means that there may be room to consider in-kind retaliation, especially as it may involve the use of non-destructive counter-space tactics that do not result in the proliferation of orbital debris (which would make the tactic politically more palatable). Limiting U.S. regrets for implementing a deterrent threat should add to its credibility. Development of new capabilities to "remove" an adversary satellite or satellites from operation or "turn off" a satellite or constellation (even temporarily) would leave a profound impression on the adversary and support space deterrence. Tailoring U.S. deterrence threats to escalate in their scope and destructiveness depending on the level of provocation may also promote the credibility of those threats.

Possible deterrence threats to prevent *non-destructive or reversible* counter-space operations by China might include variations of the following non-escalation options:

Cyber-attacks on Chinese command, control, and communications systems to achieve in kind temporary effects. Overt or covert cyber-attacks by superior U.S. cyber forces against Chinese command, control, and communications assets (perhaps focused on Chinese space system assets) would exploit China's fear of loss of control. The ability to turn Chinese space systems "off and on" without creating debris problems would send a strong signal – that the United States is capable of taking China out of space should it prove necessary in retaliation for its interference with U.S. satellites. Keeping the response focused on space systems could reduce the risk of escalation within the terrestrial domains.

Jamming and dazzling operations against Chinese space systems. The United States could execute reversible effects to impact the operation of Chinese satellites to inflict in-kind punishment. This also would amount to a warning that continued interference with U.S. space operations would jeopardize China's position in space.

A decision to threaten nuclear use in retaliation to a space attack may be incredible, unless the Chinese attack on U.S. space assets was part of a much broader attack on the United States or its allies. Because a degree of proportionality may be key to the credibility of U.S. space deterrence threats and limiting the U.S. regret associated with U.S. deterrence threats may also be key, it is very important to have non-nuclear kinetic and non-kinetic space deterrence options.

Possible deterrence threats to prevent permanent or massive counter-space operations by China might include variations of the following options, most of which are cross-domain:

Cyber-attacks on Chinese command, control, and communications systems to achieve more lasting and consequential effects. Overt or covert cyber-attacks on Chinese command, control, and communications assets (in space and on land) would exploit China's fear of loss of control, not only over its military forces, but possibly also over its population and outlying territories, potentially undermining the Chinese system. Cyber-attacks may be used to take control of a

Chinese satellite.²³⁴ A cyber-offensive also may be executed to disrupt the Chinese economy and financial system as well as China's access to space and the movement of its military forces. An effective attack might lead China to stand down and allow the United States to achieve its objective. While the United States would have similar economic, financial, and military concerns, loss of control over information and forces would be a major political concern for China. As we established in Chapter 2, Chinese military writings stress the importance of maintaining control, to include the need for control in the conduct of information warfare, particularly as it might impact command and control. A cyber-offensive threat may be effective to deter both reversible and irreversible counter-space actions against the United States. It could also be credible and advantageous across the conflict spectrum, from peacetime, to crisis, to wartime.

Target Chinese Satellites. While China is clearly not as dependent as the United States is on space systems, it is becoming increasingly reliant on them. This means that space systems, over time, will become more valuable to Beijing, and it is, therefore, appropriate to develop deterrence options that include threatening China's space systems, which could have a significant effect on China's economy and national security. For example, should China become dependent on a new satellite system it is developing and plans to deploy in 2019 to monitor activities in the South China Sea, the United States may want to consider disabling or even destroying this ten-satellite constellation as part of its deterrence package.²³⁵ This strategy also would threaten Chinese control over these waters and work to uphold the principle of freedom of navigation on the high seas.

Of course, the United States does not currently deploy weapons dedicated to the ASAT mission. Without capabilities to disable, destroy or in some way limit the operation of adversary satellites, this deterrence option must be removed from the table. The development of non-kinetic space weapons would have the advantage of being both exotic and favorable to limiting space debris. For example lasers, high powered microwaves, or neutral particle beams could have a physical effect on the satellite, and may be used to temporarily or permanently blind sensors or destroy a satellite's electronics and processors. It would accomplish this impairment without creating hundreds or even thousands of pieces or orbital debris. If China shows a significant dependence on a set of satellites (i.e., it places great value on these), the United States could also threaten to jam or spoof radio frequency signals or even take control of the satellites. These represent steps that might be taken during times of peace, crisis or war.

Disrupt Critical Lines of Communication. This idea again leverages a cross-domain approach to achieve deterrence objectives. These tactics would seem to be most appropriate in wartime, but might also be helpful to maintain deterrence in high intensity crises. A deterrence strategy would feature joint operations that threaten to cut critical lines of communications. Cyber operations would be a part of this strategy. The Chinese have long feared the idea of being cut off and deprived of materials required for the health and prosperity of the nation, to include a blockade by a foreign power, loss of maritime resources because of weakness in naval power, and the choking of the sea lines of communication. Fear of land invasion, air strikes from aircraft carriers or land locations, and territorial dismemberment influences military thinking and, given North

²³⁴ For a general discussion see Kathryn Waldron, "Space: The last frontier for cybersecurity," *The Hill*, July 28, 2018, <https://thehill.com/opinion/cybersecurity/399224-space-the-last-frontier-for-cybersecurity>; see also Joint Chiefs of Staff, *Space Operations*, Joint Publication 3-14, April 10, 2018, pp. II-3 and III-5.

²³⁵ David Tweed, "China Developing Satellites for Watching South China Sea Traffic," *Bloomberg News*, August 16, 2018, available at <https://www.bloomberg.com/news/articles/2018-08-16/china-developing-satellites-for-watching-south-china-sea-traffic>.

Korea's proximity to China, may be near the heart of the scenario in this study. Of course, U.S. satellites would play a vital role in virtually any U.S. military campaign, and would make logical targets for the Chinese military.

Target Key Space Facilities or Support Centers. This deterrence threat option may be available to U.S. planners as part of a wartime deterrence strategy. A target of particular interest may be a Chinese spaceport. This may be especially relevant if China chooses to launch an ASAT missile from one of its launch sites. The benefit of targeting a spaceport would be that a spaceport would already be isolated from the civilian populations, meaning that a retaliatory strike against it is very unlikely to result in civilian fatalities. Also, by destroying the launch site responsible for delivering a kinetic kill vehicle to space, the United States would remove the launch facility from operational use for a period of time, reducing near-term Chinese military space replenishment potential. This strategy also may include targeting ground systems necessary for command, control, and communications or processing data. Conventional strikes against the stations themselves or again support infrastructure (electrical power grid, communications lines, etc.) could accomplish this objective.

Space Deterrence Threats and Coercion: The Virtue of Clarity

The job of a space deterrence strategist must be to determine what China values and how to hold it at risk in a fashion deemed credible by the adversary. China must be made to weigh the risk to any number of its valued assets against the possible benefits it might achieve by attacking U.S. space systems. China's valued assets would include, among other things, regime survival (which could be put at risk if the conflict were to escalate to general war with the United States), the mechanisms for controlling the population (cyber, high-tech domestic surveillance, and police forces), critical infrastructure (to include space launch complexes), military forces (ships and air forces), and its reputation abroad as a regional power. Although China does not rely on its space systems as much as does the United States, China is also coming to place great value on them.

A promised military response in support deterrence may often be critical to the credibility of U.S. public and private statements. The threat should be based on specific and meaningful military objectives and appear credible to the opponent (a threat of U.S. nuclear response to GPS jamming, for example, may not be a credible threat may be unlikely to be heeded). Specific and appropriate military actions threatened in anticipation of an attack could help build the credibility of the threat and help convince Chinese leaders that their plan of action ought not to be viewed as a *fait accompli*. The build-up of missile defenses, to include upper tier and lower tier missile defense system integration, and conventional forces in the region would be intended to send the message (especially if it were to follow significant improvements in U.S. missile defense and nuclear capabilities) that the United States has the will and military power to resolve what it views to be a national crisis.

Then the question becomes, how real do Chinese leadership consider the threat to be? Chinese decision-making in this crisis would turn on the stakes involved and how the leadership answers this question. Its assessment as to whether the United States lacks the will and capability to carry out the threat may be accurate or false. Promoting the Chinese perception of both U.S. will and credibility should contribute to deterrence effectiveness. It may also be true. One may be certain that China would do whatever it could to undermine U.S. will to follow through, to include

threatening that the United States and its allies would suffer a great loss of life should it execute its deterrent threat(s) against China.

Much as the United States has upheld the principle of freedom of navigation in the South China Sea by entering waters over which China has declared sovereignty, one may expect the United States to uphold its right to freedom of action in space in the face of Chinese attempted interference. Thresholds for escalation in space are ambiguous, in part because there is limited history to draw from and the space domain is so different; after all, actions in space may not be immediately discerned or visible to the public or video cameras. This is especially the case before a conflict has broken out or when the level of conflict is relatively low. To be sure, each side can have its own view of what constitutes a threshold. So, to a major extent, it is incumbent upon the side issuing the deterrence threats to make clear where that line is (although U.S. leaders may choose to keep retaliation options ambiguous). Ambiguity has the advantage of leaving room for flexibility in response to aggression, but it may also allow greater latitude for opponents' miscalculation or manipulation.

Reliance on "strategic ambiguity" could be a mistake if the United States does not clearly establish a pattern of enforcement. The goal must be to establish in the mind of the adversary the panoply of U.S. capabilities that may be used to deny an opponent its goals and inflict punishment for violation of U.S. interests. While establishing a policy is important, deployment of the capabilities and establishing an apparent will to use them, are even more important. Former U.S. Secretary of Defense James Mattis' response to a question asking how the country would respond to a space attack is an example where the United States is relying on the adversary's awareness of U.S. responses to aggression. Mattis explained that he would prefer ambiguity. "I don't tell adversaries in advance what we will do or what we will not do.... We will not stand idly by if someone tried to deny us the use of space."²³⁶ This approach clearly would have greater chance of success if U.S. military capabilities to respond proportionately and forcefully are developed and proven. The challenge facing U.S. planners is to ensure that China's leaders can anticipate no advantageous limited use of force and no favorable path for escalation.

Ambiguity that is not supported by capabilities and a vivid U.S. reputation for response to aggression may not help, since ambiguity may provide room for an opponent's optimistic expectations. Ambiguity in a deterrence strategy may leave too much room for interpretation (i.e., misinterpretation) and it may leave the impression that the United States is leaving itself leeway to back away from undertaking any punishing actions. One may make that case that, in the absence of a clear pattern of U.S. enforcement, the statement of U.S. intent and the object of what would be placed at risk should be made clear to the Chinese government. Defense planners then will have to weigh what would strike more fear in Beijing – the threat of uncertain action on an uncertain timeline, or, for example, the threat of a cyber offensive to take down China's command and control infrastructure once its responsibility has been identified?

The bottom line is that manifest actions and capabilities will help clarify deterrence declarations. While U.S. policy has been clear that national security space assets are vital to the nation, there have been few public examples where the United States has responded to temporary interference (jamming, dazzling, or spoofing) with military action. There is limited experience on which to

²³⁶ Robert Burns, "Mattis: U.S. needs Space Force to counter Russia, China," *Associated Press*, August 14, 2018, <http://www.apnews.com/e9c8a97b2f3645df91a1ef094db58f40/Mattis:-US-needs-Space-Force-to-counter-Russia,-China>.

signal clearly how the United States would respond to transgressions in space. When it comes to a face-off with China, in other words, the United States will have to draw strong parallels to its actions and responses to violations of sovereignty or U.S. interests in other domains. These may be the examples that establish Chinese expectations, and thus the credibility of U.S. deterrence threats.

Should the U.S. deterrent threat fail and China's leaders decide to execute counter-space operations against the United States, the United States would have to choose to retaliate (hence the importance of a designing a military response that is tailored to the aggression). Failure to do so would undermine U.S. credibility in the current crisis and in future crises. It would also undermine the credibility of the U.S. commitment to defend its allies, especially in the Indo-Pacific region. With a major show of commitment, backed by a pattern of "red line" enforcements (in space or other domains), Washington could turn China's fear of an escalating regional crisis to its advantage and deter China from undertaking counter-space operations in the first place.

Given what we have learned, there are several high-level considerations to be made when framing a space deterrence strategy for controlling Chinese behavior. Should the United States adopt an assertive approach to deterrence, it would make it clear to China that an attack on U.S. space systems would force the United States to respond in an equally forceful manner against Chinese space systems or, depending on the severity of the attack, even to escalate the conflict into another domain. The U.S. deterrence goal here is to promote the Chinese calculation that an attack on U.S. space systems would likely not lead to U.S. conciliation but to military actions that would be costly to China. The United States, for example, might make it clear to China that its forces would enter North Korea should the regime collapse in order to secure nuclear weapons. This is transparency that is also deterrence (it puts forth a scenario that Beijing would find costly).²³⁷ Appropriately-sized U.S. military capabilities deployed to the region to defeat the PLA and deny China its objectives would support this approach. The possible repercussions could be potentially significant domestic turmoil in China (which the regime would want to avoid). The scenario would likely involve refugees flooding into China, also undesirable from Beijing's point of view. In a crisis or high-end conflict, linking credible, assertive U.S. responses in and around North Korea and China to Chinese interference with U.S. space systems in this particular scenario might reinforce Chinese good behavior.

The United States clearly has more at stake in space than does China. The Chinese leaders must be made to understand that the significant stake of the United States in space is not a vehicle for Chinese coercion of the United States but a factor that will drive the United States to take severe actions to protect its interests there. China would attempt to leverage the fact that this battle over North Korea would take place in its own backyard, and its leaders might need to be convinced that the United States would be willing to commit significant resources to a battle halfway around the world and risk escalation. Washington would have to proceed on the basis of minimizing the risk of military and civilian casualties, which no doubt would require significant offensive and defensive capabilities in place.

This discussion speaks to the importance of U.S. leaders educating the American people on the vital importance of U.S. space assets for a wide spectrum of critical military, civilian, and

²³⁷ Ben Dooley, "Once taboo, China listens to US contingencies on N. Korea," *Yahoo.com*, December 18, 2017, available at <https://www.yahoo.com/news/once-taboo-china-listens-us-contingencies-n-korea-085115092.html>.

commercial purposes. This would help the American people understand why they might have to support U.S. capabilities, possibly in space, intended to deter limited attacks and their escalation in any conflict in the Indo-Pacific region.

