CHAPTER 4

SPACE WEAPONS AND PROLIFERATION

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Will flight testing or deploying space weapons prompt arms races?[2] This assertion figures prominently in the writings of both critics and boosters of space warfare initiatives.[3] We contend that the arms race argument is weak and beside the point, since arms racing is not needed to negate the space weapons of a potential adversary. Advanced space-faring nations such as China and the Russian Federation could compete in making low-Earth orbit inhospitable to satellites with modest investments and unsophisticated techniques. Any nation that possesses medium-range ballistic missiles, space tracking capabilities and the means to precisely insert a satellite into orbit also has the ability to destroy a satellite. Rather than engaging in an expensive arms race, states threatened by US space warfare initiatives are likely to respond in cost-effective ways to counter US weapons. The fundamental problem associated with space weapons is not their expense or their propensity to generate arms races. Instead, the fundamental problem associated with space weapons is how easily they can pollute space, and how much long-term and costly damage could result from relatively inexpensive investments.

We argue that additional proliferation of nuclear weapons, rather than new arms races, is the most likely outcome in the event of renewed interest in space warfare. Proliferation will be a natural consequence of more nations feeling less secure as a result of space weapons. Furthermore, in the absence of united fronts against proliferation by major powers and by US friends and allies, international efforts to strengthen non-proliferation and disarmament norms are likely to fail, and hedging strategies against a more worrisome future are likely to multiply.

The US Air Force's Counterspace Operations doctrine, released in August 2004, embraces power projection in and through space by means of what the Pentagon calls "offensive counter-space" capabilities.[4] The

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implications of US initiatives to pursue offensive counterspace capabilities for the non-proliferation regime—constructed during an era of bi-polar, Cold War competition—have not been carefully analysed. Military dominance confers many advantages. Paradoxically, success in preventing proliferation is not one of them. Instead, the dominance of one state could prompt others to seek insurance or deterrence in the form of proliferation. Successful non-proliferation policies are usually based on collective, not unilateral action, since collective action is usually more dissuasive and effective than unilateral enforcement. A dominant state may have difficulty in generating collective action if other states view the dominant power with concern, or if they view proliferation as less of a threat to them than to the dominant state. The problems of shaping a collective response are exacerbated if the dominant state pursues initiatives that are widely perceived as unwise.

Our analysis suggests that the negative impacts of US military dominance on proliferation will be accentuated in the event that Washington also seeks dominant military capabilities in space. This pursuit will be widely viewed as unwise and dangerous, not only by potential adversaries, but also by most of Washington's allies and friends. Consequently, US initiatives to flight-test and deploy space weapons are likely to hasten efforts to seek insurance or deterrence against US might. We view the advocacy of US space dominance as a useful prism to analyse why proliferation concerns are growing, and why efforts to strengthen non-proliferation and disarmament norms have encountered such great difficulty in recent years.

DEFINING SPACE WEAPONS

We define space weapons and offensive space warfare initiatives as terrestrially-based devices specifically designed and flight tested to physically attack, impair or destroy objects in space, or space-based devices designed and flight tested to attack, impair or destroy objects in space or on Earth. In other words, weapons that are designed to be "mass-to-mass" or that create physical effects on a satellite. This definition respects the distinction between capability and actuality. It excludes residual or latent space warfare capabilities such as ballistic missiles that temporarily travel through space en route to their destination. Also excluded in this working definition are satellites that provide essential military functions, but which

do not serve as weapon platforms. In other words, the definition used here clarifies the essential distinction between the current military uses of space and the flight testing and deployment of space weapons that some wish to pursue in the future.[5] This definition also excludes activities that are specifically designed to interfere with the uplinks or downlinks of satellites. Jamming is treated separately from direct, physical attacks against satellites because jamming has long been considered a part of warfare, whereas direct attacks in or from space would be consequential firsts in the history of warfare.

THE PERILS OF ANTI-SATELLITE TESTING

It is even harder to control or limit the effects of weapons in space than on Earth. When sea battles occur, debris sinks to the bottom of the ocean, but when space warfare occurs, debris can linger for years or for millennia, depending on the orbit where combat takes place. The problematic dimensions of weapon effects have previously helped to dampen interest in space weapons. The first profoundly disturbing glimpse of the dangers of space warfare occurred prior to the signing of the Limited Test Ban Treaty in 1963. Before this, the former Soviet Union and the United States tested nuclear weapons repeatedly in the atmosphere. One US test series, code named STARFISH in 1962, unwittingly and indiscriminately killed or damaged four US satellites, one British satellite and a Soviet satellite.[6] Realizing the dangerous and catastrophic nature of atmospheric and space-based nuclear weapon tests, and respecting the provisions of the Limited Test Ban Treaty to not test in space, the former Soviet Union and the United States (and later 121 other countries) agreed under the Outer Space Treaty of 1967 not to place weapons of mass destruction in outer space.

The preferred way of testing satellite-killing weapons in the 1970s and 1980s was by means of a direct collision. These Cold War-era anti-satellite weapons (ASATs) tests were an infrequent occurrence: the number of ASAT tests carried out by both nuclear superpowers averaged less than two per year during the 34 years between the launch of Sputnik and the demise of the Soviet Union.[7] In contrast, Moscow and Washington together averaged one nuclear test nearly every week during this time frame.[8]

The last Cold War-era ASAT test was in 1985, when a US F-15 fired a direct homing device against an ageing US satellite engaged in

meteorological research. The resulting impact created over 250 pieces of space debris that were visible to US space surveillance systems.[9] The last piece of debris de-orbited 17 years later.[10] One piece of space junk from this ASAT test came within one mile of the International Space Station.[11] As with the earlier atmospheric nuclear tests during the 1970s and 1980s, few appreciated how debris created by ASAT tests could cause harm to one's own or friendly satellites.[12]

Currently, there is far greater recognition that space debris is an indiscriminate killer and the biggest threat to satellites, the Space Shuttle and the International Space Station. The National Aeronautics and Space Administration (NASA) has preliminarily reported that if another catastrophic accident occurs to the space shuttle, there is a 50% chance that it would be the result of space debris.[13] Even in the absence of ASAT tests over the past two decades, the amount of orbital debris has doubled. In a typical year, 150 metric tons of debris, including paint flecks, pieces of rocket boosters and stray nuts and bolts are placed into orbit.[14] Over 13,000 objects greater than 10 centimetres in diameter are now tracked by the US Air Force Space Command.[15]

With new appreciation for the dangers created by space debris, the international community has begun working on mitigation strategies. NASA and the European Space Agency, among 11 space agencies, have formed the Inter-Agency Debris Coordination Committee and have published a set of guidelines to mitigate space debris. These worthwhile steps would be overwhelmed if space warfare occurred and produced debris fields.

Because of the potential dangers posed by debris to US and friendly satellites, the Pentagon now proposes to focus on offensive space warfare capabilities featuring temporary and reversible effects. There are, however, no guarantees that adversaries would engage in space warfare using similarly polite rules. Dictating the rules of warfare has not been easy for the United States on the ground, and may be no easier in space.

ASATS AND VERTICAL PROLIFERATION

For space warfare initiatives to generate an arms race, both contestants need to be able to compete, and see value or necessity in the competition. Moscow's ability to engage in an arms race with the United States is now

very much in doubt. The Stockholm International Peace Research Institute estimates Russian military expenditures to be approximately US$ 20 billion a year, or less than 5% of the US defence budget.[16] Russian-deployed nuclear forces continue to decline in numbers, the result of block obsolescence of Cold War-era investments, funding constraints, defence production impediments and national decisions to apply limited resources to other priorities. From a high point in 1986 of over 40,000 stockpiled warheads, the Russian nuclear arsenal is estimated to consist of 16,000 warheads, no more than half of which may now be operational.[17] By contrast, during certain phases of the Cold War, the former Soviet Union increased its stockpile size by 1,000 warheads per year.[18] It will be difficult for Moscow to reverse the decline of its strategic nuclear arsenal, let alone engage in an arms race at present. While the Russian Federation's economic prospects have improved since 2002, these constraining factors still apply, suggesting that new predictions of an arms race in the event of a resumption of US space warfare tests are overdrawn.

Space-based weapons directed at terrestrial targets have long been a concern to Moscow, but the Pentagon's track record in this regard has been poor. These concepts remain technically challenging, extremely expensive, susceptible to countermeasures and politically unpopular. Unlike space- and ground-based missile defences, ASATs are relatively cheap to build and easy to deploy. Moscow is, therefore, likely to view the resumption of US ASAT testing as a very real potential threat. However, as was the case with the US withdrawal from the Anti-Ballistic Missile (ABM) Treaty and the initiation of limited national missile defence deployments, the resumption of ASAT testing by the United States is unlikely to prompt Moscow to engage in an arms race. Adjustments in the Russian Federation's strategic force posture, such as an increased commitment to deploying survivable, launch-ready strategic forces with improved penetration capabilities, as well as continued heavy reliance on tactical nuclear weapons, might be expected within the context of financial and structural constraints.

Compared to Moscow, Beijing is better positioned economically to increase its strategic forces if the Pentagon implements its new doctrine for space control. Beijing's views regarding space-to-ground weapons, national missile defence and ASATs are likely to parallel those of Moscow. A united diplomatic front on space weapons between Beijing and Moscow is now very much in evidence, with military and technical interactions also possible. Beijing will need to be more sensitive than Moscow about US

national missile defence deployments, given the far smaller size and more relaxed readiness rates of its strategic nuclear forces, but Beijing possesses an insurance policy in the form of a burgeoning supply of shorter-range missiles that can target nearby US bases, allies and friends.

China's strategic nuclear posture was markedly relaxed during the Cold War, when Beijing faced not one, but two hostile nuclear superpowers. Even during the height of the border dispute with Moscow in 1969, Beijing kept its nuclear powder dry.[19] Now, as then, Beijing's leadership appears confident that national security interests can be met with numbers of strategic nuclear delivery vehicles that Moscow or Washington would consider to be unacceptably low. Since the early 1980s, public estimates of the total inventory of Chinese warheads have remained flat, with recent unclassified estimates suggesting a total stockpile of perhaps 200 weapons, of which approximately 130 may be operationally deployed.[20] The Pentagon currently estimates that China has deployed approximately 20 intercontinental ballistic missiles (ICBMs). This number is expected to grow to perhaps 60 ICBMs by 2010, an increase of eight per year.[21] By way of comparison, during peak periods of the Cold War arms race, the former Soviet Union and the United States each produced an average of 300 ocean-spanning missiles annually.[22]

China's strategic nuclear forces, unlike those of the Russian Federation and the United States, have remained at low states of readiness to respond in the event of an attack. China's liquid-fuelled ICBMs may not be mated with warheads. The deployed Chinese ballistic missile nuclear submarine "fleet" presently consists of one boat, which has difficulty operating at sea.[23] Furthermore, China rarely tests its ICBMs, having carried out no more than 20 such tests over the last 34 years.[24] In contrast, during the Cold War arms race, it was not unusual for the former Soviet Union and the United States to each flight test over 35 ocean-spanning missiles per year.[25]

The relaxed biorhythms of China's strategic modernization programmes suggest a strong inclination to spend as little as is required to deter nuclear threats, while applying resources to higher priorities such as the maintenance of domestic tranquillity, economic growth and contingencies related to Taiwan. While more attention is being paid to China's longest-range nuclear forces, these efforts do not begin to rise to the level of an arms race.[26]

Beijing, like Moscow, is likely to retain and improve various means to counter US space warfare initiatives,[27] while pursuing diplomatic initiatives against the resumption by Washington of flight-testing techniques for space weapons.[28] If, however, Washington initiates flight tests of an actual ASAT, Beijing and Moscow are unlikely to remain passive. Whether their responses are subtle or overt would depend on how they perceive they can best influence US choices, while meeting national security requirements.

ASATS AND HORIZONTAL PROLIFERATION

The states of greatest proliferation concern at present—the Democratic People's Republic of Korea and the Islamic Republic of Iran—are a very poor match for US power projection capabilities. This relative weakness is not, however, the only reason for Pyongyang's and Tehran's interest in nuclear capabilities. Iranian security concerns extend to Israel and to states in the region that permit the basing of US forces. Iranian leaders may also view nuclear weapons as modern symbols befitting a proud, ancient civilization.[29] Speculation regarding the Democratic People's Republic of Korea's nuclear programme usually centres on Pyongyang's security concerns regarding Japan and the United States. The Democratic People's Republic of Korea's nuclear and missile programmes also provide an equalizer to the Republic of Korea's stronger and more modern armed forces as well as rationales for forcing engagement with Pyongyang.[30]

The flight testing and deployment of space weapons by the United States would certainly be noticed by Pyongyang and Tehran, but such US steps would not greatly affect the existing imbalance of power. Pyongyang and Tehran are unlikely to respond in kind in the event that the United States initiates the flight testing and deployment of space weapons. Granted, the Democratic People's Republic of Korea's Tapeodong and Nodong missiles could be used for space launches and space warfare. Pyongyang launched a missile over Japanese territory in 1998 that failed to place a satellite in orbit, but very much succeeded in gaining the attention of Tokyo and Washington.[31] If the Democratic People's Republic of Korea has produced a small number of nuclear weapons and is able to fit them atop missiles, Pyongyang could destroy or damage many satellites in low-Earth orbit with a nuclear detonation. In doing so, however, Pyongyang would not only be striking at the United States, but also other space-faring nations whose diplomatic support it seeks, especially China. Pyongyang

could also use non-nuclear means, but would need to possess improved space tracking and accurate orbital insertion capabilities.

The Islamic Republic of Iran possesses a variant of the Democratic People's Republic of Korea's Nodong missile, which it calls the Shahab-3. Over time, it, too, could possess rudimentary space warfare capabilities.[32] But the Democratic People's Republic of Korea and the Islamic Republic of Iran do not need to launch ASATs in order to respond negatively to US space warfare initiatives. They might also try to interfere with US satellites by jamming techniques using Russian-built equipment, as did units of the Iraqi Republican Guard during the 2003 invasion of Iraq. Iraqi efforts, however, were foiled by the very satellite-guided munitions they were trying to neutralize.[33]

The dictates of asymmetric warfare suggest that while rudimentary forms of space-related initiatives by Pyongyang and Tehran cannot be ruled out in the future, it is more likely that they would seek to produce casualties on the ground rather than try to damage inanimate objects in space. The proximity of forward-deployed US forces as well as US allies and friends provide a "target rich" environment for asymmetric attacks. Covert attacks against the US homeland by various means would also seem to be more likely than more easily attributable attacks against US satellites. The flight testing and deployment of space warfare capabilities by the United States are not likely to alter the outcome of a war between the United States and either the Democratic People's Republic of Korea or the Islamic Republic of Iran. Nor would US offensive space warfare initiatives be likely to stop either of these two countries from harming the United States and its allies and friends in the event of a conflict.

Given these pre-existing conditions it is unlikely that new US offensive space warfare capabilities would prompt a large increase in Pyongyang's and Tehran's nuclear stockpile requirements. Increases in or threats to increase nuclear stockpiles could, however, occur for non-military reasons such as seeking to influence US, allied or major power diplomacy. Any increase in the Democratic People's Republic of Korea's or the Islamic Republic of Iran's nuclear capabilities for any reason would be unwelcome and could well have adverse proliferation consequences. In addition, the absence of an overt arms race would provide little comfort if small amounts of weapons-usable material or a single warhead change hands as a result of newly enlarged stockpiles. Put simply, the absence of arms racing, whether

along the vertical or horizontal axis, is a poor indicator of the net proliferation effects of US space weapon programmes.

DOMINANCE VERSUS PROLIFERATION

The United States already enjoys military superiority with respect to ground, naval, air and nuclear forces. In addition, the United States utilizes space for military purposes far more than any other nation. The military use of space conveys many advantages to US forces, helping to deter war and, if conflict arises, facilitating quick and successful military campaigns with a minimum of casualties and collateral damage. Adding offensive space warfare capabilities to existing US military dominance does not automatically equate to more success on the battlefield. Space weapons could greatly compound the difficulties faced by expeditionary forces in harm's way if the net result of space weapons endangers rather than protects US satellites.[34]

The protection of vital US satellites by means of space weapons requires the ability to dictate how a war in space would be waged. Space control, therefore, requires doctrine and capabilities not only to seize the initiative, but also to prevent weaker foes from successfully retaliating.[35] The clear US preference is to engage, if needed, in offensive operations using non-destructive means. The Pentagon does not, however, rule out the use of destructive methods in space.

It is most unlikely that weaker adversaries would play by Marquis of Queensbury rules in space in the event of US space warfare initiatives. Moreover, the implementation of a proactive and pre-emptive strategy of space control requires timely, accurate intelligence so that the initiative can be taken before US satellites are placed at risk. If the United States cares about lining up domestic and international support in the event of the first direct attack against a satellite in the history of warfare, then the intelligence supporting this action must be publicly persuasive. These are all very daunting requirements.

Effective preventive diplomacy in hard proliferation cases is clearly preferable to preventive war. Successful preventive diplomacy in such cases depends, in significant measure, on whether Washington is able to forge a united front among the Permanent Members of the UN Security Council

and among friends and allies in regions that are threatened by proliferation. The flight testing and deployment of space weapons by the United States are likely to make it harder for Washington to round up help against hard proliferation cases. They are also likely to lead more states to seek insurance and deterrence policies against US power projection capabilities.

It is very difficult for the use of force to compensate for missing elements of a comprehensive non-proliferation and disarmament strategy. The risk of failure can be reduced, however, if the dominant state that threatens or uses force does so on behalf of norms that have broad international support. Conversely, when the dominant state disapproves of or rejects key elements of non-proliferation and disarmament regimes, garnering support for the use of force can be quite difficult. Under these circumstances, the use of force is not intended to bolster universal norms; instead, it is directed against a particular object. We should not be surprised, in such cases, when the use of force does more harm than good for non-proliferation.

The proliferation consequences of military dominance, combined with disinterest in key elements of a comprehensive approach to non-proliferation and disarmament, are now evident. The Bush Administration's ability to strengthen non-proliferation norms is limited by its "*a la carte*" approach to treaties and norms. The administration does not want others to resume testing nuclear weapons, while opposing ratification of the Comprehensive Test Ban Treaty. It seeks to prevent Russian nuclear commerce with the Islamic Republic of Iran, while desiring to engage in nuclear commerce with India. It seeks the adoption of intrusive monitoring in states suspected of proliferation, while sloughing off intrusive monitoring on US soil.

The results of this highly selective approach to non-proliferation and disarmament are internally consistent, but externally corrosive to global efforts to strengthen non-proliferation and disarmament agreements. The dominant power sets trends that others follow. If the United States deems it essential to adopt an *a la carte* approach to treaties and norms, others will order from this menu. When more customers order *a la carte*, treaties become hollow, and norms are sacrificed to hedging strategies. When the most powerful nation in the world undercuts treaty regimes and norms, weaker states cannot provide compensatory support. Major powers that are concerned by US military dominance become "free riders", standing on the

sidelines in hard proliferation cases. They might also view US travails in dealing with proliferation as not being inimical to their interests. US dominance is proving to be a poor substitute for treaty norms, and an insufficient lever for collective security or unilateral enforcement.

Successful efforts to stop and reverse proliferation face long odds when the dominant state demands to play by its own rules. These odds become even longer when the dominant state cannot enlist the active support of Beijing and Moscow on hard proliferation cases that bother Washington more than them. Official Chinese and Russian threat perceptions of the United States are not articulated in public, but they may reasonably be inferred. Both capitals might well question why Washington seeks to extend its military dominance into space by pursuing capabilities that would not be particularly helpful in scenarios involving the Democratic People's Republic of Korea, the Islamic Republic of Iran or other developing countries. Instead, the pursuit of US dominance into space may well be viewed by Beijing and Moscow as part of a broader effort to negate their nuclear deterrents. If so, prospects for non-proliferation and disarmament would further decline.

CONCLUSION

The Nuclear Non-Proliferation Treaty (NPT) regime was devised during the Cold War, when non-proliferation was one of the few large enterprises that Moscow, Washington and their allies could agree upon. Another important common interest during the Cold War was the inadvisability of initiating space warfare. It remains to be seen whether a unipolar system will be equally as effective in controlling proliferation or refraining from space warfare, but the early returns are not encouraging.

Space has been blessedly free of weapons, and for the last two decades it has been free of anti-satellite tests as well. Political sensitivities against crossing these thresholds are heightened, and efforts to do so will be quite divisive in the United States, in allied countries and elsewhere. China and the Russian Federation, the two nations whose assistance the United States needs most to stop and reverse hard proliferation cases, are likely to be most sensitive to the Pentagon's interest in space dominance.

Space warfare initiatives are, therefore, not merely emblematic of the difficulties facing existing norms, agreements and institutions designed to prevent proliferation and disarmament. A direct, physical attack against a satellite would be an historic first in the annals of warfare. The implementation of new doctrine and new capabilities for space warfare would come at a time when non-proliferation and disarmament compacts are under severe strain, when hedging strategies are growing and united fronts to stop and reverse these trends are scarce. The pursuit of offensive space warfare initiatives would surely accelerate these negative trends.

Notes

1 An expanded version of this essay appears in *Non-proliferation Review*, 2005 (summer), vol. 12, no. 2.

2 The authors would like to thank Ellen Laipson, Clay Moltz and an anonymous reviewer for their comments.

3 For example, critics Helen Caldicott and Craig Eisendrath argue that "placing weapons in space inevitably would provoke an arms race there. Such a race eventually would consume hundreds of billions of dollars." Supporters of space warfare initiatives also base their advocacy, at least in part, on pre-empting an arms race. Everett Dolman argues that "the time to weaponize and administer space for the good of global commerce is now, when the United States could do so without fear of an arms race there". See No Weapons in Space, *Baltimore Sun*, 16 May 2005; Leonard David, Weapons in Space: Dawn of a New Era, Space.com, 17 June 2005, at <www.space.com/news/050617_space_warfare.html>.

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15 Theresa Hitchens, 2004, *Future Security in Space: Charting a Cooperative Approach,* September, Washington, DC, Center for Defense Information, p. 26.

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18 Ibid.

19 Central Intelligence Agency, 1970, *Intelligence Memorandum: Military Forces Along the Sino-Soviet Border*, SR IM 70-5, 1 January, Washington, DC, Office of Public Affairs, p. 1; Central Intelligence Agency, 1969, *Weekly Summary*, 15 August, Washington, DC, Office of Public Affairs, p. 10; Central Intelligence Agency, 1969, *National Intelligence Estimate: The USSR and China*, NIE 11/13-69, 12 August, Washington, DC, Office of Public Affairs, p. 5.

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21 United States Department of Defense, op. cit.

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[35] For the Bush Administration's national security, doctrinal and supplementary policy statements related to space control, see United States Department of Defense, 2004, *National Defense Strategy of the United States of America*, Washington, DC, pp. 12–15; Department of Defense, 2004, *Joint Doctrine for Space Operations*, Joint Publication 3–14, 9 August, Washington, DC, at <www.dtic.mil/doctrine/jel/new_pubs/jp3-14.pdf>; United States Air Force, 2003, *Counterspace Operations*, Air Force Doctrine Document 2.2-1, Washington, DC; United States Air Force, 2003, *Transformation Flight Plan*, November, Washington, DC, pp. 49–74.