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ABSTRACT

This paper evaluates the importance of a space military strategy for India against China. It advances the view that in light of China's advances in space weapons, New Delhi needs to seriously consider developing at least a limited menu space weapons and integrate them into India's defence posture. It draws on conceptual literature on nuclear deterrence, air power and sea power to show that space weapons, at least some variants, are usable military instruments and must be related to objectives. Space deterrence is most analogous to nuclear deterrence, yet not identical. The most conceivable scenario where the space medium will potentially play an active role and the offsetting space military capabilities of India and China are likely to be employed in the context of a Sino-Indian land war. Therefore, as the analysis shows, an Indian space weapons capability serves two purposes: deterrence and warfighting.

INTRODUCTION

Most Indian analyses address the importance of the country's space programme for military purposes,¹ yet fail to establish what exactly should constitute a space military strategy for India vis-à-vis China. Do Indian space military capabilities serve as instruments of coercion and warfighting? It remains unexplained why and how available and potential

Indian space military power should be disciplined to meet objectives likely to be in dispute. The most critical contribution of current literature has been on the technical side of what comprises Indian space capabilities.² Therefore, one of the lacuna is at the conceptual level in rationalising a space military strategy. Space deterrence is feasible; so is space warfighting. To the extent that India's space strategy vis-à-vis China, if it has any, requires Indian strategic managers and policymakers to clearly delineate whether they see space as a medium for conducting terrestrial military operations or a domain for conducting military operations. This would mean developing and deploying militarily applicable technological capacities and assets for the conduct of defensive and offensive, space-based military operations or counter-space missions against a potential Chinese space military offensive on Indian space-based assets in the event of a land war.

At one level, space as a *medium* and as a *domain* for the conduct of military operations are interrelated—corresponding roughly with the tensions between deterrence and warfighting. Interests determine objectives. An Indian space military strategy, and the capabilities that will be a part of it, should be directed towards those goals. As the title of this paper suggests, India's interests across its disputed frontier with China give it a ready and immediate rationale for space military capabilities vis-à-vis its neighbour. It serves two purposes: deterrence that will prevent China from using its space military capabilities against India, and space warfighting in the event deterrence fails. By definition, 'strategy' is the relationship between means and ends to the extent it is based on available—or how *potentially* available—military power ought to be employed to serve specific goals.

Therefore, means and ends matter in that even a pure territorial defence requires that India build space military capabilities as the space medium will play an active part in a Sino-Indian land war. In any territorial contest, the political and military objectives are the same.³ The space medium will inevitably play an important role in a boundary war. This

paper argues that a space military capability, at least in certain forms, can be ‘conventionalised’ and, therefore, Indian decision-makers ought to invest in these military instruments, precisely because they are more usable and could potentially be used by China in a land war against India if deterrence failed. This paper endeavours to justify why India needs a space military posture vis-à-vis China conceptually.

A space deterrent strategy is most analogous and not identical to a nuclear deterrent strategy. There are similarities and differences, but more relative rather than absolute. Nuclear weapons are “special weapons” as Hans Morgenthau showed, simply because of the destructive consequences of using atomic weapons, whether on earth or in space.⁴ Nuclear-tipped space weapons have the same quality, yet non-nuclear space weapons are more “conventionalisable”, in that they are more usable. Even here, differentials exist in the category of space weapons. Usability of non-kinetic weapons is greater than direct ascent conventional kinetic weapons, which in turn are more usable than nuclear-tipped space weapons. This is due in part to the fact that the space environment does not readily lend itself to the usage of debris generating kinetic weapons, let alone nuclear weapons. Conventionalisation, or the conventionalisability of space weapons, will form the conceptual core of this analysis. Decision-makers, military planning staff at the armed service headquarters, the larger strategic community in India, and the public ought to consider space weapons and their integration into India's military posture against China. Therefore, this analysis lacks any overarching theoretical framework, but provides a conceptual and a conceivable basis for the need to develop an Indian space weapons programme and integrate it into India's defence posture against China.

The first part of this paper evaluates the distinctions between denial-based strategies and control-based strategies by drawing on concepts of air power and sea power theories, their limits and usefulness. It shows why nuclear deterrence strategy is most analogous to space deterrence as it is the most useful analogue, albeit inadequate, stemming from the fact that

space weapons are indeed warfighting instruments in certain forms. Sea and air power concepts are useful in crafting a space military strategy that will affect a land conflict. Yet these too are inadequate, because space deterrence is also feasible or possible, provided retaliatory capabilities are developed.

The second part of this paper examines the nature of the space environment, which is crucial to understanding what India can and cannot do. While the physical properties of space exert their objective constraints, the use of conventional space weapons is relatively easier than the use of nuclear weapons, either terrestrially or in space. Any space military encounter between India and China—where the space medium plays an active part or space itself becomes a domain for action—will be intricately linked to adverse developments along their disputed land frontier. Terrestrial factors will determine and influence what happens in space. Therefore, the margin of uncertainty and the consequences of space weapons usage is somewhat lower than the use of nuclear weapons, making the former more usable. It also gives the reader context by drawing a distinction between the conduct of space military operations and that of terrestrial missions.

The third part looks at the effect of legal restraints against space weaponisation, analysing whether India should fetter its acquisition of space weapons through legal regimes. Legally restricting New Delhi's procurement of space weapons would only serve to bequeath an asymmetric advantage to China, which already has proven and tested space military capacities. At best, as this section demonstrates, tacit restraint between Beijing and New Delhi on the condition the latter complement it with the accumulation of space combat power. Legal restraints are extremely difficult to negotiate and fetter the acquisition of what are conventionalisable weapons systems.

The fourth part explains why a blend of finite deterrence and a limited space weapons employment strategy serves India well. It sets out to

explain why space deterrence is feasible, provided New Delhi invests in space weapons. However, any use of space weapons by India can only be geared to retaliate, and in the event of deterrence failure, to limit damage and raise costs against China from continued hostilities in a land war, rather than an all-out blow to eliminate Chinese space capabilities. Deterrence through denial and deterrence through punishment are two forms of deterrence that will be analysed. Denial can frustrate, thwart and even defeat the adversary from making territorial gains using the space medium.

The paper concludes by explicating the importance of relative and absolute capabilities, defining what the scope of India's space military capabilities should be. At a minimum, it recommends that India have non-kinetic means of attack; at the most, kinetic means of attack.

NUCLEAR DETERRENCE THEORY, AND SEA POWER AND AIR POWER THEORIES IN TERRESTRIAL AND SPACE OPERATIONS

In the event of a land war between India and China, New Delhi will have to seriously consider the importance of the space medium in the conduct of terrestrial operations and the prosecution of operations in space. For instance, as a counter-offensive to a Chinese land attack against India's territorial defences, the premium on developing space weapons is high. Indeed, a report which received the endorsement by the then National Security Advisor Shiv Shankar Menon, titled, *Non-alignment 2.0* and released in 2012 observed: "Whether China resorts to a limited or a larger offensive – our aim should be the restoration of *status quo ante*.⁵ But this does not mean that we will have to resort to a purely defensive strategy...Such a strategy will not only wrest the initiative from the Chinese, but will also be useful for our diplomatic efforts to restore status quo ante. While the report offered a superficial assessment of how Indian space military capabilities ought to be employed, it also called for an asymmetric strategy against a Chinese land attack across the frontier. The

authors of the report, however, did not include asymmetric responses in space or denying China exclusive access to the space medium, which will be pivotal in the early stages of a land war between India and China.⁶

Further, using the sea power and air power analogies, scholars and analysts have tended to ignore that “sea control” or “command of the air” are distinct from “control” in space. Indeed, a Report of the Institute for Defence Studies and Analyses (IDSA)-Pugwash Society Working Group on Space Security observed: “Evolution of a comprehensive 'Space Defence' or 'Space Control' policy will require a high degree of integration of space and defence capabilities.”⁷ As far as integrating space and existing Indian conventional military capabilities go, this statement makes sense. It is unclear what the report meant by “Space Control”—Was the implication military, as one would assume “sea control”? If it is military, it only invites further questions: How does one exercise “control” in space? Should India make military dominance its space policy?

Typically, control-based approaches comprise naval, air, and ground operations. Control-based strategies seek optimum objectives and deny the opponent any choice.⁸ In the case of the former, there are examples of 'sea control' advanced by the American naval strategist Alfred Thayer Mahan, such as the ease with which defence of littoral seas can be sustained, in part to shore-based support. Further, if the navy is large as was the case with the erstwhile British High Seas Fleet that was fast and endowed with high firepower allowing it to dominate vast ocean spaces. In the case of airpower, a control-based approach can be pursued such as the American tactical air forces defeat of the Japanese air force during World War II. In space, exclusion of other parties is not technically feasible. As the American Cold War strategist Herman Kahn observed: “It is very easy to make the obvious Mahan analogy on 'control of the sea' and talk blithely and superficially of 'control of space.' The analogy was never really accurate even for control of the air, and...it seems to be completely misleading for space.”⁹ Consequently, space control, dominance or space superiority are

illusory, rendering the IDSA-Pugwash Society statement problematic. More relevantly, the pursuit of denial in space can enable territorial “control”. Space capabilities and the space medium offer several distinct benefits in this regard: They allow for precision movement and precision strike, weather updates, photographic, signal and electronic intelligence assist in determining the enemy's “order of battle” and can tilt the balance of forces at the terrestrial level.¹⁰

As John Mearsheimer, American foreign affairs scholar, accurately observed: “Armies, along with their supporting air and naval forces, are the paramount form of military power in the modern world...even in a nuclear world, land power remains king.”¹¹ Indeed, Mearsheimer—who is otherwise a fine realist thinker—overlooked space military forces and the space medium playing an active part in a land war. Therefore, given the disparity in space military power between New Delhi and Beijing, the space medium for China, given its present capabilities, could decisively shift the land balance against India if Beijing were to go to war today. Indeed, *Nonalignment 2.0*. at best sees space as a medium of warfare or an adjunct to a surface engagement across the disputed Sino-Indian Himalayan frontier. The report, which calls for asymmetric responses by India against a Chinese land attack, does not adequately deal with space as domain for asymmetric action, nor calls for India to pursue asymmetric action against China.¹² Indeed, a direct ascent ASAT capability will serve an asymmetric deterrent strategy. To the credit of the report's authors, they considered cyber warfare capabilities as a critical means to offset China's superior military strength, but do not precisely elaborate on directing cyber capabilities to target the ground nodes of the Chinese space segment.¹³

Yet if sea control does not suffice, is sea denial satisfactory as an analogy? It is, to a significant degree. Sea denial prevents an adversary from obtaining exclusive access to an area of the sea, to the extent that the enemy's operations in contested waters are constrained. Yet sea denial is limited in place and time. It is a form of guerrilla warfare at sea which

requires the employment of hit-and-run tactics, making it an asymmetrical form of warfare. However, even 'sea denial' can be as confusing a concept as 'sea control', because a navy (or navies) can pursue denial-based operations in one area of the sea or ocean and simultaneously pursue sea control in another. As the British naval thinker Geoffrey Till observed, denial can lead to control elsewhere and treated as an indirect strategy, as the Americans and the British did against Japan during World War II by pursuing denial in the Indian Ocean and control in the Western Pacific.¹⁴

Some air power theorists consider air power as the closest analogue to space power.¹⁵ Giulio Douhet, the Italian air power theorist, proposed that the advent of air power meant that "the decisive field of action will be the aerial field."¹⁶ This assumption flowed naturally from Douhet's view that air power could strike easily at the enemy's population and break its will by circumventing any land battle with the enemy. This presumption was highly flawed, as the experience of World II and other succeeding wars have shown that the use of air power was, and continues to be, intricately connected to ground engagements and air power can only aid a land war. Douhet also underestimated the extent to which populations were far more resilient and adaptable in the face of enemy air attacks, until the arrival of nuclear weapons.¹⁷

Further, the control of the enemy's airspace overlooked the development of radar which would give the defender advance warning of the attacker's air assault, allowing the defender adequate time to mobilise its Air Force for interception. Subsequent developments of Surface to Air Missiles (SAMs) also enabled the destruction of the enemy's aircraft. Indeed, control or command of the air can occur only after defeating the enemy's air forces, as was shown by the Allies against the Axis Powers in World War II. War, as Clausewitz observed, is a contest between animate entities with opposing wills and opposing capabilities.¹⁸ If the purpose were to shock the enemy into submission, the state embarking on a shock

attack would need the element of surprise. Space provides opportunities for a surprise attack that can seriously impair the effective performance and operation of spacecraft. At present, there exists no credible or effectively survivable defence against a space attack. In space, attacking is easier than defending. Air-power concepts in this regard such as “command of the air” are inadequate because the defender can intercept the enemy's air force. Only a defeat of the enemy's air force can lead to the command of the air. Nor do the strident advocates of air-power theories, which they see as somewhat adaptable to the space environment, ever fully consider fighting in the aerodynamic environment of planet earth where the risks and costs and the destructive consequences of fighting a conventional aerial war are less than fighting a space war due to orbital mechanics. Any attrition space war involving kinetic weapons would mean more debris in space. There are thus some significant constraints to fighting a war in space, making deterrence feasible. Yet if any space war ever happened, which air-power theorists believe to be likely, it will conceivably be fought non-kinetically even if a non-kinetic space war has not actually occurred. This non-kinetic warfare will occur most likely between states with the most advanced space military programmes, which is unlikely to be conducted independently of terrestrial objectives.

Space is the fourth medium of warfare, intricately connected to land, sea and air warfare. Denial in space requires redundancy: more than depriving the enemy the use or exclusive access to the space medium, it constrains the enemy's capacity to target all of one's satellites, which ought to be numerous if denial in space is to have any chance of success. For instance, saturating space with a large number of satellites is only one-way and a rather passive means of denying the adversary exclusive access to space. It is also a form of space defence. Ground-based lasers can jam satellites. Cyber warfare capabilities can shut down the electrical grids to which ground tracking and telemetry stations are connected. On the other hand, there are also active measures such as targeting the ground nodes (e.g., ground stations and telemetry stations) of the adversary using Land

Attack Cruise Missile (LACMs). A direct ascent Anti-Satellite (ASAT) weapon is also another active and potent means of destroying satellite targets. Yet unlike sea denial, it is also different because orbital mechanics constrain the use of space weapons because of the sheer expanse of space, which denude opportunities for precisely targeting satellite assets. However, this constraint is not absolute and only relative when it comes to space deterrence and warfare.

Ultimately, nuclear power or strategy serves the best analogy. Just as nuclear deterrent strategy lends itself to deductive reasoning,¹⁹ so does space strategy, to the extent that no space war has ever happened just as no nuclear war has. Unlike land, air and naval wars, there is no historical precedent for the conduct of a space war, even as space has served as a critical medium in the pursuit of conventional military operations.

The closest that respected contemporary scholars has come to drawing an analogy between a space strategy and nuclear strategy is that done by Karl Mueller of the RAND Corporation. Mueller showed that the costs of using space weapons—particularly anti-satellite weapons—are lower than nuclear weapons. This author draws on some conceptual themes outlined by Mueller, but reiterates that the purpose of this article is to delineate the conceptual predicates that should form India's space military strategy and to make the reader understand that the acquisition of space military capabilities or space weapons must connect to certain objectives. Although Mueller himself does not use the term, space weapons are conventionalisable.²⁰ Further, conventionalisability of space weapons assumes greater salience between India and China, principally due to their disputed land frontier. Contested territorial sovereignty between the two states serves as a strong political incentive for the use of space weapons in a potential land war. The conflictual interests between India and China and their characteristics render space weapons conventionalisable. In order to establish why space weapons are conventionisable, this paper draws clear distinctions between the space and earth environments.

SPACE ENVIRONMENT AND TERRESTRIAL ENVIRONMENT: DEFINING CHARACTERISTICS

The physical attributes of the space environment are unique and need elucidation. Consider nuclear explosions in space as opposed to earth-based detonations. On earth or in near proximity to the earth's surface, when nuclear explosives are detonated, air density significantly reduces nuclear radiation, causing the release of neutrons and gamma rays to an extent that the adverse impact of gamma and neutron radiation is less intense than the heat generated by a nuclear detonation. Therefore, even a fission device of 20 kilotons will be more potent in radiation effects in space than on earth. The effects of nuclear detonation are reversed when heat is involved. On earth, heat intensity from a nuclear blast is greater than in space. In vacuum-packed space there is no blast, whereas on earth there is, because of the atmosphere. A core property of the earth's atmosphere is oxygen that helps sustain high heat levels from a detonation. Absent an atmosphere in the space environment, thermal radiation is low, whereas nuclear radiation is high, making it unsustainable for human beings to survive, let alone pursue manned space missions.²¹ Indeed, manned military or civilian space flights would be impossible if nuclear detonations were undertaken in space. These include the Soviet Vostok missions carried out during the period 1961-1963 and the Vodshod mission series in 1964-1965. This also held true for the American Mercury missions undertaken between 1961 to 1963, the Gemini missions that followed from 1963 to 1968 and the Apollo missions thereafter between 1968 to 1972. Radiation trapped in the Van Allen belts would have made these space enterprises impossible.²²

Moreover, the natural characteristics of space encompass orbital mechanics as opposed to aerodynamics that characterise the earth environment. Orbital mechanics do not allow spacecraft or space objects to remain static. Indeed, movement in space is relentless. Given constant movement of space objects, any orbital warfare that seriously generates debris would end up redounding to the disadvantage of the attacker, as

much as to the defender. Secondly, the attacker cannot know for sure how the defender will react, particularly if the defender has retaliatory capability. The fragility of the space domain creates uncertainties that will cut both ways for the attacker and the defender in any potential confrontation. Thus, space deterrence could work much like nuclear deterrence. The only crucial difference between nuclear deterrence and space deterrence is that the margin of uncertainty is lower in the latter, which renders conventional space weapons more usable as opposed to nuclear weapons.

Space's physical nature does not easily allow for offensive military action using kinetic systems. To those extent notions like "space dominance" and "space superiority" are a chimera due to the prohibitive costs for any major space-faring state to employ its capabilities for the conduct of military operations in space-to-space missions or even ground-to-space missions. Indeed, it parallels, to some degree, nuclear first use or a nuclear offensive, which is not easy. Nuclear weapons were used for the first and only time thus far by the United States against Japan, a country that had no means to retaliate during World War II. Given the reciprocal possession of nuclear weapons by states, political leaders in the nuclear age have been resistant to putting their people at risk, given the power of these weapons to eliminate massive populations.²³ Similarly, no space power, which has a consequential space military programme, including the United States, has an asymmetric advantage today against its adversaries.²⁴ Their reliance on space for a range of terrestrial activities such as communications, meteorology, monitoring volcanic eruptions, earthquakes, mineral and resource mapping and international commerce, will be undone. The economic costs of weapons use in space are extremely high.²⁵ As Henry Kissinger once famously observed about nuclear weapons and strategy: "What in the name of God is nuclear superiority?"²⁶ Likewise, what in the name of God is space superiority? Leave aside nuclear detonations in space; conventionally armed space debris-generating attack could render unusable large parts of orbital belts. As Cordesman and

Kendall observed: “On the strategic side, the US needs to fully prepare for the fact it will not have anything like the unilateral space superiority it had in the past, and could potentially lose critical space capabilities altogether.”²⁷ As they went on to elaborate, China—which pursues an asymmetric space military strategy against the US—has a certain set of advantages. It can surprise with a first strike and inflict heavy damage on America's space infrastructure, if not completely destroy it.²⁸ India, on the other hand, stands to lose even more, because its space infrastructure is so much smaller than the other advanced space-faring countries and has few consequential retaliatory capabilities. New Delhi, however, can match to some degree China's asymmetric strategy by pursuing an asymmetric strategy of its own.

While China has built an impressive space military programme, it is yet to amass capabilities that surpass any of its nearest, let alone distant competitors to the point of “dominating” space. Like in the case of nuclear weapons, space weapons are a great equaliser, provided a credible retaliatory capability be developed. Therefore, their primary value is deterrent. Deterrence is as much a psychological challenge as much as it is a military one. It is based primarily on the risk calculus of the attacker and not the defender.²⁹ At best, non-kinetic means of attack and defence are the least costly in the context of space military operations and investments continue apace by the principal space powers. Yet kinetic weapons systems can be used as well in extremis, because they meet the test of this paper's core argument of “conventionalisability”. Since space weapons in some forms are usable, it needs to be asked whether legal restrictions can and should eliminate what are essentially conventionalisable military instruments.

LIMITS OF LEGAL BAN ON SPACE WEAPONS AND TACIT RESTRAINT

What is to be made of a ban on space weapons that animates the agenda at the United Nations and Conference on Disarmament?

First, the Outer Space Treaty (OST) of 1967 effectively put an end to nuclear weapons testing in space and the deployment of atomic weapons in space. These prohibitions under the OST have withstood the test of time and are honoured by the signatories to the Treaty, including the major space-faring nations. Nevertheless, space has been militarised starting with the Soviet Sputnik launch in 1957 and the subsequent American Corona satellite. Satellite reconnaissance has played a prominent role in serving as an adjunct to land, air and sea power for decades. Yet OST's ban does not extend to conventional ASATs, directed energy weapons and non-kinetic weapons systems. One is tempted to draw on what Bernard Brodie, the distinguished American Cold War and nuclear strategist, observed on failed attempts at legally and legitimately banning strategic bombing to explain why a ban on conventional space weapons system has not crystallised: “The basic cause of failure is that too many people regard such bombing as being militarily desirable or even indispensable – for those who have the means to wage it. The lesson here is that rules made with too much disregard of the issue of military utility are not likely to survive. Any legal rule, on the basis of its own authority as law, can bear only so much weight of contrary interest. If the burden upon it is heavy, it needs some support from pragmatic mutual self-interest considerations.”³⁰

Therefore, a legal ban on conventional space weapons in the form of directed energy weapons, and kinetic and non-kinetic anti-satellite weapons, will be contrary to India's interests as long as China views its space military programme and weapons either as instruments of coercion or as militarily utile in some way. As long as space weapons are treated as conventionalisable, legal prohibitions cannot prevent their acquisition. In any case, China is unlikely to subject itself to legally binding fetters on its “freedom of action” in space. Just as India never got nuclear guarantees from the United States, Russia, France and the United Kingdom against China, it will face the same impediment with regard to any defence of its assets in space. Nor is a treaty consummating a space weapons ban likely to crystallise in the policy-relevant future simply because of the competition

between the major space powers such as the US, China, and Russia and, to a lesser degree, states such as India and Japan. In 2002, Russia and China presented a highly publicised working paper that sought to ban all weapons in space without much success as the US consistently objected to attempts to bind it legally to a space weapons ban; the US remains highly suspicious of both Moscow and Beijing's motives for instituting a ban.³¹ Beijing's claims to seek a space weapons ban is borne not only of its desire to create a peace-based global common in space, but also to limit Washington's capability to meet its extended deterrent commitments to allies particularly in the Asia-Pacific. Space serves as a vital medium for projecting American power globally,³² such as sustaining its alliance commitments and countering threats, whether current or emerging.

Beijing's dispute-ridden territorial claims with its immediate neighbours means there is a potential for force. The space medium will play an active part, at the least, and at the most, space could become a domain for military action. For example, China's anti-access/area denial (A2/D2) strategy has been specifically developed to deny access to a strategic area against a third party that might intercede, while exercising potent control over a vital territorial area such as Taiwan or any other Chinese maritime claims. The People's Liberation Army's (PLA) declaratory posture is formulated to "dissuade, deter and defeat" any tertiary intervention.³³ India only needs territorial control through space denial.

Yet the mutual possession of space weapons does not imply actual use. If anything, space weapons may provide the same deterrent insurance as nuclear weapons do in that offsetting space military capabilities will prevent them from breaching the deterrence threshold. Mutual self-interest lies not in banning space weapons, but more in their non-use. Indeed, the present space competition between the US and China illustrates how competitive geopolitical factors can stymie the best legal efforts at proscribing space weapons and space weaponisation. As long as China and the US view their space military programmes as bequeathing

strategic benefits in constraining the other party to service each side's interests and denying undue advantages to the other, India will need to develop at least the option of developing non-kinetic capabilities, and at most, a kinetic capability. These space military technological accoutrements will help limit particularly Beijing's goals to advance its territorial interests vis-à-vis New Delhi. The Americans have retaliatory options against China, which India presently does not possess, or at least not to the extent that it should. In 2012, India's Defence Research and Development Organization (DRDO) claimed that the country has all the "building blocks for an anti-satellite (ASAT) capability" which was expected to mature by 2014 and, presumably, form part of India's current defence posture. Yet India will not test it by destroying one of the country's own satellites for fear of creating debris; rather, it will base an ASAT capability on simulated electronics tests.³⁴ A simulated kinetic ASAT has no psychological value from the standpoint of deterrence, let alone warfighting. As Herman Kahn has noted, space programmes generally do not have psychological worth, although he did not quite anticipate the invention of the direct ascent ASAT,³⁵ which certainly bequeaths psychological benefits and reinforces space deterrence. Further, an ASAT is hard to intercept and there are no active defences against a kinetic capability due to orbital mechanics as it is extremely difficult to shift the trajectory of a satellite to escape a hit due to the limited fuel capacity of spacecraft.³⁶

If legal instruments do not satisfy, can tacit restraint help? The best one can hope for is tacit cooperation between India and China to ensure space deterrence. The American Cold War historian John Lewis Gaddis has shown cogently how the satellite reconnaissance regime helped stabilise the Cold War by managing the nuclear rivalry between the Soviets and the Americans. He delineated three advantages. First, it minimised frictions by reducing the amount of prestige each of the superpowers attached to their respective space programmes. Second, absent a high level of publicity accorded to space programmes, the superpower governments did act with

alacrity for initiatives taken publicly, thereby obviating the involvement in the consultative process of critical domestic interest groups that could have thwarted attempts by Soviet and American leaders to defuse tensions. Finally, issues that were highly sensitive between the superpowers were removed from the domestic political arena, particularly in the US.³⁷ Gaddis's point is similar, if not identical to Brodie's in that mutual space restraint can emerge from some mutual self-interest. Nevertheless, the disadvantages of tacit cooperation range from uncertainty about what any tacit agreement includes. It cannot fully obviate misperceptions and accidents. After all, parallel efforts on the part of the superpowers to build anti-satellite capabilities tend to reveal the level of competition between them, even as they cooperate tacitly in not targeting each other's space assets.³⁸ Despite the superpowers' rivalry, their tacit space cooperation during the Cold War helped them avoid a catastrophic nuclear showdown and it transcended their immediate national interests. However, the Sino-India conflict dyad is somewhat more distinct, because the rival territorial claims between Beijing and New Delhi can constrain, if not impossibly prevent tacit cooperation, as their immediate national interests are directly in collision over their contested boundary, which was not a facet of superpower rivalry during the Cold War. In the Sino-Indian dyad, each side attaches a high degree of importance to their positions on the boundary dispute.

Therefore, even if tacit cooperation is possible, it must be treated by New Delhi as an adjuvant to the accumulation of space military capabilities; the two are not mutually exclusive. As shown in the preceding sections of this analysis, while the destructive consequences of detonations in space are massive—whether with conventional high explosives, let alone nuclear explosives—India can still exploit the uncertainties inherent in the space environment to deter a Chinese space attack while simultaneously pursuing Research and Development (R&D) in anti-satellite weapons. Yet such R&D needs to mature and it has to be credible through a proven and tested space weapons capability.³⁹ In

India's case, some part of that capability is already at hand in the form of satellite reconnaissance, imagery, and encrypted communications, but more needs to be done. Should India pursue space deterrence or a space warfighting strategy? This important question needs some careful engagement.

FINITE SPACE DETERRENCE AND LIMITED SPACE WARFIGHTING: THE ROLE OF DETERRENCE THROUGH DENIAL AND DETERRENCE PUNISHMENT

As is the case with nuclear deterrence, space deterrence is based on similar, if not identical premises. Deterrence by definition is the power to dissuade rather than compel.⁴⁰ Compellence on the other hand is the positive side of coercion. It is an active effort to shape the will of the adversary to resist.⁴¹ Deterrence, as Glenn Snyder put it, is ultimately a “peacetime objective”, whereas “defense is a wartime value”. In the pre-nuclear age, forces were structured towards defeating adversaries in battle to win a war by amassing superior strength; in the nuclear age, military forces, at least among major nuclear powers, are geared towards preventing war.⁴² A war in space that is akin to conventional terrestrial, naval or air operations is still distant. Glenn Snyder drew the classic distinction between deterrence through denial and deterrence through punishment. Deterrence through denial seeks to thwart or disrupt an enemy attack by convincing him that he would not make gains or acquire an advantage by striking first. Deterrence through punishment, meanwhile, places a high premium on capabilities that effectively and inevitably guarantees retaliation on a massive scale. It places great emphasis on offensive capabilities and importantly seeks to influence enemy intentions through the threat of unacceptable damage. Denial prevents an adversary from successfully and comprehensively executing his missions. Therefore, denial obviates the demands on building massive capabilities as is the case with a punishment-based strategy. Denial capabilities are geared to degrading the enemy's primary attack forces. Off-course, the distinction between denial and

punishment fuses, because the side pursuing denial must be in a position to prevent the adversary not just from starting a war, but in the event deterrence collapses, from raising the costs sufficiently high to prevent the enemy from continuing hostilities and reducing the possibility of the enemy making military gains. As Sir Michael Quinlan, widely considered the United Kingdom's foremost deterrent theorist, observed in a direct critique of Snyder: "I don't understand the distinction [that some people draw between deterrence and defence]. It's a bit like the distinction between deterrence and war-fighting. It always strikes me as stripped down, fundamentally bogus." He elaborated further in the context of the Cold War: "Weapons deter by their capability for use when the chips are down and if they have no possibility of use then they can't deter. If deterrence fails, as it were at the first level, if the Russians look us in the eye and march, then the weapons are there to be used to defend us and in the nuclear age, to defend us not by disarming the foe, as in past times, but by persuading him that he has miscalculated the risk and our resolve; in that sense nuclear weapons would be for defence. They can't provide a physical guarantee that we cannot be annihilated. They would be there for use and a use which was directed to ending conflict before we had lost things we regarded as vital..."⁴³

This same subset of issues apply in the context of an Indian space military strategy against China. Ironically, Quinlan's argument is more valid with regard to a space deterrence and space warfighting strategy, because of the greater usability of space weapons as opposed to nuclear weapons. Notwithstanding the fact that engaging in space war has its own constraints and costs, it does not prevent a capable state such as China from carrying out a non-kinetic or more extremely a kinetic means of attack against Indian space infrastructure and China's capacity for using the space medium for ground operations against India. To that extent, China's accumulated space military investments do give it an asymmetric advantage at least vis-à-vis India, if not against the US and Russia. China's anti-access strategy, geared towards blinding American satellites and even

destroying them, could with great ease be turned against India in a land war. Indeed, Beijing is believed to have an Electro-Magnetic Pulse (EMP) capability that could temporarily or even completely blind American satellites in the event of war over Taiwan. China has satellite tracking stations that exceeds India's and an extensive space surveillance network. Beijing has satellite tracking stations in Pakistan, Namibia and Kenya.⁴⁴

Here this paper draws a distinction between countervalue and counterforce. Targeting the enemy's civilian population is countervalue; counterforce seeks to destroy the adversary's warfighting capability. Off-course, the distinction blurs, because military (counterforce) targets are situated in close proximity to cities or populations centres; any use of nuclear weapons would result in the destruction of whole populations as much as the military targets they are geared to eliminate. In space, however, there are no human inhabitants, even if humans and military establishments on earth rely on space assets. Further, given the dual-use nature of satellites that perform both civilian as well as military functions, let alone weapons systems such as space-based lasers and co-orbital ASATs, the distinction between counterforce and countervalue with respect to space-based platforms is both irrelevant and indistinguishable. The satellite is merely a military target and not a political objective. Indeed, the political objective would be over India and China's contested land frontier. Nevertheless, in the event of a land war with India, the destructive consequences of using an ASAT or mounting cyber-attacks is not as costly⁴⁵ for China as using nuclear weapons against the India's population centres. Even if there are costs, they will tend to be indirect in that Indians will suffer—like most if not all humans who rely on space-based assets like communications, weather, commercial activity, scientific research—and future space launches could be seriously impaired, because whole orbits could be crowded with debris.

Notwithstanding all the foregoing arguments about the constraints and uncertainties of the space environment, a real question faces India:

What if space deterrence fails as a consequence of land war between India and China? Like in the case of its nuclear posture, New Delhi will need to account for how it proposes to respond in defence of its space assets and counterattack in the event of its space deterrent posture collapsing, which will be closely tied to the collapse of its deterrent posture on land. It is certainly conceivable.

Even proceeding from the premise that it is easy for China to undertake a space military offensive against Indian space assets, a *hors de combat* against Indian space infrastructure is only one possibility; the other is space deterrence. The former could potentially, or actually, lead to: 1) the complete destruction of India's space-based assets in the event of a land war; 2) a defeat for India in a land conflict using the space medium. If India strives for the second possibility of space deterrence and intends to sustain it, New Delhi will need to expand and invest in space military capabilities in a bid to present a credible retaliatory capability against Chinese assets. If India allows itself to be subject to a zero space weapons posture, it seriously runs the risk of impairing a credible defence of its core territorial interests, *more so* losing the capability to pursue a counter-offensive against China in order restore the status quo ante. The implication is devastatingly clear: it is interests that determine objectives. Without a link to some objectives, investments in space military capabilities will become superfluous and may resemble science fiction.⁴⁶

A menu of limited retaliatory options or what this author calls Mutually Assured Counterforce (MAC) space military posture is also imperative for reasons of coercion. As the eminent strategic scholar, Ashley J. Tellis, observed regarding India's nuclear posture vis-à-vis China: "...a more capable and transparent Indian nuclear posture could also come about simply as a result of the same contingency [Pakistani nuclear coercion]...a Chinese countervalue capability that is used for purposes of nuclear coercion in a manner similar to, or different from, the present Pakistani exploitation of its limited nuclear capabilities....the pressures on

New Delhi to develop a nuclear posture that embodies flexible response capabilities would only increase.”⁴⁷

Given China's expansive and impressive space programme at least relative to India's, Chinese exploitation of its existing space capacities for coercion becomes a real possibility. For Sino-Indian deterrence to hold in space and for New Delhi to deny Beijing exclusive access to space, India will have to reduce the ease of a Chinese attack, in 1) space to space attack, 2) ground to space attack and 3) a space to ground attack. Among these three possibilities: the first is plausible at least non-kinetically. The second is a distinct possibility, because China already has a proven direct ascent ASAT capability and proven ground to space non-kinetic means and the third is also a very real possibility as far as China's use of the space as a medium to execute ground operations unfettered from Indian disruption and denial.

A priority should be retaliatory capability that enables India to terminate hostilities in the early stages of a land war in which the space medium plays an active part. Therefore, much like the way a limited menu of nuclear retaliatory capabilities can avoid the disaster of an all-out nuclear war,⁴⁸ a limited menu of space military retaliatory capabilities can service the same for India in a land war. On the other hand, the risks are substantial in the absence of Indian space military capabilities. False optimism could lead India to underprepare, thereby easing a Chinese attack against Indian space-based assets and the ground nodes of its New Delhi's space segment. Logical and justifiable optimism could also lead China to attack, if India unduly or unilaterally subjects itself to self-imposed constraints, thereby seriously running the risk of easing a Chinese space-to-space attack or a space to ground attack or Beijing's use of its space military capabilities as a means to compel India to attain its goals in terrestrial operations.

What of the argument that India might fall prey to self-deterrence as New Delhi, for some reason, is inhibited from employing its counter-space

capabilities in response to a Chinese attack against Indian space assets? The concept of self-deterrence is ultimately not analytically useful simply because it is the actual retaliatory capability of one side that deters an opponent.⁴⁹ If self-deterrence stymies India from using weapons in retaliation, targeting Chinese ground-based space segments and space-based assets, why should not the same be operative for China?⁵⁰ Is China not bound by the same uncertainties, risks, costs and consequences of a space war or even a limited space war as India? After all, it is the uncertainty of losing control that makes nuclear war unthinkable,⁵¹ because belligerents lack the capacity to control its escalatory dynamics, tempo and the destructive consequences following use or exchange. A space war between India and China could escalate from non-kinetic attacks to kinetic attacks, which likely will be tied to a land engagement. Indeed, the destruction of two or three Indian satellites by China and a matching response by India might halt any further attacks in the space domain. Yet we cannot presume that escalation can be controlled through the exercise of restraint by both sides.⁵² Therefore, it renders space war difficult, if not outrightly unthinkable, for the reasons earlier stated. Therefore, even a limited space war could get out of hand. As nuclear strategist, Thomas Schelling, put it: “The idea is simply that a limited war can get out of hand by degrees,”⁵³ without allowing it to descend into an all-out war. New Delhi will have to emphasise a shared risk following the outbreak of hostilities; Beijing will have to consider and anticipate the costs and risks of losing control of a space war and where the space medium plays a significant part in terrestrial operations against India. Therefore, the balance of resolve also plays an important role in deterring and contesting China's moves. For New Delhi, the purpose must be to emphasise risk as much as cost. Notwithstanding the remote possibility of space war tied to a land war, a strategy predicated exclusively on exploiting the risks inherent in uncertainty is necessary, but insufficient. As long as China develops an array of space capabilities, India cannot but pay attention to the improvement of its own space military capabilities.

Space military technologies developed and used by India can arrest a rapid Chinese attack against Indian territorial interests across the Himalayas rather than condemning New Delhi to take stands from a position of acute space military inferiority. Indeed, self-imposed constraints will anathematise New Delhi into provoking and conveying weakness at the same time – a dangerous way of preserving deterrence,⁵⁴ whether in space or otherwise, let alone engage in the extreme possibility of space warfighting. Strategic space deterrence can be effective when capabilities are undergoing constant improvement and upkeep, because intentions can change faster than capabilities. Capabilities have long gestation periods from the moment of conception to research, development, production and eventually, deployment. Critically, Indian leaders ought to avoid the Nehru trap of having it both ways by denying choice as they seek to accommodate China while at the same time confronting it from a position of excessive military weakness.⁵⁵ By denying choice, incoherence manifests itself and is a natural consequence of politics. Denial of choice will be innocuous only to the extent that no trigger exposes the deep contradiction between the means developed for purposive ends, particularly over core interests.⁵⁶ Briefly, India does not have the luxury of ambivalent space deterrence vis-à-vis China.⁵⁷

Since there has been neither space war nor nuclear war and much like the nuclear age threw up its uncertainties, constraints and challenges in initiating nuclear war—where the onus lay with the attacker and not the defender⁵⁸—space as a domain for offensive military action is equally daunting, if not impossible, at least kinetically. As noted, a non-kinetic attack is more conceivable and preparing passive defences against such a type of attack is indispensable. However, leaving the initiative to the Chinese may be one consequence and downside of an Indian counter-space strategy vis-à-vis China. As Clausewitz observed in distinguishing between the offence and the defence, the latter is better, because, “awaiting the [initial] blow” with the aim of protecting and conserving one's forces is the better form of warfare. It also gives the defender an

estimate of the enemy's intentions and military capacity. This brings this paper to the distinction between absolute and relative capabilities, which will help establish the scope of Indian space military capabilities.

RECOMMENDATIONS: ABSOLUTE VERSUS RELATIVE SPACE MILITARY CAPABILITIES

As Henry Kissinger accurately put it: “Power has no absolute measurement; it is always relative.”⁵⁹ India faces a massive if not an absolute asymmetry in space military technological capabilities, yet its latent space capacity borne out of decades of investments can help redress some of the present imbalance in space military capabilities between the two countries. Therefore, any assessment about the scope of India's space military posture ought to consider the distinction between absolute and relative capabilities.⁶⁰ Most force planning for any range of contingencies is predicated generally on relative capabilities. India cannot match China pound-for-pound on every dimension of space military power, simply because it faces a relative gap in resources (and not latent space technologies or existing missile technologies) vis-a-vis Beijing. S. Chandrashekhara captured this dilemma well: “India may have to make some hard choices on the trade-offs between the efforts required to put a man in space and the associated benefits in building a robust, space-based network-centric war-detering capability. Doing both simultaneously may not be possible, given the resources that are currently available in the country.”⁶¹


Therefore, absolute security and defence against a Chinese space attack is unattainable. However, the opportunity costs for the non-pursuit of a space military strategy are equally high due to the nature of conflicting territorial interests between India and China. Therefore, the worst is possible and preparing a limited retaliatory capability is the most critical requirement. India need not destroy all of China's space assets in the event of war, but only a fraction of its space assets in order to force it to cease

armed hostilities. This will help India deny China exclusive access to space and the opportunity to use the space medium as a force multiplier for territorial gains in ground-based operations. Notwithstanding the demands on resources, the most critical area of investment focus ought to be in developing non-kinetic means of attack and counter-attack. These non-kinetic means in addition to the effective employment of Indian space assets are the minimum requirements. At the maximum end of the capability spectrum, developing kinetic means of attack such as the kinetic anti-satellite projectiles and directed energy weapons will require additional expenditure outlays and Indian policy-makers need to identify a clear nodal agency for the conduct of space military missions. This paper makes three recommendations which Indian policy-makers and strategic managers can adopt individually or in combination with one another. None of these options can avoid trade-offs whether politically or financially, and if India's territorial interests have to be protected, choices are unavoidable with regard to the military capabilities. The first two of the following options will be highly compatible with a space-denial strategy, but the last option will fit to some extent with a punishment-based strategy. None of these measures are watertight prescriptions. New Delhi can pursue passive and active measures.

First, space-based operations are heavily dependent on land-based infrastructure. India's retaliatory capabilities can be directed towards targeting the ground segments of China's extensive space surveillance network. For this India needs long-range land attack cruise missile forces that can strike deep and accurately at the ground nodes of China's space segment. This option does not require that India target Chinese space-based infrastructure. The advantage of this option is that land attack cruise missiles have low radar signature and are hard to intercept. The downside is that India's current land attack cruise missile capability lacks range and will necessitate investment.

The second option involves passive measures that several experts have already identified. These include building redundancy by launching

numerous satellites into space. However, India will need to increase launch rates. As of now, Chinese launch rates dwarf India's. Numerically, China's satellites are greater than India's. In addition, India will need to build more dual-use satellites. Numerous dual-purpose satellites will allow India to migrate to other satellites, in the event China destroys Indian satellites kinetically or non-kinetically following the outbreak of a land war and during the course of a land war. This measure can be accompanied by cyber-space warfare capabilities that target the electrical grid of the ground stations of China's space-based infrastructure.

Finally, a direct ascent ASAT is a highly potent and an active measure and therefore can be developed and tested. Its value derives not only from its military utility, but equally from its psychological effect. Publicly, it would demonstrate that India can match China's capabilities and can be a potent means to reinforce deterrence both on land and in space, thereby influencing China's assessment of risk and cost. India's strategic managers and decision-makers can be bold on this front by conducting three different types of ASAT tests. The first can be ground launched, the second, air launched and the third, sea launched. The latter two will be more daunting because the hardware and software aboard air and surface platforms need to be adapted to carry kinetic ASAT test. All these tests can be conducted by de-orbiting one of India's obsolescent satellites that is on the brink of re-entering the earth's atmosphere and then destroying them much like what the US did in February 2008. The downside to this option is that it will generate orbital debris, but its effects will be mitigated by the fact that it is conducted close to the upper atmosphere and the earth's gravitational pull will help clear the debris in a few years. This will require considerable political will if an actual Indian ASAT capability is to be realised. 

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