MILITARY-Industry Partnership in Space Militarization: The Art of Contemporary Space-Based “Sensing, Command & Control”

Julianne Oh
Royal Military College of Canada, Kingston, Canada

Abstract

Some leading spacefaring nations, like the United States (US), have been prioritizing missile defense for their homeland security by making the best out of the space infrastructure, which is believed to realize more effective, as well as proactive, defense. Technically, the space-based sensor layers play an indispensable role in the execution of the Ballistic Missile Defense System (BMDS). For instance, the US Space-based Kill Assessment (SKA) project, led by the Pentagon’s Missile Defense Agency (MDA), represents one of the latest attempts to strengthen the layered satellite sensor systems, and eventually to reinforce the American missile defense capabilities, such as the BMDS, by 2020.

The SKA experiment is noteworthy also in a sense that the kill assessment sensors will be piggy-backed on commercial satellites mainly for the cost savings benefits. This reportedly first partnership of the MDA with commercial stakeholders for its space applications evokes the enduring debate over the dual-use objects as a potential aid to space weapons. It is true, to some extent, that the increasing cooperation between the defense and the commercial industry sectors permits more ‘economical’ investments in outer space, and facilitates its efficient use for national security interests. However, this approach may simultaneously generate the consequence of jeopardizing the current regulatory framework and norms that the international community had long been trying to establish in order to ‘peacefully’ preserve outer space as a common heritage of all mankind. Considering today’s paradigm shift from global harmonization to reverted nationalism, the sustainability of our civilization may, after all, depend on each national government’s choice; i.e., in which direction they would form their space policy and how far to go.

[Keywords] Space Militarization, Space-Based Missile Defense, Sensor-Layered Defense, Space-Based Kill Assessment (SKA), Military-Industry Alliance

1. Introduction

For the most part, the term, “outer space,” suggests a field of adventure and unlimited possibilities; e.g., the mine of untouched natural resources and the next destination for civilization. And yet, it has also been serving as a superb high ground from which to secure a military advantage since the inception of the Space Age in the 1950s, for example, via missile launches, spy satellites, and etc. Thus, unlike our usual – even ‘naive’ – projection of outer space being clear...
and quiet, the reality unfolds plenty of space weapons and debris congesting it. Some governments have been labeling it even as a ‘sanctuary’ providing various supports to their defense activities. From their perspective, the space systems and capabilities are just some integral elements augmenting the nation’s military effectiveness, even though such belief and practices may often contradict the Outer Space Treaty’s principle underlining “peaceful purposes” for its use[1].

In light thereof, this article intends to introduce some aspects of the latest development in space exploration for defense interests, such as space-based missile defense, which has been pushed forward, for example, by the American government valuing its critical role for the US homeland – and its allies’ – security. It will thus address a sample case how the private industry and the military are cooperating in this venture, especially to build the cutting-edge and efficient sensor-layered defense system; i.e., a review of the space sensor systems extends to an examination of the ongoing SKA experiment, which includes but not limited to identifying its major issues and assessing their implications. As part of evaluating the subject matter, the project’s pros and cons will briefly be observed.

The major goal of the present discussion is, therefore, to provide its readers, especially a nation’s industry leaders and policymakers, with an opportunity to ponder upon the future directions of their national aerospace defense, and further, the cost and benefit of forming a strategic civil-military partnership therein. Ultimately, the topic calls for the attention of all to the anticipated outcomes and more profound implications of such decisions.

2. Space-Based Missile Defense

Missiles are classic yet still widely-used weaponry in armed operations. For a discussion of satellite-enabled missile defense and its implications on space weaponization, it may be a prerequisite to grasp how the missile technology and the militarization of outer space have interconnectedly been evolving given the thesis of rocketry; i.e., how the technicality of missile defense raises the issue of space militarization/weaponization.

In a nutshell, a substantial portion of missile defense tasks should be carried out in and through the space domain, because a considerable part of Inter-continental Ballistic Missiles (ICBM)’ trajectory is spent in space[2]. As most ballistic missiles, except for very short-range ones, travel in outer space, “space-based assets can play an important role not just in intelligence and early warning, but also persistent fight tracking to enable successful intercepts by ground-based systems,”[3] which would eventually amount to increasing the military-dominant space activities in exchange for the so-called ‘more resilient’ missile defense systems.

To conceptualize it in more technical terms, the lifecycle of missiles comprises of their boost/ascent, midcourse and terminal phases, and needless to say, missiles are mostly launched for an attack. Against such incoming threats, today’s technology permits a counterpart’s defense through three core processes: Sensing, intercepting, preemptive destroying before they reach an intended target. Given the above-mentioned phases of missile deployment, the continuous monitoring for launch detection, early-phase tracking for exoatmospheric midcourse intercept and precision in differentiating the missile parts would determine a more effective defense against incoming missile strikes over the territories to be protected. In sum, the current ballistic missile defense systems are largely aided by the space sensor systems, and they operate, in their entirety, by the ensemble of ground-based and overhead-satellite capabilities.

“No missile defense system is better than the [space] sensors and command and control systems that determine where the threat is and how to kill it,” according to the US’ Missile Defense 2020[4]. This statement seems to reflect the vision of the US military vis-à-vis space exploration, including their specific and immediate need for satellite sensing. Pentagon, the US Department of Defense(DoD), has always been seeking an integrated layer of space-based sensors as part of its overall missile defense capabilities like “launch detection, tracking, discrimination, intercept, and kill assessment,” as illustrated above. Indeed, the space sensor layers have been promoted as a must for a more solid missile defense, and the DoD has been placing sensor development on the top-priority in its space endeavors; e.g., the Space Tracking and Surveillance System(STSS) demonstrators, dubbed as a blueprint for the forthcoming systems, had actively been tested between 2009 and 2013[5], followed by the announcement of the SKA sensor experiment in 2014.

Referring to the general ICBMs’ trajectory described earlier, the STSS is constructed to identify missiles in their boost phase, track reentry vehicles and provide tracking data to the BMDS in near real-time thanks to its sensors capable of detecting visible and infrared light, whereas the SKA sensor network mainly concerns the midcourse phase of the missile defense. The MDA, a section of the US DoD, provides a comprehensive list of sensing equipment enabling a layered defense, which includes ground- and sea-based radars in addition to satellite sensors[6].

Albeit such ‘dedicated’ attempts, the advocates of the idea, like some experts at Center for Strategic and International Studies(CSIS), believe that the current state is short for the real-life needs, and therefore, the government should allocate more budget for this layered defense architecture.

4. SKA Constellation†

Kill assessment, assisted by Kill Vehicles on a missile interceptor, determines the success or failure of individual interceptor missions, and informs whether a second shot against an enemy ballistic missile should follow. The SKA sensors have been developed by the Johns Hopkins University Applied Physics Laboratory. They are the Kill Vehicle’s space component designed to operate by a network of small sensors(hosted on commercial satellites) and create a more robust communications network for more strategic interception of incoming threats, e.g., by performing a battle damage assessment mission based on improved situational awareness.

In addition to empowering more technically upgraded defense communications, the MDA originally conceived of the SKA sensor network being able to ensure seamless ‘birth-to-death tracking’ of missiles from space, by closing the midcourse gap and sharpening discrimination [4][7]. Thereby, it would eventually contribute to a layered space sensor system as one of the ‘state of the art’ space-based surveillance and tracking tools, which, in brief, materializes the most widely-acknowledged perception of space-based missile defense[8].

When the MDA announced the SKA experiment at the start in 2014, the first SKA payload launch was planned in FY 2016. However, due mainly to budget cuts and cost issues, it was rescheduled a few times and postponed until later[9]. In September 2018, MDA Director Lt. Gen. Sam Greaves concisely informed that the SKA sensors were finally getting ready, at the time, to be on orbit by the end of 2018, and to

† Last update of the SKA project in this article: May 2019.
be tested and fielded in the consecutive years. The (publicly-accessible) latest update was quoted in March 2019 when MDA’s new FY2020 budget request for the SKA project was reported: MDA Deputy Director Rear Admiral Jon Hill then told that SKA sensors had been deployed throughout 2018[10], which upholds Lt. Gen. Greaves’ preceding statement, “SKA sensors currently in place have conducted over 1,000 experimental observations” as of February 2019[11]. A limited number of specialized news services and think-tank platforms has occasionally released the SKA experiment progress only bit by bit during the first quarter of FY 2019. As a consequence, many details still remain unclear because no official statement from the MDA or the US DoD has been made available to the public: e.g., the dates of initial payload launch as well as the final constellation of the intended batch; the number of deployed sensors; or the selected commercial-satellite hosts.

All in all, the MDA’s approach to the project leaves an impression that the Agency expected the SKA network to surpass the existing technical capacity of a communications-sensor category and become a “game changer” capable of differentiating even the missile parts; i.e., warhead, decoy, and other junks. According to MDA Director, Greaves, SKA is still an experiment and has no operational role yet. Its real-life operability is still being tested by the warfighter, and its current limitations and remaining issues are also being discussed among several key parties like MDA, the Government Accountability Office (GAO), DoD, NASA, and certain federally funded R&D institutions. While SKA’s functional potential remains optimistic and ongoing, the MDA has already been moving along with its next project, which is a more complete, comprehensive and operable space-based sensor network called the Space Sensor Layer (SSL) – a missile defense tracking system launched in 2018[11][12].

5. Hosted Payload and “Dual-Use Object”

It has, by far, become obvious that one of the major issues associated with the SKA project was the ‘money.’ Hence, the MDA was undoubtedly content with an alternative of deploying the SKA sensors on commercial satellites, instead of the (newly-built) military ones. It benchmarked the US Air Force’s Commercially Hosted Infrared Payload (CHIRP) experiment featuring a missile warning sensor hosted aboard a commercial telecommunications satellite. Because commercial space platforms would provide the power, data handling and other necessary functions worth multi-billion dollars, such a hosted payload concept promises a great cost advantage, as well as an expedited process, by making use of the existing space and ground system. Therefore, the MDA publicized, with pleasure, that the partnership would be a win-win for both the military and the industry[13].

Here, a question may be posed: Whether these commercial satellites with military-sensitive function, the so-called ‘dual-use’ objects, would raise the risk of militarizing outer space even further? The dual-use objects refer to space items, holding both technological potentials for civil and military uses, like spacecraft, and artificial satellites – the scope of the present discussion – are considered as a type of spacecraft[14]. The SKA sensors’ payload – commercial communications satellites carrying military asset, i.e., commercial resources attached to defense interests – seems to meet the definition of a ‘dual-use’ object. Then, should this be classified as a commercial property or a military issue?

The problem is this vague identity, which may enable them to make the best out of the loopholes in the current framework banning the Weapons of Mass Destruction (WMD) in outer space, and conveniently circumvent certain disciplines strictly applicable to arms control. The
deployment of more dual-use space objects increases the possibility of spreading armed goods[15], which would potentially and gradually congest the entire sphere of outer space with military dominance. The manipulation of space items for military applications becomes more hassle-free, considerably by the growing alliances between the defense and commercial sectors.

This type of space activities has intensified the debate between the needs for self-defense and the benefit of global cooperation, especially in light of the Outer Space Treaty principles, such as the ‘peaceful uses of outer space.’ Although it should be acknowledged that space exploration was initiated and propelled during the Cold War for the national security reasons, the military uses of outer space have constantly increased in numbers, scale and destructive nature since. The so-called ‘weaponization strategies,’ especially when applied to space, are expensive, provocative and even self-defeating in both military and political contexts. They are not "just a single-point solution”[16]. Our terrestrial experience shows that more advanced and expanded defense deployments to offset the opponents’ threats are countered by more destructive and powerful weapons. The exchange of such retaliatory armed actions normally aggravates tensions, and apparently creates more sources of conflicts.

Arms races in outer space indeed congest space environment; i.e., not only they generate more space debris, but they also end up transporting more nuclear substances from earth to space by launching ballistic missiles and the countermeasures. After all, the bottom-line of the space-based missile defense rationale is to explode a possibly nuclear-tipped enemy missile in outer space, and the interceptors are just another kind of missile, which is a weapon by nature, however they may be decorated.

6. Military-Industry Partnership

By far, the key concepts of the layered space sensor architecture and its latest materialization, the Space-based Kill Assessment sensor network, have briefly been discussed. The MDA calls the SKA project a “pathfinder” for its (continuing) collaboration with the commercial satellites industry[11][17]. The hosted payload model adopted in this experiment indeed presents the following gains out of a partnership between the military and the industry:

- Cost-/time-saving advantage;
- Optimal use of cutting-edge space technologies

And yet, quite a bit of criticism has also been identified in the process of assessing the implications of such a joint-undertaking as follows:

- Skepticism about militarizing outer space;
- Its potential destructive outcome against our humanity and terrestrial civilization

The above diagnosis demonstrates both the bright and dark sides of the military-industry alliance, posing a possibility of further militarizing outer space. This may hopefully offer the readers an opportunity of contemplating what they would like to do, insofar as their nation’s space-based defense capabilities are concerned, and how far the two sectors should work together in a suitable and reasonable manner for the State of their own.

For example, national governments appear to have three alternatives, broadly speaking, in setting the course of their space policies and programs: First, they allocate more budgets and invest more in their space-based missile defense. Second, they can continue to increase more partnerships with the well-funded private industry. The third option may likely be an ordeal but could possibly be ideal in the long run: Disarmament, which seems to have been disregarded by most leaders of many spacefaring nations. What
would then be your choice?

The weight imposed on every single decision-maker – military, industry and government altogether – is certainly considerable, as their terrestrial judgment would eventually extend to the extraterrestrial forum, and vice versa. Besides, all their opinions should equally matter, because they often influence the decision-making process of one another.

7. Conclusion

Given the progressing speed of the MDA’s SKA experiment between its initiation and now, the operability or ‘fightability’ of the space-based sensor systems like SKA may not be so dramatically boosted by the target year of 2020. Amid several influencing variables, this presumption may find its ground partly – if not wholly – from budget constraint. The approval and allocation procedure of defense spending, for instance, is a highly complex matter, especially within the US system; i.e., even if the Senate approves, for a given year, all or most of the Pentagon’s fiscal proposal for its space programs, the House may still oppose it, depending what they see as priorities at the time. By and large, space and nuclear may often be considered the areas of contention in defense bill subject to, e.g., the nation’s political waves and/or the global agenda of ‘imminent’ threats in a certain era. Though, these temporary, real-life and procedural hurdles do not necessarily mean that changes may occur to their fundamentally ‘pro-military’ perception about outer space. It may rather be more reasonable speculation that their unvarying enthusiasm for the so-called “Sensors and Command & Control” defense system will continue ‘slowly but surely.’

On the one hand, all uses of military force should not be condemned as morally wrong, because the military capabilities are necessary for preserving civilization where conflicts persist, like in many corners of the world even today. And universally, a nation’s defense capability determines her fate, both during the peacetime and at war. On the other hand, we understand that outer space is declared to be a common heritage of all mankind where the ever ‘sacred’ national sovereignty does not extend, and for the preservation of such a common heritage, all of us are supposed to take responsibility for our shared ownership. Then, how can we approach this type of dilemma and find a balance?

In seeking the appropriate guidance for balanced decisions, the “element of time” may serve as a valuable point of reference, because decisions should not be made with the impulse to live only for today. A lot of science-fiction literature and films have shown what the destroyed Earth by nuclear power would unfold for humanity. The alarming signals communicated through the channels of pop culture may not be overlooked casually, because their earlier imaginations of the technologically advanced ‘future’ world had already been materialized in our life ‘now.’ Therefore, both the policymakers and the business leaders of today should recognize the weighty consequences of the current course of development for the generations to come.

8. References

8.1. Journal articles

8.2. Thesis degree

8.3. Additional references