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# United States and Russian Outer Space Weapon Capabilities - An Assessment

**Mahvish Malik**
*Visiting Research Fellow*
*South Asian Strategic Stability Institute, Islamabad*
**Correspondence: malik.mahvish414@gmail.com**

**ABSTRACT**

The U.S. and Russia have developed a common military practice for seeking advancements in space-based weapons. Both states are aiming for space superiority and pursuing very effort to be a space-power. The outer space is struggling with the notions of potential space warfighting doctrine by the U.S. and Russia. The improvements in Anti-Satellite Weapons, Hypersonic Glide Weapons and acquiring laser- based space weapons are offering security challenges to the non-space faring nations. This paper aims to evaluate the implications of these variants of space weapons that underlines the qualitative assessment stating that are no cost-effective solutions to counter threats in outer space. Therefore, such potential space war scenarios can be minimized if the Russian Aerospace Defense and U.S. Space Command establishes a mechanism for exchanging the intelligence over cyberspace threats in peacetime. Both Forces should also sign a CBM on refraining any deliberate attack over space assets. They may include other technologically advanced state like China as well. Only progress in bilateral talks between Russia and the U.S. may increase their collaboration at international normative approach on outer space Post Cold War arms race is not restricted to two traditional rivals i.e. U.S. and Russia. The domino effect of this technology has introduced the offense - defense doctrines and other states like China and India are also working on space weapon capability.

**Keywords:** *Space-based weapons, U.S. Space Command, Russian Aerospace Defense, Space policy, future wars*

## Introduction

With the advancements in military technology, the world's security landscape has transformed the warfare phenomena from ground, air and sea toward outer space domain. Outer space remains significant for international community for both military and commercial purposes. The military-based space technology can be traced back to Cold War rivals including the United States and former Soviet Union, now Russia. The 1957 Sputnik Satellite served the evolutionary debate over competition between U.S. and Soviet Union for becoming leading space power (Mowthorpe, 2010). The Soviet Union also invested in highly advanced space-based military industry. It also tested world's first R-7 Semyorka-Intercontinental Ballistic Missile (ICBM) with 7,000kms range in 1957 (Seigel, 2019). The U.S. took advantage of Soviet's space expertise and their bilateral cooperation was converted from military competition to economic cooperation. Both sides agreed to work together in exploring space for peaceful purposes (Sagdeev, n.d.). The bilateral agreement on Strategic Arms Limitation Talks (SALT-I) and Strategic Offensive Arms in 1972 called for limitations on antiballistic missiles in space. The U.S. also remained focused on exploring the military side of the space for reconnaissance and communication purposes. It

pursued the Anti-Satellite (ASAT) Weapons to counter Soviet's on-Orbit weapons in space in 1960s. The U.S. also endorsed its operational ASAT capability after the blinding incident of its satellite in 1975. After this development, the U.S. administration proposed a mutual ban on ASAT weapons to the Soviet Union. On the other side, with the signing of SALT-II agreement with Soviet, this particular initiative couldn't be pursued further because of U.S. focus on the 1979 Afghan invasion episode (Mowthorpe, 2010).

The 1983 Strategic Defense Initiative (SDI) also remains significant in the U.S. space policy on not tolerating any hostile space-based weapons. It offers in enhancing military operations for deterrence stability to itself and its allies. SDI visioned to develop research and development for future ballistic missile defense. The 2006 President Bush's space policy emphasised on gathering essential military data from space-based technology. It also negated any arms control efforts that would hinder the U.S. access to the outer space. The next Obama administration adopted an opposite approach from the previous administration and kept more focus on developing national space industry for commercial purposes. It also remained committed to gather international cooperation on arms control measures on outer space; but no significant progress could be made (Broad & Chang, 2010).

This paper aims to provide an overview of the recent U.S. and Russian space capabilities including their domestic legislation, military doctrines, future space-based weapons and their national approach towards international space law in military domain. It also offers an assessment of their normative, technical and political aspects and provides a way forward towards the need for securing the space security for all.

## 2. US Space Capabilities

The U.S. foresee the 'space domain' as an advance level of warfare, which is likely to be fought with revolutionary space-based technologies. Various officials have alluded towards gaining 'space superiority' and work dedicatedly to compete against any chances of 'space pearl harbour' in future (Arms Control Association, 2004). Former General Lance Lord, Commander of U.S. Air Force Space Command, said that gaining space superiority should reflect Americans way of fighting a war (Krepon, 2004). Similarly, Donald Rumsfeld, former Secretary of Defense, warned against space pearl harbour that could resulted from jamming, destroying satellites and paralysing the U.S. command and control systems (Lewis, 2004). In this backdrop, the main U.S. space policy is competing against space warfare tactics led by the Russian Aerospace Forces and Chinese PLA Strategic Support Force (Cheng, n.d.).

### *Trump's Space Policy*

The U.S. President Trump announced the establishment of the sixth military command titled as, the *United States Space Force (USSF)* on 19 December, 2019. The Secretary of the Air Force is directed to train both Space and Air Forces against modern challenges (Cheng, n.d.). President Trump also re-established the U.S. Space Command on 29 August, 2019. Earlier, this Space Command was dissolved and merged under U.S. Strategic Command during former President Bush administration. He mentioned that few states are pursuing the space

weaponization and hence, it is essential for America to develop counterspace capabilities to target its enemy's missiles (Erwin, 2019).

On 6 April, 2020, President Trump also issued an Executive Order (EO) on "Encouraging International Support for the Recovery and Use of Space Resources" by stating the U.S. policy on recovering and use of resources in outer space including the Moon and other celestial bodies. The U.S. has incentivised the space innovators and entrepreneurs for space exploration missions by developing space economy in future. It has explicitly negated any kind of its adherence to the 'global common' notion in space and emphasised on formulating its own legal precedents with regards to recovery and use of space resources. With this background, this brief aims to assesses the U.S. approach towards international space law and the role of the U.S. private sector in space exploration in future (The White House, 2020).

***FY2020 National Defense Authorization Act***

With the authorization of Fiscal Year 2020 National Defense Authorization Act (NDAA), USSF is established under the U.S. Air Force command. The main mission of this Space Force is to work along space doctrine and develop its space war-fighting capabilities. It is also subject to deter any kind of foreign aggression against U.S. and its allies by performing offensive-defensive military operations (Congressional Research Services, 2020). Further, the estimated USD 934 Billion military budget runs through 1 Oct, 2020 to 31 Sep, 2021 allocates USD 636 Billion to the U.S. Department of Defense. Within that, the missile defense will receive USD 20 Billion and space program will receive USD 18 Billion in future (Amadeo,2020).

***2019 U.S. Missile Defense Review***

The 2019 U.S. Missile Defense Review (MDR) remained significant in entailing its aiming technologies in missile and space domain. It targets Russia, China, North Korea and Iran. The U.S. Department of Defense reported that they possesses the limited capacity to strike against enemy's intermediate range and medium range ballistic missiles against its allies. This review focused on expanding the scope of the U.S. missile capabilities and places more stress on space-based military technologies to intercept missile in boost-phase. The expanded scope included regional cruise missiles and hypersonic missiles. The MDR has identified eleven (11) key issues for disseminating the future US missile policy. It asked for establishment of the Homeland Cruise Missile Defense Agency. It endorses the worldwide deployments of the THAAD missile system. It emphasised on making Aegis missile system fully streamlined against intercepting ballistic missiles with ten years' timeline. It calls for enhancing the F-35 planes to strike ICBMs in boost-phase. It also suggested to operalize the Aegis Ashore Test Center in Hawaii to counter threats from North Korea. It mentions the development of human resource and technological up-gradations in space-based intercepters in boost-phase. It is also further aiming to develop war-fighting involvement processes. It asked for alternate options to work towards countering trans-regional defense-related threats. It seeks the operational responsibilities for 'left to launch options' to preempt the incoming missiles before it take-offs. It also asked to develop an early warning assessments and its responses against cruise and hypersonic missiles (Arms Control Association, 2019).

Moreover, in Space domain, the MDR highlighted the Anti-Satellite (ASAT) weapons by the Russia and China an ultimate threat to the U.S. It has indicated that Russia and China both are advancing their space capabilities through on-Orbit activities. Russia is working on the directed-energy ASAT weapons and ground-launch ASAT capability. China also possess the directed-energy ASAT weapons. The aimed space-based technology will help in assessing the future threats from emerging state-of-the-art cruise missiles and Hypersonic Glide Vehicles (HGV) (Office of the Secretary of Defense, 2019). Also, Gen. John Raymond, Commander of U.S. Space Command and the U.S. Space Force Chief of Space Operations, stated that Russia has recently conducted a direct-ascent ASAT weapon test on 16 April, 2020 (Clark, 2020).

***Further Developments***

With regards to procuring different space-based weapons, the USSF has received a satellite jammer from the U.S. Air Force named *Counter-Communications System Block 10.2*. It is considered one of the effective space-based weapon against enemy in combat operations (Hendricks, 2020). Also, the U.S. defense sector has been investing in testing the neutral particle beam in orbit in 2023. This potential direct-energy weapon is aimed at testing to attack satellites with using stream of subatomic particles that may travel with the potential near-equal speed of the light (Tucker, 2020). On co-orbital ASAT capabilities, the U.S. has these potential technological essentials as it has conducted various tests in Low Earth Orbit (LEO) and Geo Sun-synchronous Orbit (GEO) for rendezvous and proximity operations. whereas, it has never publicly announced its potential co-orbital ASAT capability. Similarly, it also has an operational direct ASAT weapon capability which is not publicly acknowledged yet. It has conducted mid-course missile interceptor tests against LEO satellites. The U.S. also possesses the jamming capabilities of global navigation systems carrying civil signals. Other military capabilities like spoofing and jamming enemy's military signals are also not announced publicly (Weeden & Samson, 2020). Besides this, the U.S. is also focused on launching space-based war games with its inter-agency process including its allies in year 2029. It visions for assessing the collective emerging challenges, prospects and its impact on decision-making among allies at broader level (David, 2020).

***U.S. Approach on International Space Law***

The U.S. approach on international space law over space weaponization suggests that it is more likely to adhere with less stringent, voluntary and non-legally binding, transparent confidence building measures (TCBMs). This step is very significant in countering the Russian and Chinese role in eroding the space security for all (Ford, 2020). In this context, the U.S. fully endorses the European Union (EU) International Code of Conduct for Outer Space Activities (ICoC) that offers voluntary guidelines in the form of TCBMs to all states (Reaching Critical Will, n.d.). In contrast, the Russia and Chinese-led draft Treaty on Prevention of Placement of Weapons in Outer Space (PPWT) offers legally binding measures that downplays the main concern of banning the ASAT tests in future (Ford, 2020). On issue of Prevention of an Arms Race in Outer Space (PAROs), the U.S. opposes negotiations on PAROs and highlighted that this draft treaty is fundamentally flawed and doesn't address the security dynamics at length. Two

important sections on definitions and verification issue remains ambiguous and excludes the debate over ground-launched ASAT weapons (Wood, 2019).

## 3. Russian Space Capabilities

The Russian space capabilities are meant to offset the U.S. space capabilities and foresee space as a 'strategic region'. Russian national space policy aims itself to be a great power and hence, pushes the U.S.-led unipolarity towards 'multipolarity'. The U.S. withdrawal from bilateral Anti-Ballistic Missile (ABM) Treaty and its policy over multi-layered missile defense poses security threat to Russia. It further perceives the U.S. First Strike against Russia originating from space-based weapon technology (Jackson, 2018). Russian President Putin perceives North Atlantic Treaty Organization (NATO) aiming towards militratization of an outer space and therefore, intended to enhance Russian work for orbital groups, space rockets and missiles in future (Ellyat, 2019).

Moreover, in the backdrop of establishing the U.S. Space Command, President Putin mentioned that Russia needs to expand its space forces as the U.S. is rapidly developing its space forces for implementing its space-related military operations (BBC News, 2019). Whereas, the Russian response over Trump's EO on enhancing the role of private sector in exploring space mines and negating the 'global common' notion mentioned that the U.S. is playing the 'odds' with the international commitments over equal excess to 'global common heritage'. It denounces this aggressive act of capturing space territory by the U.S. (Reuters, 2020).

### *Putin's Space Policy*

Russia remains the first country in establishing the Space Force in 1992 under its Defense Ministry. As of today, it is now merged into Aerospace Defense Forces, which was established in 2015, comprises the integration of its Air Force and Outer Space Force. It also works in close collaboration with Russian Federation Armed Forces (Harrison, Johnson, Roberts, & Young, 2020). The objective of this Aerospace Defense Forces is to monitor, identify and prevent the potential threats to its space security (Russian Ministry of Defense, n.d.).

### *Military Doctrine*

Russia might come-up with the updated 2020 military doctrine specially after the Trump's Space Force, 2019 MDR, and his decision to withdraw from the bilateral Intermediate-Range Nuclear Force (INF) Treaty. Whereas, various Russian military leaders have stated to call for an effective and proportional response to the U.S. space policy in future. Russian Chief of General Staff Valery Gerasimov said that with the addition of space as a fifth military branch of the NATO forces, the potential of future wars is now extended to any form of warfare scenario. Russia needs to be fully prepared in this regard (Global Security, n.d.).

The 2014 Russian military doctrine was updated in the context of threat perceptions from the U.S. allies including NATO forces and their armed buildup in Europe and beyond (Russian Ministry of Defense, n.d.). This military doctrine added key policy sight over space security issues. Aerospace Defense Force will be equipped with the advance technology and training. While assessing the external military risks, it was highlighted that few states may keep intent to place

weapons in outer space. They may also intent to develop high-precision weapons and to prepare for global strike mechanisms and deploy missiles systems in future. All such scenarios will erode the global strategic stability. On issue of deploying Armed Forces, the situation will be mapped based on the information that will categorise a threat either under wartime or peacetime zone. In peacetime zone, the early warning notifications will prevent any threat in outer space by the readiness of the Aerospace Forces. The orbital group of space vehicles and Aerospace Forces' relevant facilities will be further guarded (Russian Embassy, 2014). Nonetheless, there is no official source on Russian military budget on its military aspect of space could be found. The commercial use of space under Roscosmos is reported to have annual budget on military satellites around USD 1 billion (Luzin, 2020).

***Further Developments***

Russia is believed to carrying their footprints of the Soviet Union's space-based technology ahead.On ASAT space weapon, Russia has developed its ground-based direct-ascent ASAT and co-orbital ASAT technology. Total 7 tests of direct-ascent ASAT weapon are conducted of PL-19/ Nudol system till 2018. The first co-orbital ASAT test of Istrebitel Sputnikov was recorded in Cold War era. Another similar weapon Naryad has not recorded any confirmed interceptors tests. It is to be noted that in the post Cold War era, Russia has not officially acknowledged any newly developed co-orbital ASAT system. The U.S. has shown its reservation over the Russian inspector satellites including Nivilar series (Cosmos-2535, 2536, 2537, 2538) and Cosmos 2519, 2521, 2523, are sufficient enough to perform weapon capability. Furthermore, it is reported that S-400 surface to air missiles and its upgraded version of S-500 may develop a capability to work as directed ascent ASAT weapon that needs high precision targeting capability, still not demonstrated yet. Russia is reportedly working on its air launched direct-ascent ASAT technology as well. The advanced version of MiG-31 fighters may intend to develop as air launched direct-ascent ASAT system remaining limited to LEO. Also, in the same capacity, the MiG-31BM aircrafts may likely to get operation by 2022 (Harrison, Johnson, Roberts, & Young, 2020).

Russia has also deployed the HGV named Avangard in 2019. It has a different manoeuvre capability and hard to intercept (The Guardian, 2019). In the field of non-kinetic weapons, Russia has adopted its Cold War designed air-based laser weapons. Other new variant includes the ground-based laser weapons that remains underdeveloped. It is also remain vigilant in electronic counter-space capabilities through jamming and spoofing the adversaries communication signals in war and conflict zones (The Guardian, 2019). Hence, it remains dedicated to specialize in anti-access and anti-denial approach (Luzen, 2020).

***Russia's Approach on International Space Law***

The Russian and Chinese cosponsored draft on 2014 PPWT fully outlines the opposition of an arms race and weaponization in outer space. The PPWT share its scope with the 2019 United Nations Group of Governmental Experts (GGE) meeting on PAROs over this issues. Both states are also of this view that PPWT should supplements the GGE meetings to further gain confidence of all participating states (United Nations, 2019). At the United Nations First Committee, Russia along with China and Brazil cosponsored the resolution on *No*

*first placement of weapons in outer space* since 2014, signed by total 22 states till Oct, 2019. It further pledges states to initiate political pledges in this regard. In addition, Russia, China and the U.S. also cosponsored resolution on TCBMs in outer space activities since 2013. With the U.S. opposition in 2019 to this resolution, the talks on TCBMs remains faded (Belousov, 2019).

**4. Assessment**

The above mentioned space capabilities of both highly advanced states have provided an opportunity for military industrial complexes to produce state-of-the-art technology. Different variants of space weapons suggest that there are no cost-effective solutions to counter threats from space domain. This post Cold War arms race is not restricted to two traditional rivals i.e. U.S. and Russia.The domino effect of this technology has introduced the offensive-defense doctrines and other states like China and India are also working on space weapon capability. This revolutionised military technology has called for Space Arms Race 2.0.

The military doctrines of the U.S. and Russia have significantly highlighted the threats from each other's missiles and space weapons and called for advancing the counterspace capabilities. Such aggressive military postures have urged these states to prepare for a potential war-fighting in space. The military mind-set of both political leaders - President Trump and President Putin have interlocked themselves into rigorous space competition. Both states are seeking space superiority and pursuing an arms race to develop an edge in military space technology in future.

The 'fog of war' between adversaries in space domain can never be ruled-out. The different advanced variants of space weapons have further blurred the ambiguous redlines. For instance, the Russian 'inspector satellites' are suspected as a potential space weapon by the U.S. Further, the blurring lines over converting the crisis into full-blown war will have dangerous implications for deterrence stability for all. Similarly, the unauthorised or accidental use along with electronic malfunctioning or jamming by state or non-state actors may cause huge damage to nuclear command and control systems. This aspect of cyberspace warfare may cause a huge spark in crisis between the U.S. and Russia.

Considering the threat perception from ASAT technology, different variants to it may suggest that the Russian edge over co-orbital ASAT weapon technology may give them more decisive power to act within minutes than the ground-launched ASAT technology that will take more time to act than co-orbital technology. In this widening space-based competition, the U.S. remains mindful of this development; and it has developed the similar potential means that can reportedly be converted into co-orbital technology if it desired it in future.

The emerging traditional security threats in space domain have full potential to impact the non-traditional security of any state. The deliberate or accidental use of ASAT technology by either U.S. or Russia may cease the economic development and disrupt the daily use wireless communication channels in different private and public sectors. For instance, if for even one day any commercial city of Russia or U.S. would be disruptive from wireless-communication, it will cost a huge blow to

their worldwide businesses and lessen their credibility from security perspective as well. The uncertainty of next potential threat will increase fear in the country.

With regards to the normative approach on outer space, it is explicit that two camps i.e. U.S. versus Russia-China are pitching their narrative on outer space. The voluntary non-legal commitments versus legal treaty against space weaponization remains plausible to implement and remains under deadlock. In all this situation, these highly advanced states are exploiting this development and furthering and stocking up their military capabilities before any international legal measure could be taken into account. The above mentioned U.S. critique on PPWT calls for imperfections in the draft treaty, whereas, all the existing nuclear or missile related treaties show that there is no perfect treaty. Different loopholes existed from time to time on verification issues or the not taking into account advanced technology but they proceeded further. In short, treaties have always guarded political leverages for respective state's monopoly and for outer-space that time has yet not occurred, since neither U.S. nor Russia want to cap their military capabilities as of yet. Therefore, both U.S. and Russia are supporting different paths for taking normative approach towards outer space.

## 5. Way Forward

The aggressive space capabilities by the U.S. and Russia cannot declare that which one state is winning and other is losing. Both sides foresee themselves to be a space power and determined to seek their military hegemony in outer space. The widening technological gaps between space fare and non-space faring nations with no guidelines to monitor or lessen the threats to space security further offers challenges to all.

The technological trials, failures and improvements will take another decade or so to seek full command on space based weapons. Hence, the potential space wars also offer no technological reversals and undermine the peace and security of all.

Therefore, it is recommended that the U.S. and Russia needs to be engaged in bilateral or multilateral arms control measures in outer space. They needs to understand that these states are dragging other nuclear-states in arms race.

The next U.S. elections in 2020 may find an opportunity to re-define its bilateral relations with Russia. If Republicans will be selected then they will likely to follow the same path of negotiating no CBMs or agreement on outer space with Russia. Whereas, if Democrats come into power, then they may take less aggressive approach and proceed for bilateral arms control in outer space. Both Russia and the U.S. can initiate talks on ensuring political commitments on defining SoPs for restraint measures. Russian Aerospace Defense and U.S. Space Command needs to work for mechanisms for timely exchanging the intelligence over threats of potential cyberspace acts by non-state actors in peacetime. Both Forces should also sign a CBM on refraining any deliberate attack over space assets. They may include other technologically advanced state like China as well. Moreover, only progress in bilateral talks between Russia and the U.S. may increase their collaboration at international normative approach on outer space.

## 6. Conclusion

With the improving edge in space technology, the U.S. and Russian Space Forces are competing for space hegemony. In the absence of any legal restrain measures, both sides are exploiting this situation and are fully committed to generate a huge revenue to the space based military industrial complexes. The impact of the U.S. extended deterrence policy to its European and other allies also presents an alarming situation for Russia. Whereas, Russia is also not far behind in endorsing the war-fighting doctrine in outer space. Space wars are likely to happen and more states are likely to develop their space weapons if U.S. and Russia will not take an initiative towards space CBMs or political pledges. Peace and security will never be secured with aggressive mind-sets, hence, international community should continue to re-endorse its existing political and legal measures against developing weaponization and arms race in outer space.

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