

A Perspective on Countering China's Dominance in Space

Pushpinder Singh Bath

Ph D Research Scholar,
Department of Defence and Strategic Studies,
Punjabi University, Patiala
Email : pushpinder53316@gmail.com

Abstract

China regards its space programme as an inherent expression of its comprehensive national power for furthering its political, economic, and military interests. Driven by focused political vision, China has developed significant space capabilities, thereby transforming itself into an advanced space power. The opaque intentions and policies of China on its unsettled territorial borders and claims in South China Sea, coupled with rapid strides in space technology implies that China's improving military space capabilities could be used decisively against an adversary during a future conflict, to provide support for long-range precision strikes and threatening the adversary's space-based assets. It is therefore pertinent to examine China's military space capabilities and the threat they pose for our national security. The rapid militarization of space by China poses a serious geostrategic challenge to India. The increasingly complex and competitive geopolitical situation demands that India protects its national interests by instituting effective countermeasures to deal with the threat from China's emergence as a space power.

Key Words

Peoples Liberation Army (PLA), Strategic Support Force (SSF), Anti-Satellite (ASAT), Directed Energy Weapons (DEWs), Anti Access Area Denial (A2AD), Beidou, Mission Shakti.

Introduction

China's acquisition of advanced space capabilities has established its status as a first-tier space power. Not only does China have the capacity to exploit space to meet the strategic requirements of the Peoples Liberation Army (PLA), it also has the capability to deny the use of space by an adversary. This has a direct bearing on our national security and there is an urgent need to adopt suitable countermeasures against this emerging threat from China.

China's Growing Space Capabilities

To put China's space ambitions into context, it is worth reviewing the history of the country's space programme. It began in 1956 as an offshoot of China's missile technology development efforts and was soon allocated the same priority as the country's missile and nuclear programmes. In 1970, China became the fifth country to place a satellite in space.

During each of the two five-year plans that comprised the 1990s, China launched about 10 satellites. But in the next five-year plan starting in 2001, China placed more than 35 satellites into orbit. A 2006 Government white paper on space called for the development of a new generation of satellites and the improvement of launch capabilities¹. It portrays the priority given to acquiring advanced space capabilities by China.

A more important motivation for China's investment in space is the country's perception of its security environment and its understanding of the evolution of modern warfare. The Chinese believe that it is important to deny the use of space by opponents to cripple their Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) capabilities. The Chinese military comprehends just how reliant most modern armies have become on their satellites. Space-based applications have transformed the conduct of war on land, at sea and in the air. Space-based assets have made it possible to collect and rapidly disseminate intelligence almost in real-time. They make military more effective and lethal, while simultaneously reducing casualties. PLA believes that the past approach to wars, which relied heavily on mass mobilisation and preparation for an all-out warfare, are no longer viable. These inferences have been made by Chinese after assessing the use of space applications in Operation Desert Storm, NATO operations in the Balkans and the wars in Afghanistan and Iraq. PLA engaged in extensive analysis of these coalition operations and sought to incorporate the lessons into its own approach to war. These conclusions have shaped China's overall military modernization efforts as well as its space ambitions².

Analysis of authoritative Chinese documents indicates that Beijing believes that Space dominance would be critical to its military operations³. Hence China's thrust in space rests on the acquisition of following capabilities:-

- **Ability to Enter Space** : It includes the ability to launch satellites of multiple payloads and weight classifications into space to meet the strategic requirements of PLA. It also includes telemetry, tracking and control (TT&C) capabilities.
- **Ability to Exploit Space**: This involves the capability to support terrestrial operations and includes surveillance tasks, ballistic missile early warnings, communication, navigation and meteorological data.
- **Ability to Control Space**: This involves the ability to preserve own space assets, including capability to operate in the face of enemy Electronic Counter Measures (ECM) and the ability to interfere with, disrupt or destroy an adversary's space assets.
- **Focus of Chinese Space Investments**: In consonance with the concept of space dominance, Chinese space investments seem to be focused towards the following domains :-
 - Developing capabilities to fulfill its space support requirements i.e. being able to launch systems of different roles and configurations into space.

- Improving capabilities that enhance the employment of PLA in the Asia-Pacific region.
- Developing capabilities that allow China to deny the use of space to its potential adversaries.

PLA is assessed to have acquired the following space capabilities in its pursuit of achieving space dominance⁴ :-

- **ISR Capability:** Space based systems to enhance PLA's Intelligence, Surveillance and Reconnaissance (ISR) capabilities, to provide situational awareness and early warning to the operational commanders and strategic planners.
- **Ballistic Missile Warning:** Space based systems in conjunction with ground based systems to provide real time warning of the launch of ballistic missiles.
- **Tracking of Space Assets:** Space and ground tracking systems to obtain the data pertaining to adversary satellites in conjunction with its counter space capabilities.
- **Satellite Communications:** Ability to establish or augment communications in operational areas that lack terrestrial communication means.
- **Positioning, Navigation and Timing (PNT):** Space based PNT capabilities through its Beidou constellation to provide reliable navigation and precision guidance for conduct of operations and targeting by PLA.
- **Environmental Monitoring:** Space based systems to provide data on meteorological, oceanographic and space environment, which may affect application of forces by PLA.
- **Counter Space Capabilities:** Capability to target the adversary's space and / or ground based assets to cripple his C4ISR network.

Today, China possesses the facilities, satellite technology, mission control centers and launchers required of a space power. The 'Long March' series of rockets can launch satellites with multiple payloads in the geosynchronous and polar orbits. Various satellite constellations have been designed for communications, meteorology, remote sensing and navigation. In addition, China has shown great interest in small satellites and has developed a dedicated launcher for them. The Chinese have also developed kinetic and non-kinetic counter space capabilities to engage the critical space assets of an adversary to deny their usage in war. The creation of Strategic Support Force (SSF) by PLA is an important milestone in the prioritisation of space and heralds an increased role for space applications in the planning and conduct of operations⁵.

Threat Analysis

China is developing an array of kinetic and non-kinetic Anti-Satellite (ASAT) weapons including direct ascent missiles, high power lasers, ground based jammers and killer satellites, that will give it a strategic advantage in any future conflict. China now has the capability of targeting an adversary's satellites in the low and medium Earth orbits. While direct ascent missiles and killer satellites are kinetic ASAT weapons, non-kinetic ASAT weapons like Directed Energy Weapons (DEWs)⁶ could disable satellites from a standoff distance using lasers, particle beams, high-energy radio frequency etc.

China is developing multi-dimensional ASAT capabilities⁷ to support its Anti Access Area Denial (A2AD) strategy. It is also making large investments in building and fielding robust space warfare capabilities designed to support Beijing's drive to achieve regional and global hegemony.

In order to gain self-reliance in satellite navigation capabilities, China has developed its indigenous Beidou⁸ satellite navigation system that will assist PLA in expanding its global reach and provide precise targeting capability to its long range weapons.

PLA's prime objective is to deny the US access to the Indo-Pacific region. Military operations supporting that goal would begin with attacks aimed at destroying and disrupting the adversary's command and control capabilities by the employment of cyber and kinetic attacks on satellites and ground assets. Future systems could include orbiting electronic jammers, satellites with robotic arms, laser weapons. China is preparing for future wars and is developing formidable space and counter space capabilities, to say the least.

To accomplish its strategic objectives, various types of offensive counter space operations⁹ that may be put to use by China, are as given below:-

- **Denial and Deception:** This would constitute counter space activities to nullify space capabilities of an adversary nation, generally through non-lethal means.
- **Sabotage Ground Segment:** One of the easiest ways to disrupt, deny and degrade the utility of space systems is to attack or sabotage the associated ground segment. These specialized facilities are critical to the continuity of operations and effective use of the satellites, at the same time these are more vulnerable to attacks by a variety of means, ranging from physical attack to computer network intrusions.
- **Direct Ascent ASAT Weapons:** These can take the form of direct ascent interceptors or orbital interceptors. These weapons are typically ground or air launched into orbits that are nearly the same as the intended target satellite. These have been described below:-
 - **Interceptors:** The potential of an interceptor is a function of its damage mechanism, which could either be kinetic or non kinetic.

- **Miniature Satellites:** Microsatellite, placed on an interception course and programmed to home-in on a satellite could fly alongside a target satellite, until commanded to disrupt and then disable and destroy the target satellite. Detection and defence against such an attack is very difficult.
- **Co-orbital ASAT:** These systems consist of a satellite armed with a weapon such as an explosive charge, fragmentation device, kinetic energy weapon, LASER, radio frequency jammer or a robotic arm. Co-orbital satellites may also be designed to intentionally collide/ crash into a target satellite.
- **Directed Energy Weapons (DEWs):** DEWs include LASER, Radio Frequencies (RFs) and particulate beam weapons. DEWs are capable of attacking multiple targets in a short span, whereas interceptors tend to be single shot systems taking relatively longer time to reach and affect the target. DEWs afford a degree of deniability due to stand off nature of attack, lack of opportunity to the potential victim to defend itself due to the relatively quick nature of the attack and degradation of the target may not be immediately apparent, making it difficult to figure out when and from where the attack occurred.
- **Electronic Attack on Communication, Data and Command Links:** An act involving the use of electromagnetic energy to target the command and data links of satellites and ground stations.

India's Space Policy

India's space programme and policy have been undergoing important changes in recent years. The focus of Indian space programme has been social and economic development of the country. India's traditional position opposed militarisation of space and Indian officials argued that space should be used only for peaceful purposes. Even as India continued to rally against militarisation of space, it clearly acknowledged the passive uses of space assets for military applications in the realm of surveillance and communications. So, development, technological advancement and security have all been important drivers of India's space programme.

The Chinese ASAT test in January 2007 had a marked impact on India's approach towards utilisation of space. Policy articulations after the ASAT test became much more unambiguous on the need to develop more sophisticated ways of dealing with these new challenges posed by China. The Chinese ASAT test and the US shooting down a satellite thereafter in February 2008 pushed India to recalibrate its own policy options. It is a result of this recalibrated approach that India carried out Mission Shakti¹⁰, a direct ascent ASAT test on 27 March 2019. While making a declaration about the successful conduct of this ASAT test, Mr Narendra Modi stated this test was not aimed at any other nation but its purpose was to validate the capability to safeguard own space assets.

Vulnerability of India's Space Assets

India's communication, navigation, weather and ISR satellites orbiting in Low Earth Orbit (LEO) are clearly more vulnerable today against offensive counter space weapons than they have ever been in the past and their vulnerabilities have enormous implications for a

whole range of areas affecting socio-economic activities and military operations. Offensive counter space measures involve the use of lethal or non-lethal means to neutralise an adversary's space systems or the information they provide. Offensive counter space operations are designed to achieve following purposes¹¹ :-

- **Deception:** It employs manipulation, distortion or falsification of information to induce adversaries to react in a manner contrary to their interests.
- **Disruption:** It is the temporary impairment of some or all of a space system's capability to produce effects, usually without physical damage.
- **Denial:** It is the temporary elimination of some or all of a space system's capability to produce effects, usually without physical damage.
- **Degradation:** It is the permanent impairment of some or all of the space system's capability to produce results, usually with physical damage.
- **Destruction:** It is the permanent elimination of all of a space system's capabilities to produce effects, usually with physical damage.

Contours of Response Strategy

Based on the threat perception brought out above, the suggested contours of India's response strategy could be as follows:-

- Formulate a **National Space Policy** and establish **Defence Space Agency** that would coordinate the planning, launch and utilisation of defence space assets and also institute necessary safeguards to ensure their security.
- **Hardening** of own satellites against various types of attack.
- Develop capabilities for **rapid reconstruction and launch on demand**.
- Develop **alternatives to space systems** and utilise the space assets of friendly nation's to create redundancy.
- Engage in bilateral and multilateral agreements to enforce '**Zero Weapons in Outer Space**'.
- Develop various **offensive counter-space capabilities** as a means of deterrence.

Suggested Countermeasures

Active Defensive Posture: India needs to adopt an active defensive posture, beginning by expanding and invigorating the research and technical base needed to defend or replenish space assets. In the absence of defensive systems, India would do well to invest in small satellite development and rapid launch capabilities. The combination of the two,

once achieved, changes the strategic calculations of prospective adversaries. Another important component of an active defensive posture is political rhetoric that fits the times.

Synergy in Research and Development (R&D): It may also be necessary to bring about synergy in the R&D effort of ISRO and DRDO, while simultaneously tapping the potential of private industry for the development of encrypted satellite based communication and navigation equipment and surveillance sensors. The direction of R&D effort should be based on operational requirements of the armed forces.

Legislative Push: Parliament must focus on bringing about a legislation to encourage the development of private aerospace industry. Presently, ISRO has the monopoly in this sector. Whereas, in advanced space faring nations like US and China, private aerospace industry is playing a pivotal role in ushering in new space technologies. However, we are lagging behind in this sector and a legislative push is required to make the conditions conducive for the establishment and growth of private aerospace industry in India.

Passive Countermeasures: Passive countermeasures include warning for hiding, evading, manoeuvre and initiation of deceptive measures through electronic countermeasures. Some of the suggested passive countermeasures are as under¹² :-

- **Hiding**, by means of satellite miniaturisation and orbit selection.
- **Manoeuvre** from a ground station for evasion.
- Deception by deploying **lightweight decoys**.
- **Hardening** of the satellite and its on board systems, for example, use of shielding.
- **Electronic countermeasures and electro-optical counter measures**, for example, use of shorter wavelengths and directional antennas.
- Redundancy in ground infrastructure by adding more Earth stations and developing **mobile ground stations** to enhance survivability.
- Deploying new generation satellites with the capability to enhance the **power of signals** thereby making jamming more difficult and deploying additional satellites for redundancy.
- Protection against DEWs by developing a variety of **sensors, filters and shutters**. These sensors should trigger the on-board active and passive defence mechanisms.
- **Modular design** to enable mix and match of different payloads on the same spacecraft platform.
- **Developing partnerships with friendly foreign countries to use their satellites** for space applications. The adversary may get disinclined to attack a foreign satellite due to diplomatic ramifications.

- **Reduce dependence on space systems** by utilising space assets as an alternate to terrestrial or aerial platforms.

Active Countermeasures: While active countermeasures do not counter ASAT attacks, they portray our implied threats of retaliation and act as a deterrent against the adversary's intended ASAT attacks. Some of the suggestions for the development of active countermeasures are as under :-

- **Direct ascent ASAT weapons** and Co-orbital ASAT systems as a credible deterrence measure.
- Capability for **satellite jamming**. India should explore different jamming options available including proactive, function specific or hybrid and smart jammers.
- **DEWs** for retaliatory actions or to render adversary's ISR capabilities ineffective.
- **Electronic Warfare (EW) and Cyber-attacks** to target the adversary's vulnerabilities while retaining the option of plausible deniability.

Conclusion

The recent and on-going conflicts world over, have emphasised the importance of military space operations. It is expected that in near future, space assets will possess the capabilities for countermeasures for avoiding, evading and attacking any threats. The question of restricting the use of space for peaceful purposes remains under debate and shall require much more than lip service from the global community. China has established itself as a major player in the space arena and is vigorously propelling its research work in the field of counter space offensive operations. While the focus of the space developments of China are directed more towards tackling the US, India needs to remain vigilant and adopt suitable countermeasures to safeguard its critical space assets in the interest of national security.

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