Indian Military in the Space Realm

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Introduction

Since ancient times, the seas and oceans have been an arena of rivalry and armed conflict, and during some stages of history, those who mastered the seas, ruled the world. Subsequently, the fleet became relatively less important and the decisive role was played by conflicts on land or air. In the last two decades, however, scientific and technological progress has helped in the emergence of space, the ultimate high ground, as the decisive medium for warfare. The Vietnam War, the Cold War, Operations Desert Storm, Allied Force, Enduring Freedom and Iraqi Freedom testify to the successful military applications of space affecting the terrestrial battlefield.[1] In fact, the 1991 Gulf War is usually referred to as the first "space applications war," wherein for the first time in history, exploitation of various space systems contributed to the swift and efficient conclusion of a war.[2]

The launch of the Sputnik-1, a 68 kg satellite, on October 04, 1957, by the erstwhile Soviet Union from Baikonur Cosmodrome marked the dawn of the Space Age. This was an extension of the research carried out by a German scientist for the A-4 military rocket which had a successful launch way back in October 1942. The Sputnik's launch was followed by the launch of a large number of surveillance satellites by both the US and the erstwhile USSR, which remained ahead of the US during the early years of the space race.[3] From 1957 till the end of the Cold War, there was overwhelming utilisation of space for military purposes by the two major powers, which included satellite-based communications, electronic

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and communication intelligence (ELINT and COMINT), photo-reconnaissance, weapon guidance, anti-satellite and meteorology.[4]

While the US and the erstwhile USSR were busy extending the Cold War into space through different military projects, Vikram Sarabhai, the great scientific visionary and founder of the India's space programme, saw in the vantage point of space, a different use which offered a potential solution to many of the problems relating to education, health care, management of the earth's resources, etc, that India faced then[5]. The establishment of a rocket launching station at Thumba on November 21, 1963, was the first step in the creation of a certain level of space capability by India. Over the years, India has built an impressive capability in space technology and our existing space assets are being efficiently exploited for multifarious applications. Nearly five decades later, India has achieved a unique position in the community of space-faring nations in the world,[6] with an indigenous capability to access space, realise space-based systems and use these extensively by the network of ground segments earth stations.

Military Exploitation of Space

Like land, sea and air, space is a separate medium by itself, which starts somewhere at 150 km altitude from the earth, where the lowest circularised orbit of a satellite is possible. The physical domain of the air ends at 42 km, till which the highest possible buoyant flight takes place. It may be mentioned here that the term 'aerospace' in its characterisation as a single medium encompassing both the Earth's atmosphere and the space beyond has not found legal acceptance at the UN. The UN Charter and the 1967 Outer Space Treaty, of which India is a signatory, do not accept the continuum of air space, i.e., extending air space, with well defined boundaries into outer space, where no boundaries can be laid. Various agreements and laws accepted by the UN clearly distinguish two separate entities of air space and outer space.

Since 1957, the military exploitation of space has grown manifold. Space affords numerous military capabilities such as near real-time communications, reconnaissance and surveillance, highly precise navigation and space-based missile guidance. Reconnaissance, be it photographic, electronic or oceanographic surveillance, is one of the primary uses of satellites. Till 1981, 40 percent of the military satellites were photo-reconnaissance satellites. Today, satellites are being used to provide photos of enemy deployment and terrorist training camps. The second major application area is satellite-

based communication. The US commenced employment of satellites for communications way back in 1966 with the launch of the Initial Defence Satellite Communications Programme (IDSCP), which eventually grew to a constellation of 26 satellites. Today, over 70 percent of US military communications travel via satellites.[7]

Satellites are also being employed to provide real-time positioning data of ships, aircraft or missiles, which facilitate various military operations. Satellite-based navigation is extremely useful to assist movement of ground troops, especially in areas devoid of navigational aids, ascertain accurate disposition of troops and guidance of missiles/ weapons, and so on. In today's highly mobile battlefield, exact positioning and versatility can be a vital factor for the success of a mission. Early warning military surveillance satellites carry infrared sensors, which are designed to detect missile launchers by observing the characteristic infrared signatures of the exhaust from its rocket. Satellites also provide the capability to monitor communications as well as characterise the parameters and location of electronic warfare equipment and radar systems.

Another key military application of satellites is to provide a more robust command, control, communication, computers and intelligence and information (C4I2) system. Space-based meteorology applications have recently gained enhanced importance due to the role played by weather conditions on the accuracy of guns, missiles and other weapons. Different concepts of space-based ballistic missile defence (BMD) systems have been initiated by the US. While one concept envisages placing of high-energy lasers in orbit, another involves mounting missile interceptors onboard satellites.

It is important to understand the difference between militarisation and weaponisation of space. Militarisation of space falls within the definition of utilising satellites for enhancing the performance of terrestrial-based weapons, surveillance and communication systems. In view of the fact that since the 1960s, both the US and the former Soviet Union have deployed several military satellites in orbit for surveillance, reconnaissance and communications, space has already been militarised. On the other hand, weaponisation would mean placing of weapon systems in space, i.e. using space platforms as weapons.

Major Powers and Space

The US military has more than 50 years experience in space exploitation. As on date, the US is the only space superpower which has robust and indigenous space capabilities in all the three sectors: civil, commercial and national security

(military and intelligence), and is working on an extensive modernisation of its space capabilities to retain its unique position in space. The US space budget in 2006 was 30 and 40 times larger than that of China and India respectively.

Having achieved well established capabilities in all areas of space application, the US now has plans to establish habitats on the moon, liberation points (these are huge areas in space between the earth and the sun/moon where the gravitational pull of one planet counter-balances that of the other. Objects placed in liberation points require minimal energy to remain in space and virtually hang in space), and subsequently, on Mars. The objective is to establish space lines of communication and control key geographical areas in space.

Russia, the second most advanced space-faring nation in the world, launched the first human, Yuri Gagarin, into space on April 12, 1961. It also maintained a technological lead over the US in the initial years of the space race. Consequent to the launch of the Kosmos 4, the first Soviet photo-reconnaissance satellite in 1962, similar systems have been in orbit since then. Over the years, five generations of photo-reconnaissance satellites have been operationalised. The Soviets have also launched more than a hundred electronic intelligence/ communication intelligence (ELINT/COMINT) satellites since 1967. Despite recent downturns, Russia maintains active military space programmes in five areas: early warning, optical reconnaissance, communications, navigation and signal intelligence.[8]

China's space programme has been impressive since its beginning in the 1960s. It has acquired significant capabilities in space, in the civilian as well as military sector. China is greatly advantaged by the fact that its military (Chinese Military Commission) controls the civil space programme in addition to the military component.[9] Since the launch of the country's first military satellite on April 24, 1970, China has sent over 70 spacecraft into the earth's orbit. On October 15, 2003, China launched a manned spaceship, the ShenZou-6 which carried China's first astronaut Lt Col Yang Liwei, and thereby, became the third country in the world to independently send a man into space.

China reportedly has a total of 19 military satellites in orbit, which include at least three dedicated military telecommunications satellites, three imagery intelligence satellites, two maritime surveillance satellites, and two experimental navigation and positioning satellites. China has reportedly disguised a lot of military satellites as civil satellites. Many surveillance satellites could be orbiting with false identifies as civil earth-monitoring satellites. Publicly, these satellites are named Ziyun-2(ZY-2), but these photo-reconnaissance satellites can be used

for military missions in Japan and Taiwan. As regards satellite-based navigation, China has taken part in the European Union's (EU's) Galileo satellite programme, which is currently under development as an alternative to the global positioning system (GPS).

Presently, technology does not allow space-faring nations to establish habitats on the moon, Mars or liberation points. The US, Russia and China are working towards establishing habitats/colonies in these regions with the aim of controlling key geographical regions in space.[10] The other likely aim will also be to control the Helium 3 resources in the south polar region of the moon. The Chinese lunar mission is scheduled to land in this region in 2024.[11] The moon, which was the object of intense space technology competition in the 1960s, is likely to see renewed interest in the future by the current space-faring nations, including China and India.

Indian Use of Space

India has a robust and ambitious civil space programme which has fulfilled most national needs and aspirations since its inception in the 1960s. The Indian Space Research Organisation (ISRO) launched its first satellite, Aryabhatta, in 1975, and subsequently developed indigenous access to space on July 18, 1980, by the successful launch of the Rohini, a 35 kg test satellite, into low earth orbit from the launch vehicle in Sriharikota. Since then, it has followed a focussed path at a sustained pace to development, in consonance with the national objectives.

Today, ISRO has established two major indigenous space systems, INSAT for communication, television broadcasting and meteorological services and the Indian Remote Sensing Satellite System for resource monitoring and management. In addition, ISRO has developed well-established capabilities in search and rescue, tele-education, tele-medicine, and so on. Currently, ISRO is well placed to facilitate the growth of the Indian militaty as the future space power. ISRO has also entered the lucrative market of launching payloads of other nations. The success of Chandrayaan-l has signalled India's entry into the lunar nations club. The other nations are the US, Russia, the European Space Agency, Japan and China.

Exploitation of space by the Indian military commenced in the 1980s with the use of satellite imageries, procurement of GPS receivers for use for different purposes and utilisation of satellites for search and rescue. However, it is only recently that specific space assets have been reportedly created for military use. As dependence on space, for both civil and military applications will only

multiply in the coming years, space is bound to emerge as the centre of gravity of national security.

Space-based assets for real-time intelligence, surveillance and reconnaissance, communication, navigation, positioning and weapon control/ guidance requirements of the Services will have to be created through an integrated approach at the national level. As such, most of the envisaged space-based systems will be equally useful to all the users, including the military. For that, different stakeholders such as the defence Services, Defence Research and Development Organisation (DRDO), National Technical Research Organisation (NTRO), Intelligence Bureau (IB) and other national security agencies should together plan, develop and establish systems in space to be utilised by all users. Ability to use space is an integral and essential part of the overall capability of the nation, of which military capability is an important subset.

Space has been rightfully accepted as a tri-Service domain for defence by all the stakeholders. Currently, the Indian military is in the transition stage with regard to exploitation of space and development of space infrastructure. To facilitate optimum exploitation of emerging space technologies by the military, it is imperative that the developments of space technologies and study of their applications should be concurrent to enable informed decision-making by the Space Cells.

Action Plan for the Future

As India's national interests expand in the regional context to the extent of influencing the Indian Ocean Region and being a strategic competitor to China, the requisite military capabilities in various application areas of space would have to be built and effectively integrated. India will have to formulate a defence space strategy which would help us to not only shape the future space technologies required by the Indian military but also initiate strategic space programmes that are needed. We especially need to reduce dependence on those systems which may be denied to us at a critical juncture. To effectively integrate space applications within the Indian Army, it has to be understood that space is a General Staff function and not a charter of some select branches.

The Indian military will also have to establish dedicated space organisations at various levels, through which we can plan, progress and develop space assets for real-time situational awareness through satellite communication and space-based sensors. We need to establish space assets, which would be the 'eyes in

the sky' with capability to link strategic weapons with satellite communication/ intelligence gathering systems, air defence systems, battlefield real-time information/communication facilities, airborne reconnaissance systems and electronic-counter measures (ECMs). For all this, there is a requirement of dedicated military satellites along with supporting ground staff and a specially trained ground military staff to exploit the system.

The conduct of military operations in the future is not likely to be limited to the dimensions of land, sea and air. Space now extends the boundaries, adds a new dimension and is considered as the ultimate military strategic high ground required in dominating the world. The Indian military needs to exploit space capabilities to enhance its operational efficiency in various levels of war. Only space systems can provide global, real-time continuous coverage and connectivity to allow the Indian military to execute its future missions effectively and efficiently.

Notes

1. *USI Digest*, vol. 6, no. 12, March-August 2004, p. 98.
2. Joseph A Angelo Jr., *Space Technology* (New Delhi: Pentagon Press), p. 202.
3. Ibid.
4. Subodh Kumar," The Military Implications of Space Assets and Policy Implications for India", the United Service Institution of India Paper, p. 2.
5. K Kasturirangan, "India's Place in Space", talk at India Habitat Centre in New Delhi, May 12, 2008.
6. Futron Space Competitive Index 2009.
7. Franklin D Mariotta, *Brassey's Encyclopedia of Land Forces and Warfare* (Potomac Books Inc.,), p. 971.
8. Pavel Podvig, *Russia and Military Uses of Space*, Working Paper, The American Academy of Arts and Sciences Project, "Reconsidering the Rules of Space," June 2004.
9. Monika Chansoria, "Informationising Warfare: China Unleashes the Cyber and Space Domain," *Manekshaw Paper*, no. 20, Centre for Land Warfare Studies, 2010, p. 22.
10. Eugene M Emme, ed., *The Impact of Air Power* (Princeton, NJ: D. Van Nostrand Co., 1959), pp 871-872.
11. Raj Kumar Pruthi, *Space Warfare* (New Delhi: Sumit Enterprises), p. 5.