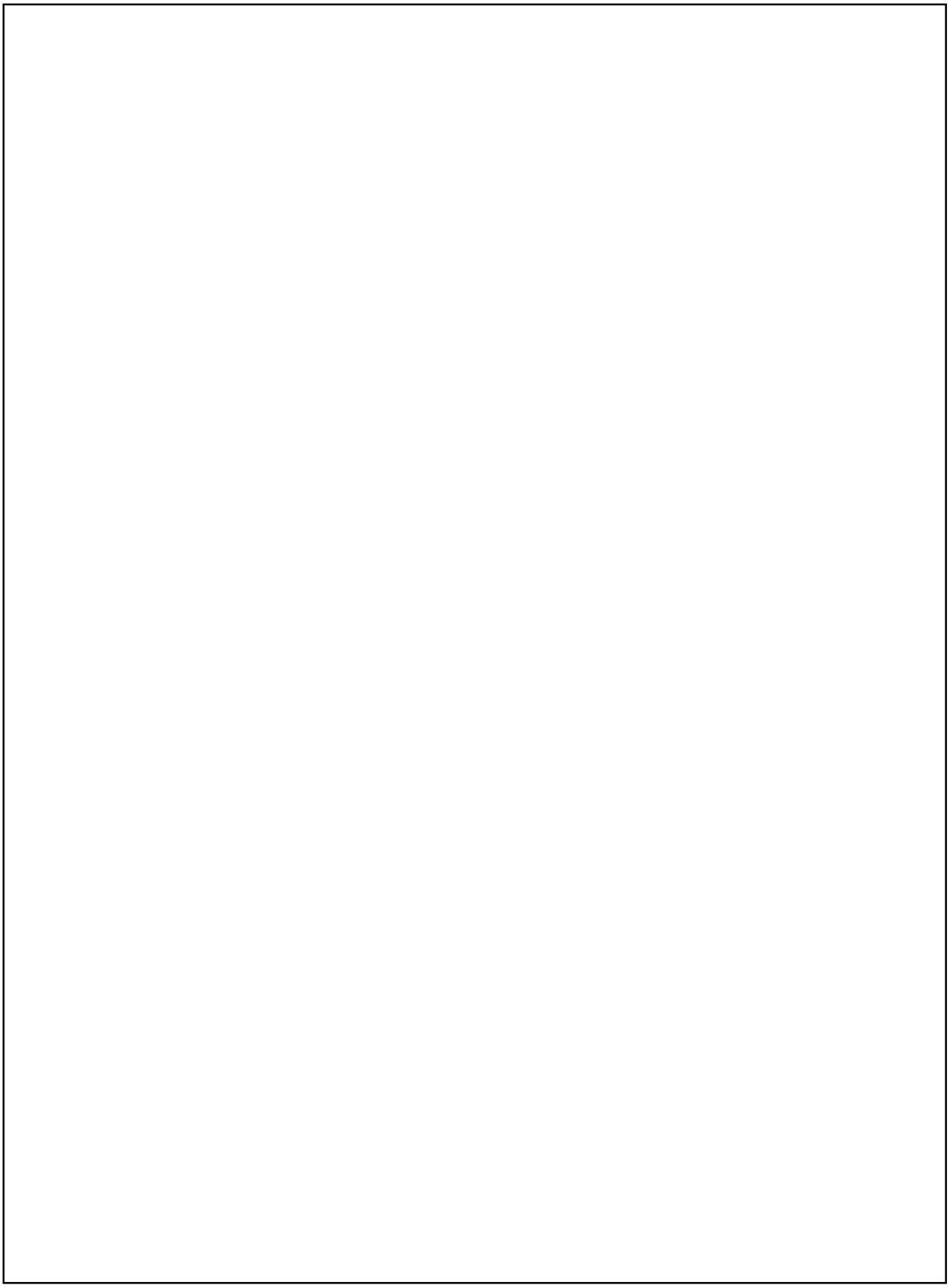

Security Implications of Indian Space Program

Khushboo Ahmad

Introduction

Far from the reach of conventional and unconventional realms, arms race between nations has entered into outer space. Today space is becoming a new battleground. Modern weapon systems and other advanced outer-space capabilities are increasingly making it possible for nations to use these space based systems. Space is a global common. It is a shared treasure of mankind. It can be used for strategic competition, as well as expanding economic growth of a country. During second half of 20th century Soviet Union was the first nation to launch surveillance satellites but soon United States also followed this path. Today, eleven countries including Ukraine and Russia have space launch capabilities and around 60 nations are maintaining nearly 1100 active satellites.

Significance of an advanced space program can be gauged from the statement of US Secretary of Defence Donald Rumsfeld, who termed it "the ultimate high ground".[1] A military oriented space program provides strategic support to national security and military related activities. It also offers an edge in terms of providing real time information support during conventional combats.

Military role of space satellites

The dual nature of space technologies has made a number of civilian and military applications possible. These can be used for certain specific military purposes.

Imagery: helps in identifying targets and detect the effects of underground nuclear detonations.

Navigation: refers to the universal purpose of satellites. It helps to locate targets and guide weapons. The most notable systems are *Navstar GPS* (which is used by US and UK military forces), Russian *GLONASS* system, Galileo developed by European Union and *Beidou* being developed by China.

Signals intelligence: as the name suggests this is used to detect and analyze communications with broadcasting signals.

Telecommunications: is the vital tool for managing communication and exchange of information during military combats from one command to another.

Early warning: is operationalized with the help of infrared satellites sensors which detects missiles because of their trails.

Meteorology: weather detection plays an important part in military operations. EUMETSAT is Europe's meteorological satellite for this purpose.

Surveillance and Reconnaissance: in military arenas satellites provide real time surveillance and intelligence information on enemy ground forces.

Militarization of space: although the phenomenon itself is vague in terms of its applications, but weaponization and space based weapons will provide an ultimate invincible position to a hegemonic state.

Evolution of Space programs during Cold war

During the Cold War, both superpowers i.e. USA and USSR, spent huge amounts of money on their space programs to counter each other's claimed superiority in space. Space exploration thus, served as another dramatic arena for Cold War competition. On October 4th, 1957, Sputnik satellite was launched into space by USSR, thus it became the first man-made object put into outer-space. It had huge political impact in the USA and triggered concerns in US about Soviet advancement in space technology and an urgency to reduce the existing gap in this field with its arch rival. In turn US created National Aeronautics and Space Administration (NASA) and two security-oriented space programs operated by US Air Force and Central Intelligence Agency were also begun. US also started putting its satellites into the orbit.

During the 1960s, competition revolved around lunar missions. Eventually the US was successful in landing Apollo 11 flight, the first manned flight, with Neal Armstrong, on the moon. Soviet Union also tried to catch up but failed in doing so. As tensions eased in 1970s, both superpowers conducted joint Apollo-Soyuz missions in 1975. Nevertheless, the security concerns remained throughout 1980s as space planners in both countries focused on building space based military capabilities. In the United States research concentrated on building a space-based anti-missile system called the Strategic Defense Initiative popularly

known as Star Wars, but it was never built. In the USSR concerns over possible offensive uses of the US space shuttle helped prompt the development of the heavy-lift launcher Energia, and the space shuttle, Buran. But worsening economic conditions forced suspension of both programs.

Space competition after the Cold War

After the Cold War, the US redefined NASA's plans and also included Russia as a partner in developing an international space station. It ushered in an era of cooperation between Russia and the US, demonstrated by flights of cosmonauts on the space shuttle and astronauts on the Mir space station. Meanwhile, other nations also started space exploration missions. 13-nation European Space Agency (ESA), formed in 1975, has also cooperated with Russia and has flown on shuttle missions. From the late 1970s a series of European rockets, called Ariane, have been launched as commercial satellites. ESA's activities in planetary exploration have included probes such as Huygens, which landed on Saturn's moon, Titan, in January 2005 as part of NASA's Cassini mission, and the Mars Express orbiter, which went into orbit around Mars in December 2003.

Other nations such as China, Japan and India have also developed space launchers, but out of these countries only China has put a piloted spacecraft into outer-space. Japan has joined Canada, Russia and ESA in contributing hardware and experiments to the International Space Station. Moreover, China has indicated an interest in establishing a space station that will be permanently crewed.

South Asian Region and Outer-Space

The South Asia region is locked in an enduring rivalry of arch-enemies India and Pakistan since partition of India in 1947. This rivalry for prestige, military superiority and security had earlier expanded from the realm of conventional warfare to nuclearization of sub-continent as both nations acquired nuclear deterrent one after the other. Both nations also commenced their space exploration programs in 1960s, but today India's proactive space program is far ahead of Pakistan and has a heavy military orientation. It has the capacity to disturb the fragile stability and balance of power in the South Asian region.

Evolution of India's Multi-dimensional Space Program

Indian space program was initiated for meeting growing challenges of socio-economic growth but over the years it was also developed for military use. Indian space program has advanced tremendously over the past few decades. It stemmed from the broad strategic vision of Prime Minister Jawaharlal Nehru and Vikram Sarabahi, a renowned scientist. Vikram Sarabahi envisioned space program to be, *"a civilian programme with focus on application of space technology as tool for socio-economic development of the country."*[2] He pronounced that India intended to build a space program that can use space technologies and research in the critical areas of communication, meteorology and natural resource management.[3]

History of Indian space program has been unique in the world. It began with slow but outstanding feats and suffered remarkable failures during its journey. It commenced in early 1960s. In 1962 Indian National Committee for Space Research was established under Department of Atomic Energy. It was mandated with supervising and managing space research and developing international cooperation in space exploration.[4] In 1963, India launched its first sounding rocket into the outer space with cooperation from NASA.[5]

Next, in 1969 Indian Space Research Organization (ISRO) was established under the aegis of Department of Atomic Energy, but was later placed under Department of Space in 1972. Moreover, a space commission was formed in the same year. In 1974, India conducted a nuclear test. As a consequence of India's nuclear test international community imposed sanctions on India. These sanctions effectively stopped technological cooperation and assistance from the Western world which stunted progress in space technology and research. To overcome this challenge India began the process of indigenization. It took ISRO few years to consolidate its foundations but now Indian space infrastructure stands on a solid footing.[6]

In 1975, India launched its first satellite, Aryabhata, into the orbit with Soviet assistance.[7] After successful launch of Aryabhata India put into orbit Bhaskara-I and Bhaskara-II in next few years.[8] In 1980, India became a space-faring nation, when it placed a satellite called Rohini-1 in space using indigenously developed Satellite Launch Vehicle (SLV) from its own territory. Its objective was earth observation.[9] After this successful launch India continued to make significant progress in various space technologies. For the next decade India focused on

further development of Rohini satellite series and several advanced versions with various modifications were launched over the years.

In 1994, India launched SROSS-C2 satellite into orbit by using ASLV-D4. This satellite carried two payloads. First, Gamma-Ray burst experiment for detecting celestial gamma-ray burst and potential analyzer to study the characteristics of the equatorial and low latitudes ionosphere and thermosphere. This satellite was specifically aimed at earth mapping and studying geographical features of India.[10]However, the most successful Indian endeavor has been development of Polar orbiting Satellite Launch Vehicle (PSLV). PSLV was made operational in 1997, and since then ISRO has come to rely on it as it successfully launched 22 space missions from it. This vehicle made ISRO able to launch multiple satellites in a single rocket launch. In 2009 ISRO launched 10 satellites in one go by using PSLV-C9 launcher, thus setting a unique precedent.[11]

A significant shortcoming of Indian forays into outer space is failure to launch heavy satellites that can carry larger payload to the geostationary orbit. Geosynchronous Satellite Launch Vehicle (GSLV) has not become operational yet as it suffered two repeated failures in 2010. India again plans to test launch of GSLV rocket by the end of 2013.[12] Indian constraint is to make GSLV work successfully in the absence of cryogenic engine technology, because in 1992 United States had barred Russia from transferring this technology to India. US then believed that India could divert it for development of its missile program.[13] India has yet to indigenously develop cryogenic engine technology necessary for such launches. It is expected that by the end of 2013 India will test this technology thus becoming self-reliant for launching satellites weighing around 4-5 tons.[14]

Commercial Dimension

ISRO established a commercial unit called Antrix Corporation. It markets space and telecommunication products manufactured by ISRO. India has also extended cooperation to other countries in their satellite launches by offering its launch facilities on commercial basis. Antrix Corporation provides solutions and services for space products, applications covering communications, earth observation, and scientific missions and services including remote sensing data series, transponders' lease service; launch services and mission support services.[15]

Remote sensing is another area where ISRO excels. It has developed and launched satellites with 80-cm resolution[3]. Indian satellites offer one of the best resolutions among its competitors.[16] Moreover India also plans to design and develop a regional navigational system to meet its growing needs. The proposed Indian Regional Navigational Satellite System (IRNSS) is an assemblage of seven satellites that will cover India and its neighboring regions. It is expected to be operational by 2015.[17]

Usage of Space Applications by Indian Military

Indian military remained oblivious to space activities of its nation for years after Indian space program began. ISRO functioned independently of military as space systems were managed by scientists and civilian administrators.[18] But, Defence Research and Development Organisation (DRDO) was tasked with developing technology for use by the Indian military. DRDO was established in 1958, and since then it has been the technological arm of the Indian military.[19] Thus, Indian armed forces had no role in regular space operations before 2007.[20] But after ASAT test by China in 2007 India focused its attention on seeking military oriented space capabilities and DRDO started collaborating with ISRO for developing space-based military assets and systems.

In June 2008, India announced establishment of Integrated Space Cell (at Integrated Defence Services Headquarters) to coordinate military space operations with ISRO and also began the process of forming an operational aerospace command.[21] Since then Indian military has focused on developing and acquiring space-based reconnaissance capabilities, navigation systems, targeting, early warning, communications, electronic intelligence and active defenses.

For a number of years Indian military didn't have access to real-time intelligence data from space-based systems. But from 2001, it gained access to detailed photographic imagery through commercial satellite companies.[22] From April, 2008, a dedicated satellite *Cartosat-2A* fitted with Israeli technology for high-resolution imagery has been put under direct military control and now serves the Indian Defence Intelligence Agency's Defense Imagery Processing and Analysis Center.[23] Moreover, *Riasat-2* satellite with all-weather synthetic-aperture radar acquired from Israel was placed into orbit in April 2009,[24] while a second *Cartosat-2B* i.e. optical-imaging satellite also began transmitting data from July 2010.[25] The said intelligence center also receives satellite data from Russian and Israeli space-based systems.

Employment of Space Capabilities in War Doctrine

To institutionalize and further develop these limited capabilities, Indian military has put forward a new doctrine called "Defence Space Vision 2020".[26] This doctrine focuses on phased expansion starting with space communications and surveillance capabilities and setting up of a military-run operational center under the new Integrated Space Cell. The plan envisages dedicated satellites launched by ISRO for three branches of the military i.e. army, air force and navy. Moreover, specialized workforce will be raised, with ground and space-based military assets and their command and control systems.[27]

Efforts are already underway for operationalizing the goals set by Space Vision 2020. The dedicated military satellites program is in development phase as DRDO has been regularly putting satellites in the orbit for last two years. In 2010, DRDO announced designing and development of Communication-Centric Intelligence Satellite (CCI-Sat). This satellite is fitted with an intelligence sensor that will pick up conversations, communications and espionage activities across the Indian border. In addition it will provide real-time surveillance data to Indian intelligence agencies, while monitoring troop movements along its borders. DRDO aims to send commands to cruise missiles through this satellite in near future.[28]

ISRO plans to launch a dedicated satellite for facilitating naval communications. This satellite will assist in network of Indian naval warships, submarines and aircrafts with command centers through high-speed data links, thus allowing maritime threats to be detected and shared in real-time to ensure quick reaction.[29] DRDO will launch a communication satellite for Indian air force as well in 2014. This satellite will connect six AWACS and ground and air based radar systems.[30] A Tri-services Defence Communication Network (DCN) is also being developed. DCN has planned a network of optical fiber cables, satellite earth stations and transportable and portable satellite terminals with high security features.[31]

Security implications of Indian Space program

Strategic and military implications of Indian space program are profound for the region in general and for Pakistan in particular. India has always proclaimed that its space program is civilian in nature and it aims to focus on scientific and

commercial applications of space based systems. But, these space systems also provide India with high-end and real time military satellite intelligence capability. Moreover, Indian endeavors in space technology should be seen in the context of wider Indian ambitions to become a major regional power and an influential actor at global stage.

Security Competition in Outer Space

India is not the only state to have security concerns which prompted it to pursue space goals. Ground as well as space developments are rooted in the security dilemma cycle which leads to pursuing offensive security measures by other states. After the collapse of Soviet Union, US shifted its attention towards China because of its growing economic and military might and saw it as a potential threat to its position in Asia. US support to India in its military as well as civilian infrastructure is seen as a power balancer against China in Asia. However, India itself is also involved in this strategic and space competition. The Indo-US civil nuclear deal and access to advanced military and space technologies to India has implications for Chinese security. It is seen by China as a step towards positioning India against Chinese interests.

Due to growing mutual security concerns between China and India, apart from strategic and conventional arms race, a space race is also brewing between China and India. India allocated $1.45 billion for ISRO during the year 2011-12.[32] China in 2012 sent three astronauts into space and Chang'e-I and Lunar-II missions. Currently, China is developing indigenous space navigation system called "Beidou" as an alternate to American GPS and Russian Glonass. Moreover, with its active military space programme, China aims to develop rapid response launch vehicles that can help deal with urgent military tasks in outer space, expand its space surveillance capabilities, thus multiplying the effectiveness of its armed forces.

India soon followed suit by launching its first moon mission (Chandrayaan-I) which was a step forward in its race with China. Currently it is planning launch of Chandrayaan-II in 2014 with a Mars mission as well.[33] China in 2007 developed its ASAT capability, while India is reportedly developing Anti-sat which might be tested in near future. With these space ambitions, India plans to launch 58 missions including 25 launch vehicles and 33 satellites during next five years.[34] China, on the other hand, also envisions building a 60 ton Space station with a number of launch missions.

As far as regional scenario is considered, Indian satellite intelligence can also keep track of Chinese military forces in Tibet, providing Indian military planners with tactical and strategic intelligence. Early warning system of India will provide an upper hand to India in keeping track of military movements in South Asia as well as activities of Chinese forces from central China to Tibet.

Military and Strategic Implications of Indian Space Program for Pakistan

Militarization of outer-space by India certainly raises concerns for Pakistan. Indian communication satellites and its regional navigation system will improve Indian armed forces surveillance, reconnaissance and targeting capabilities. Space-based surveillance and reconnaissance systems have added new dimension to the military equation in South Asia. It has the potential to undermine deterrence between two nuclear rivals and has threatened Pakistan's security.

India has gained a strategic edge by developing its ability for tracking positions and movements of Pakistani forces. It thus is able to counter military operations given daily round-the-clock coverage of Pakistan military movements along the border. Moreover, Pakistan's missile forces and launching sites may also be vulnerable to detection, monitoring and targeting by Indian military. These capabilities also provide India with the opportunity to launch a quick pre-emptive strike against Pakistan.

Notwithstanding it's No First Use nuclear policy, India will have an advantage over Pakistan through surveillance and reconnaissance of its forces and terrain and this advantage to its military may tempt India to execute a first strike.

Furthermore, Indian efforts to deploy an Anti-Ballistic Missile system against Pakistan have prompted Pakistan to propose a bilateral agreement calling for keeping South Asia ABM free zone.[35] However, India has not shown interest in the proposal. Indian maneuvers to project power in outer-space has destabilized fragile balance of power in the region, as other states will seek to develop their own technological capabilities to offset Indian pre-eminence in this field.

During war and peace, space based systems would prove extremely helpful as non-aggressive and non-invasive tools to monitor movement of enemy troops, vehicle movements and aircrafts. Space based assets provide a smaller military

power (in this case Pakistan) with enhanced capabilities as such systems boost precision and guidance of weapons systems, improve tactical maneuvers and provide up-to-date reconnaissance and surveillance information. Concurrent developments mean that Pakistan has to start expanding its nascent space program to meet emerging threats to its security.

Conclusion

During, the Cold War, US primarily a naval power also developed its space program. Superior military oriented space program provided United States with an edge over its competitor, the Soviet Union. Similarly, Indian ambition of becoming a global power is also manifest in its space program. Its advanced space program and space based military capabilities will provide it with additional options. But for South Asian region it has negative implications because of strategic Indian competition with China and Pakistan. Though it directly impacts regional security and balance of power, it also has broader implications for the global peace and security.

Compared to Indian space program, Pakistan lags behind due to, lack of significant government attention in the last few decades. Pakistan needs to catch up with regional space programs to secure and advance its interests. Aside from ground based technologies, Pakistan needs to develop space based detection, tracking and communication capabilities to meet the challenge of possible pre-emptive strike from India.

A possible way to counter Indian space advancement is through development of stealth technology for strategic purposes. Pakistan can use its stealth weapons to counter offensive Indian missile and space weapons. Pakistan can develop anti-satellite technology as it is already a missile power, but it needs to accelerate its space program to ensure its security against India. Wars which were once limited to air, land, sea and nuclear arenas are now on the verge of entering into realm of outer-space.

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