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Rajeswari Pillai Rajagopalan and
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About the Authors

Dr. Rajeswari Pillai Rajagopalan is Senior Fellow at the Observer Research Foundation (ORF), New Delhi. Dr. Rajagopalan joined ORF after an almost five-year stint at the National Security Council Secretariat (NSCS), Government of India (2003-2007), where she was an Assistant Director. She was also a Visiting Professor at the Graduate Institute of International Politics, National Chung Hsing University, Taichung, Taiwan in early 2012. She is the author of three books: *Clashing Titans: Military Strategy and Insecurity Among Asian Great Powers*; *The Dragon's Fire: Chinese Military Strategy and Its Implications for Asia*; and *Uncertain Eagle: US Military Strategy in Asia*; she has also co-authored two books. Her research articles have appeared in edited volumes, and in India Review, Bulletin of Atomic Scientists, Strategic Analysis, Indian Foreign Affairs Journal, and CLAWS Journal. Other writings have appeared in the Journal of Strategic Studies, Journal of Peace Research and Contemporary South Asia.

Arvind K. John is Research Assistant at the Observer Research Foundation. He did his studies in History from Delhi University, following which he has been working on geo-political relations in and around the sub-continent and issues related to Outer Space Security at the ORF Centre for Strategic Studies.

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Introduction

India has had an active space programme for several decades. Use of space technology for socio-economic development has been emphasised from the time of its inception. Addressing this aspect in the goals and motivations of India's space programme, Dr. Vikram Sarabhai, one of India's space pioneers, had said decades ago, "There are some who question the relevance of space activities in a developing nation. To us, there is no ambiguity of purpose.... We are convinced that if we are to play a meaningful role nationally and in the community of nations, we must be second to none in the application of advanced technologies to the real problems of man and society." Pandit Jawaharlal Nehru, India's first Prime Minister, also made a similar pitch while outlining India's science policy in 1958.

While space has remained critical for India's developmental mission, New Delhi has not shied away from pursuing advances in space technology; especially when it saw the relevance of such technology in the national security context. Pursuing space technology was also driven by a sense of building technological power. The visionaries who designed and tailored the space programme expected it to help India in achieving "technological leapfrogging"[1] in areas such as communications, meteorology, and natural resource management.

Even as the importance of space in national security is understood and acknowledged, India continues to maintain a policy of non-weaponisation of outer space. It has persistently argued against the militarisation of outer space, both in domestic and international settings.

Instead, India has consistently advocated the idea that space should be open for all nations to exploit for peaceful purposes only. This policy direction as well as an interest in establishing international frameworks to regulate outer space affairs has been repeatedly articulated by India in the relevant multilateral fora.

However, while the potential use of space assets for enhancing national security, including technology dominance, was always understood by the leadership, this objective was not given any prominence. While remote sensing satellites in the past have provided outputs for the military, India has by and large adhered to the principle of non-weaponisation and maintained a civil space programme. This policy is undergoing change, as witnessed by the launch of the GSAT-7 satellite, India's first dedicated military satellite. Regional and global realities are compelling India to change tack. Despite a slow start, India is progressing towards developing the necessary military characteristics in its space programme. Indeed, the balance may be shifting in favour of national security arguments, more so today than ever in the past. India's political masters have recognised that as spacefaring nations across the world are assigning an increasingly militaristic role to their space assets, India's inaction will not only leave it unprotected, but will also leave it lagging behind in terms of critical capabilities.

Given the new dynamism in the debate, this paper makes the case for a military space programme for India. The first part of the paper examines the initial phases of the Indian space programme and policy. The second part looks at the indications of fluctuation in India's traditional outlook towards space and the third section details the logic of a military space programme, operational framework for military utilisation, and the current and planned usage of space. The last section looks at five key contextualising factors that should help India make a case for a military

space programme, which would reflect in better infrastructure, greater resources and, more importantly, clarity in India's space policy. These are: the growing debates between militarisation and weaponisation, growing trends in weaponisation, the role of private sector in enhancing India's military space profile, global mechanisms, and global debates in international rule-making that might constrain India's options in the future should India decide not to act now. Such an articulation will also have significant value as a message to both friends and foes alike.

I. India's Space Programme: The Beginning

Since its first launch of a 9-kg sounding rocket in Thumba near Thiruvananthapuram in 1963, India has come a long way with a 100th mission in 2012. As in the case of many other countries, India's space programme has had a "science for development" approach from the very beginning, thus placing a major emphasis on communication and remote sensing satellites.

In terms of its institutional architecture, the Indian Space Research Organisation (ISRO) was set up in 1969 (although the government had established Indian National Committee for Space Research (INCOSPAR) within the Department of Atomic Energy seven years earlier in 1962).[2] Thereafter, India's space programme received a boost with the institution of Space Commission and Department of Space in 1972. Vikram Sarabhai and subsequently Satish Dhawan provided leadership and direction to India's space programme.

Of particular significance are the programme's communication satellite systems operating in the Asia Pacific region, and its remote sensing satellites providing services to a large number of national and global customers. The communication series, the Indian National Satellite

(INSAT) System, has become one of the largest domestic communication satellite systems in Asia Pacific, offering services in the area of television broadcasting, weather forecasting, disaster warning, and search and rescue missions. Major communication satellites include: INSAT-3A, INSAT-4B, INSAT-3C, INSAT-3E, INSAT-4A, INSAT-4CR, GSAT-8, GSAT-12, GSAT-10, and GSAT-7. India's test launch of GSAT-7 on August 30, 2013 will go a long way in beefing up its capabilities on the maritime security front. As a further advancement in this area, ISRO now plans to develop and launch a geo-imaging satellite called GISAT by 2016-2017.

India's Remote Sensing (IRS) Satellites, with the largest civilian constellation of remote sensing satellites in the world, deserve special mention. The IRS or Earth Observation satellites, using state-of-the-art cameras, provide images of the Earth in multiple resolutions, bands, and swaths. From its first Experimental Remote Sensing Satellite, Bhaskara-I launched in 1979, India's IRS satellites today include IRS-1C, IRS-1D, IRS-P3, Oceansat-1, Resourcesat-1, Resourcesat-2, Cartosat-1, Cartosat-2, Cartosat-2A, RISAT-2, RISAT-1, and SARAL, launched in 2013.

In a drive to increase self-reliance, India began developing a series of satellite launch vehicles by the end of the 1970s. A reflection of its growing technological wherewithal, its launch vehicles are today considered efficient and cost effective. India is therefore offering launching services to many countries around the world.[3] Beginning with the Satellite Launch Vehicle-3 (SLV-3) development in 1980, India has subsequently developed a fleet of Augmented Satellite Launch Vehicle (ASLV), Polar Satellite Launch Vehicle (PSLV), Geosynchronous Satellite Launch Vehicle Mark I and Mark II (GSLV-MKI and MKII). GSLV-MK III is currently in the developmental stage. While the SLV and ASLV have been phased out, India has made major inroads in the development of its GSLV series with the launch of the GSLV-D5, powered by an indigenous

cryogenic engine.[4] Making further advances, ISRO's design for a Reusable Launch Vehicle Technology Demonstrator (RLV-TD) to realise Two Stage To Orbit capability was approved in January 2012 and will now undergo technological experiments for testing different parameters–hypersonic flight, autonomous landing, powered cruise flight, and hypersonic flight using air-breathing propulsion.[5] Although the testing of RLV-TD was scheduled for 2012-13, ISRO is reported to have revised the schedule to 2013-14.[6]

In more recent times, two major missions—the Chandrayaan and Mangalyaan–have given the Indian space programme a big boost and international visibility.

India's Chandrayaan mission has been a major feat of ISRO. Chandrayaan-I, launched from Sriharikota in Andhra Pradesh in October 2008, was India's first unmanned mission to the moon. Given that this has been an achievement accomplished by only a handful of countries, it was considered a major technology demonstrator. The mission completed 3,000 orbits and captured 70,000 images of the surface of the moon, including mapping of the landing sites of the Apollo Moon missions.[7] Additionally, the Moon Mineralogy Mapper instrument, provided by NASA, confirmed the presence of water on the Moon.[8] The mission achieved all the stated objectives according to ISRO, which included chemical and mineralogical mapping of the surface and sub-surface of the moon; deep space tracking network and implementing operational procedures for travel into deep space; launching the spacecraft in near earth orbit; carrying out orbit-raising manoeuvres of the spacecraft from 22,000 km to 3,84,000 km; and placing the spacecraft in a circular orbit around the moon.[9]

India's Mars mission in November 2013 marked another major milestone in the history of Indian space programme. Considered a major

technological demonstration of India's capabilities, the mission is also a reflection of the growing sense of competition in the Asian space realm. Undertaken at $73 million, it is one of the most cost-effective Mars missions. The fact that the success of the mission would make India the first Asian country to reach Mars must have also figured in India's calculations. There have also been several questions raised on the necessity of such a mission for a poor country such as India. While the bread vs. gun argument is real, India needs to develop a sound scientific and technological base if development is to be the big agenda pushing these programmes. Besides, India's not-so benign security environment is an important factor. The increasing sense of regional and international competition and rivalry means India may have to demonstrate such capabilities every now and then.

India's Space Policy: The Early Years

Even as there is no declared space policy, India's space policy articulation has been gaining clarity. In its official rhetoric, India has stuck to its traditional stance of opposing militarisation of outer space. This has been reflected in the Indian criticism of programmes such as missile defence and anti-satellite (ASAT) programmes of major powers.

In one of the earlier meetings on outer space at the United Nations, India's representative Krishna Rao stated, "Outer space was a new field and there were no vested interests to prevent the international community from embarking upon a regime of co-operation than conflict. The problems of outer space were fortunately not those of modifying an existing regime but of fashioning a new pattern of international behaviour."[10] Speaking in a similar vein, Indian Prime Minister Indira Gandhi conveyed in a message to the UN Secretary General way back in 1968: "the peaceful uses of outer space, particularly in the fields of

telecommunications and meteorology, promise to confer great benefits to developing nations… India looks forward to expanding areas of international collaboration and would take initiatives as she has at the United Nations sponsored International Rocket Launching Station in Trivandrum and at the Experimental Satellite Communication Earth Station."[11]

With a policy emphasis on non-militarisation, India continued to oppose the use of space assets for offensive capabilities. This was most clearly evident in India's opposition of the US Strategic Defense Initiative (SDI) or Star War programmes in the 1980s and of the space race between the US and USSR during the Cold War, including their respective ASAT tests. India, along with the major part of the world, levelled huge criticism at these developments, since it was felt that they were contributing to the growing arms race including in the nuclear arena. Indira Gandhi took up the issue at the UN General Assembly in September 1983; however, it was her Foreign Minister PV Narasimha Rao who was much more hard-hitting in his statement, saying, "Extension of [the] arms build-up to outer space would mean a permanent goodbye to disarmament and peace and [would] plunge mankind into a perpetual nightmare." The escalation that might follow "would either blow up the entire globe to smithereens or reduce humanity to a state of utter helplessness making it a permanent hostage to terror from within and hegemony from without."[12] India's Ambassador to the Conference on Disarmament (CD) Muchkund Dubey also criticised the SDI at the CD in 1985 while calling for "negotiations to prevent an arms race in outer space."[13] India's concern regarding the militarisation of space was that it would vitiate the environment, thus hindering its access to vital space technology.[14]

The Indian stand was a reflection of the thinking that space assets were going to be significantly used in the missile defence and ASAT

programmes. However, India was not against the use of space in other military utilities such as surveillance or military communication. Even as India agreed to the passive use of space assets for military utilities, it raised new complications as to how one would define militarisation or weaponisation of outer space (covered in greater detail in a subsequent section) given that many of these technologies, for instance for anti-ballistic missiles, were not space-based. Despite the competition between the US and the USSR in developing ground-based ASAT weapons for using conventional or directed energy capabilities, it is a fact that neither has used such capabilities in hostile attacks. However, India was repeatedly seeking a ban on space weapons at the UN and other international fora such as the CD. India's proactive policy during these years went to the extent of seeking a ban on weapons in any global commons, including seabeds and outer space, while emphasising the need to institute global architectures for a weapons-free outer space.[15] Taking forward Indira Gandhi's policy on outer space, Rajiv Gandhi sponsored "a declaration of six nonaligned countries opposing an arms race in outer space and nuclear testing" in January 1985.[16]

The Indian debate in the earlier decades was largely driven by sovereignty and morality angles. As argued by strategic affairs expert Raja Mohan, "in the debates on outer space in the 1970s and 1980s, India tended to focus on strengthening state sovereignty. Like most other developing countries, India sought to limit the use of direct broadcast satellites based in outer space."[17] There was also another argument, predominantly a third-world argument, to enhance the limit of a state's jurisdiction in outer space, but this was quickly dismissed. During this period of time, concepts like non-discriminatory, comprehensive and universal disarmament were also gaining popularity, and their use became a major trend at least among Indian arms control analysts.

India continued to maintain a similar position on space and other arms control issues even after the end of the Cold War. For example, in 1997, then Minister of State for External Affairs, Salim Iqbal Sherwani, responding to a question on US space technologies stated that the government was aware of the advancing US technologies, including the use of laser-based anti-satellite systems. He further elaborated that "India's stand against use of ASAT weapons for prevention of arms race in outer space has been articulated in the relevant fora such as the CD in Geneva. India has also proposed negotiations for an international treaty to ban ASAT weapons. [The] Government remains fully committed to taking all necessary steps to safeguard its security and national interest in accordance with its assessment of developments relating to India's security environment."[18] In July 2000, when Defence Minister George Fernandez was questioned on the US plans for national missile defence, he criticised the US move, saying that "the US should give up this whole exercise as it will lead to far too many problems than we can visualize now."[19] Similarly, Carnegie's Ashley Tellis pointed out, Minister of External Affairs, Jaswant Singh also criticised the US move, declaring that "we have consistently held a view that opposes the militarisation of outer space … we cannot support this development."[20]

II. Indications of Change in India's Traditional Space Policy

Since early 2001, there have been signs of reconsideration on India's stand against space militarisation. This was first visible in India's reaction to US President Bush's National Missile Defence (NMD) speech in May 2001 and thereafter in India's own interest in a Ballistic Missile Defence system.[21] Cognizant of the short-and medium-range missile threats from China and Pakistan, indications of change in India's policy began to gather momentum. Despite the positive impact of supporting the NMD plan, the Indian government faced a lot of domestic criticism for its initial

support of the Bush government.[22] Even as India retracted its position, it must be highlighted that the Indian response this time round, unlike the vociferous criticism of the SDI, was much more ambivalent and nuanced, and reflected a creeping sense of pragmatism—there were growing missile threats in India's neighbourhood and India was finally beginning to acknowledge the utility of missile defence in tackling some of its own threats in the neighbourhood.

The huge domestic criticism to India's support for Bush's NMD speech meant that the government was not entirely certain of the change and was seen falling back on the old, comfortable position of non-militarisation of outer space several times. Case in point: in 2006, the Indian representative at the CD, Jayant Prasad said, "[India is] committed to the peaceful pursuit of space technology and to preserving outer space, a common heritage of the mankind, exclusively for peaceful uses. We share the concerns about the dangers of deployment of weapons in the outer space and believe that this will not be in our collective interest. We regard the Conference as the appropriate forum to deal with this issue."[23]

However, India's rhetoric on non-weaponisation of outer space has eased since then, particularly after the 2007 Chinese ASAT test. The Chinese ASAT test also enabled breaking down of some of the firewalls that exist within the Indian research and development institutions.[24] For instance, then Defence Research and Development Organisation (DRDO) chief and Scientific Adviser to the Defence Minister, M Natarajan, commented that given the new threat (of Chinese ASAT test), India would be looking at future collaboration between DRDO and ISRO.[25] Arguing for capabilities to protect India's space assets has also become a priority following the Chinese test. Former ISRO chief, Dr. K Kasturirangan, clearly stated, "Obviously we start worrying. We cannot overlook this aspect. India has spent a huge sum to develop its capabilities and place

assets in space. Hence, it becomes necessary to protect them from adversaries. There is a need to look at means of securing these."[26]

Similarly, the speech by Minister of External Affairs, Pranab Mukherjee, at a conference on aerospace power in 2007 reflected these signs of fluctuation in India's space policy: "Following the Revolution in Military Affairs, there is a growing focus on space-based assets to support a variety of military force multipliers. There is an increasing tendency as well to view space assets as critical national infrastructure to be protected or denied to potential adversaries. Satellites play an important role in intelligence, surveillance, reconnaissance, secure communication and delivering accurate firepower on the ground at large distances. Recent developments show that we are treading a thin line between current defence related uses of space and its actual weaponization."[27] At a lecture at the National Defence Academy, Pranab Mukherjee argued, "[T]here are also new sets of challenges which China poses such as strategic challenge as China develops its capabilities in outer space… we would need to develop more sophisticated ways of dealing with these new challenges posed by China."[28] However, insofar as to maintain India's rhetoric against an arms race in outer space, he argued for the peaceful use of outer space while not discarding the possibility of using space for military-oriented purposes. While reiterating India's traditional stance against the weaponisation of space, Defence Minister AK Antony also recognised the high reliance on space-based assets for military operations on ground. He noted that the "concern is to maintain the right balance between defence and development, since they cannot be mutually exclusive or part of a zero-sum game."[29]

Therefore, even in the face of the Chinese ASAT test, the political leadership has by and large maintained its stance of non-weaponization of outer space, reflecting the fluctuations in India's policy. In one of the

first reactions to the Chinese ASAT test, Indian Prime Minister Manmohan Singh in a joint press conference with the visiting Russian President Vladimir Putin, said, "Our position is similar in that we are not in favour of the weaponization of outer space." The Defence Minister as well as the Defence Secretary spoke in similar vein, with the Defence Secretary averring that the Chinese ASAT test was a "political statement" by China.[30] However, the Secretary, Department of Space and Chairman of ISRO, Dr. K Radhakrishnan was quick to highlight the dangers arising out of the Chinese test, particularly the issue of space debris and how the potential collision between debris objects poses a greater danger to operational satellites.[31]

Even as the issue of space and its militarisation has been highlighted at the highest levels of the government, an emphasis on the importance of maintaining a peaceful space domain has remained. However, while there is political articulation on the peaceful use of outer space, ambiguity and signs of fluctuation in India's traditional policy are also becoming apparent.

While the change in India's articulation of a space policy is not certain or clear, there is a need to understand and appreciate the imperatives and drivers that are pushing for such a change. The next section will examine the logic of military in space in the Indian context.

III. Debating the Logic of a Military Space Programme

Even as India continues with a civilian orientation to its space programme, the changing regional and global realities are important contextualising factors, compelling it to change tack, thus keeping all options open. While India's official stand itself has not changed, and New Delhi continues to oppose militarisation of outer space, there are

indicators of a small shift in India's approach. Despite a slow start, India is progressing towards developing the necessary hardware and military characteristics in its space programme. India's political masters have recognised that spacefaring nations across the world are assigning an increasingly militaristic role to their space assets—countries like Brazil are investing in dedicated military communications satellites—and India's inaction will not only leave it unprotected, but will leave it lagging behind in critical capabilities.

In addition, a few events in the recent years, including the Chinese ASAT test of 2007 and the US shooting down of a satellite in 2008, have called for a more calibrated approach to India's space programme and policy. The Chinese ASAT has had the greater direct impact on India's new thinking. Destroying an ageing weather satellite using a ground-based kinetic kill vehicle, China demonstrated its capability to targets assets in outer space. China's growing military might in space necessitates India to build up its own capability to respond to any potential threat from China. The China factor is evident in Indian Defence Minister AK Antony's reference to the threat posed by "military space systems in the neighbourhood."[32] Speaking at the Unified Commander's Conference in 2008, Antony stressed the importance of countering the "offensive counter-space systems like anti-satellite weaponry, new classes of heavy-lift and small boosters and an improved array of military space systems [that] have emerged in our neighbourhood."[33]

India's fraught relationship with its neighbours could also be a factor in its decision to pursue a military space programme. China's decision to achieve parity with the US in space technology, coupled with India's own desire for national and regional prestige, is driving New Delhi's space efforts. China's proliferation of space capabilities in India's neighbourhood is something that India is wary of. Nevertheless, it is a

reality that China has already launched a satellite for Pakistan and Sri Lanka in 2011 and 2012, respectively. This could be a repeat of what happened in the nuclear realm in South Asia in the 1970s and 1980s.

Moreover, as an aspiring global and regional powerhouse, India needs to ensure that its defence capabilities are competitive, if not at par, with a majority of the other players. This is only possible if India develops its military space assets in space and on the ground. Today, satellites are essential for a well-coordinated and synchronised tactical capability, integrating weapons systems, missiles, radars and sensors, unmanned vehicles, electronics and communications networks, aerial capabilities, logistics and support systems, and defence forces spread across a vast geographical area. With the Revolution in Military Affairs (RMA), advancement in space capability has become an integral aspect of all military considerations. The success of the US allied forces in the swift invasion of Afghanistan and Iraq was a result of the heightened reliance on space-based assets and systems and the enhanced C4ISR (computers, command, control, communications, intelligence, surveillance, reconnaissance) capability.

As noted earlier, India has traditionally held a stand against the militarisation of space, particularly space-based weaponisation. India has maintained that space should be a neutral zone accessible to all and limited to peaceful purposes only. However, the growing trend of militarisation and securitisation of even political issues mean a greater emphasis on hard power, resulting in a potential arms race, including in the space domain. So far, of the 25 satellites in operation, only 4 are considered to be dual-use in nature and have been accordingly used by the armed forces. However, in August 2013, India launched a dedicated military satellite for its navy. The satellite launched for maritime communications will go a

long way in strengthening India's maritime security capabilities, particularly given the developments in the Indian Ocean Region (IOR).[34]

Lastly, India already has a robust civil space programme and its utilisation will only increase as the country develops. India already has well developed communications, navigation and remote sensing systems; the lack of political will is holding India back from realising its full potential. It is crucial to realise that as its dependence on space-based assets increases, so will its corresponding vulnerability to adversarial attempts to "destroy, degrade, or deny" India's capability in space.[35] As India's space capability is intrinsically linked to its economy and development, any damage to or denial of its space assets and systems will have a major negative impact on the Indian economy and society. Therefore, protection of its assets through deterrence and other measures will need to be examined.

Having examined the logic behind the military in space, the next section will look at the operational and institutional architecture for greater utilisation of space assets by the Indian Armed Forces.

Operational Framework for Military Utilisation

Citing the growing threat to India's space assets, on June 10, 2010, Indian Defence Minister AK Antony announced the formation of the Integrated Space Cell. Functioning under the Integrated Defence Services headquarters of the Ministry of Defence, the cell is jointly operated by the three services of the Indian Armed Forces, and the civilian bodies of the Department of Space and ISRO. The body seeks to utilise India's space-based assets more efficiently for military purposes and makes assessments of possible threats to these assets. The body is tasked with formulating India's near-term space policy.

Unlike an aerospace command which would have been controlled by the air force, the modus operandi of the Integrated Space Cell is greater coordination and cooperation between the three wings of the armed forces, namely the Army, Navy and Air Force, the Department of Space, and ISRO. Analysts suggest that "such a cell is an organisational initiative, essential to the operational requirements of space-based assets for dual civilian-military operations and applications."[36]

However, the operations of the Integrated Space Cell are still at a rudimentary stage—thus far, the government has only put in place a minimal budget initiative. Consequently, "India's space architecture of offensive and defensive systems [is] yet to be conceived, built, and deployed."[37]

Meanwhile, the Indian armed forces have been making slow institutional modifications in tune with the changing realities. Even prior to the launch of India's first military satellite for the Indian Navy in August 2013, the Indian Navy had created a new post called the Assistant Chief of Naval Staff (Communications Space and Network Centric Operations; ACNS-CSNCO), tasked with supervising space-based military capabilities. The Navy has been making institutional changes to shift from a "Platform Centric Navy" to a "Network Enabled Navy."[38]

In addition, Ministry of Defence sources have revealed that the Indian Home Ministry plans to build a Border Space Command to survey India's porous borders with China, Pakistan, Bangladesh, Nepal, and Myanmar. Reportedly, a plan to spend approximately $2 billion on the command in the coming years has already been approved by the Home Ministry.[39] The Home Ministry is assessing worldwide technologies for the creation of the plan, which includes acquiring a dedicated satellite for the Home

Ministry and setting up ground structures with advanced sensors, fences and equipment.

Below is a summary of the growing military utilities and functionalities of outer space to militaries around the world.

Military Usage of Space

The military applications of space began with the launching of the first communication satellite into orbit. Military space-capable countries across the world rely on satellites for communication, surveillance, navigation and warning systems. The military use of space continues to expand as the arrival of newer technologies affords greater scope for exploitation. Initially, the objective of military assets in space was force enhancement missions, which basically enabled terrestrial forces to operate more efficiently. The United States has been at the forefront of exploiting outer space for enhancing military capability on ground, followed, at a considerable distance, by Russia and then China.

The majority of assets being utilised for military activities are dual-use satellites, i.e., they have both civil and defence purposes. The military use of space includes:

- **Imagery:** used for purposes varying from target identification to detecting signs of underground nuclear explosions. Examples include the Space-based Radar (USA), Fanhui Shi Weixing (China), RISAT (India).

- **Navigation:** tasked with mapping, locating targets and guiding weapons systems. Examples include Global Positioning System (USA), GLONASS (Russia), Galileo (ESA), Beidou (China).

- **Signals intelligence:** utilised to detect communications, including broadcasting signals. The Orion, or Mentor, (USA) is an example.

- **Telecommunications:** allows for direct contact between different units of the armed forces, particularly the frontlines and the command centres. Examples include Milstar (USA), Molniya (Russia), Zhongxing-22 (China).

- **Early warning:** infrared satellite sensors provide knowledge of rocket/missile launches by detecting the hot plumes of missile exhaust. For example, SBIRS (USA) and Oko (Russia).

- **Meteorology:** provide weather data to the armed forces. EUMETSAT (ESA) is an example.

- **Ocean surveillance:** developed during the Cold War for triangulating the geolocation of enemy fleets. White Cloud Naval Ocean Surveillance System (USA) and EORSAT (Russia) are two examples.

- **Technology:** space flight experiments for the research and development community, ranging from basic research to advanced development.

With increasing reliance on space-based systems, there is also a growing realisation that these very same space-based assets are also potential targets. This, in turn, has spurred the pursuit of means to protect one's assets in space and as well as to deny the adversary the opportunity to access space. Countries are now moving towards the application of military force "in, from and through space." With this objective in mind, the US has been developing systems that provide greater control and

force projection in space. The American Experimental Satellite Series is a move in that direction; these are small manoeuvrable satellites that can move around other satellites in order to inspect, service or attack.[40] China, in September 2013, manoeuvred a satellite to capture another satellite with the aid of mechanical arms.[41] Other force projection techniques are Kinetic Kill Vehicles, which can be used to target satellites (as demonstrated by China in 2007 and the US in 2008), directed energy programmes and counter-space initiatives like the American Counter Communications System (CCS),[42] which seeks to disrupt an adversary's satellite-based communication. The US has also envisaged the use of space-based miniature missile defence interceptors, which would provide a satellite-based defence against medium to intercontinental range ballistic missiles.[43] The US Air Force has looked into the use of the YAL-1A Airborne Laser beyond missile defence–targeting satellites when pointed straight up.[44] From the above, one can surmise that the world is fast moving from mere militarisation to weaponisation of outer space.

India's Current and Planned Military Utilisation of Space

The Indian Armed Forces lacked a dedicated military satellite until recently despite repeated promises. India's Defence Minister AK Antony has stated that plans are afoot to provide a dedicated satellite facility to the armed forces with an Integrated Space Cell already established under the Integrated Defence Staff to acquire space capabilities. Until August 2013, when the first dedicated military satellite was launched, the armed forces had been accessing operational civilian satellites to meet the shortfall and as a means to compensate for the lack of dedicated military satellites. In a written reply to the Rajya Sabha in 2011, Antony intimated that the "satellite requirement of the armed forces are being met from the existing facilities. Steps have also been taken for [the] provision of dedicated satellite facilities for the armed forces."[45]

Below, we outline India's current and planned capacities in the various specific areas of space utilisation.

Imaging Intelligence

India has been striving for high-resolution satellite imagery since the launch of the Indian Remote Sensing Satellites IRS-1C and IRS-1D in 1995 and 1997, respectively. Providing a resolution of 5.8 metres, they have been useful in mapping, although they do seem to have been used for national security applications. At present, India has eleven remote sensing satellites in operation, including four cartographic satellites.

After the Mumbai terror attacks of November 2008, India reacted by launching the Israeli-origin Radar Imaging Satellite called RISAT-2 on April 20, 2009. The 300-kg satellite, launched into orbit on a PSLV-C12, used an X-band Synthetic Aperture Radar (SAR) obtained from Israel Aerospace Industries (IAI). The Mumbai attack had compelled the authorities to push ahead the launch of RISAT-2 as the indigenously built C-band SAR on RISAT-1 was not yet ready then. RISAT-2 has been used for border surveillance, to detect insurgent infiltration and facilitate counter-terrorist operations. It has also provided civilian functions: these systems are also used for disaster forecasting and disaster management, with critical inputs used to understand the tropical cyclone-ridden coastal regions of India, and also for the development of forestry, agriculture and crop yield estimation.

In April 2012, India launched its first indigenously produced radar imaging satellite, RISAT-1, aboard the PSLV-C19, at an altitude of 536 km. The satellite, weighing 1,850 kg, has a designated life of five years and uses a C-band SAR, providing a resolution up to 1 metre. This obviously makes it very useful for intelligence gathering. The RISAT-1 is similar to the previously launched RISAT-2 in terms of its functionalities.

The principal advantage of the RISAT series over other Indian remote sensing satellites is the on-board sensors—it carries a SAR payload operating in C-band.[46] While previously Indian satellites relied on optical or infrared imaging, the newly developed SAR technology enables all-weather, day-and-night visibility. The RISAT satellites can take pictures in all kinds of weather and has the capacity to penetrate thick cloud cover, thunderstorms and fog. The SAR technology gives the satellite immense strategic significance as it can be utilised for reconnaissance, surveillance and location targeting for autonomous navigation and guidance.[47] The RISAT-1 must be considered a "force multiplier."

Navigational System

On July 1, 2013, India launched its first navigational satellite, the IRNSS-1A, aboard the PSLV-C22 from the Satish Dhawan Space Centre. The Indian Regional Navigational Satellite System (IRNSS) is being developed by ISRO as an autonomous system completely under the control of the Government of India. It will be able to provide an accuracy of 10 metres over India and a region of 1,500 kilometres around India. The need for the IRNSS derives from the understanding that dependence on external agencies always carries the risk of being denied access, particularly during times of crisis or war. The IRNSS will relay information 24x7 for two types of services: Standard Positioning Service (SPS) for general use and Restricted Service (RS) meant for special authorised users—military and other government agencies. The satellite system will consist of a constellation of seven satellites and a ground support segment. Three of the seven satellites are to be positioned in Geostationary Equatorial Orbit (GEO) and two will be placed in Geosynchronous Orbit (GSO). Each of the satellites will weigh 1,425 kg. The full constellation is expected to be in orbit by 2015-16. The ground support segments of the navigational system, which include control of navigation parameters, satellite control,

satellite ranging, and monitoring, have been placed in as many as fifteen locations around the country.

Early Warning

Reports have suggested that India has launched what has been termed as an 'ambitious' programme to monitor an area of 6,000 kilometres for missile activities. The plan is to make its constellation of geostationary satellites (G-Sats) the first line of defence in its anti-missile shield. According to senior government sources, "We're using these satellites to warn us of an impending danger even as they continue with their primary task of transmission and meteorological observations."[48] Special lens and electronic systems are being developed to augment the capability of the G-Sat cameras and telescopes. With the approval of the Centre, the programme is said to have entered into a critical phase of development. DRDO officials suggest that with a resolution of 1 metre, the G-Sats "will be able to capture the slightest of movements or even heat signatures."[49]

Military Communications Satellite

On August 30, 2013, India successfully launched its first dedicated military satellite, the GSAT-7/INSAT-4F. India's first advanced and full-fledged military communications satellite was launched aboard Arianespace's Ariane-5 rocket from the Kourou spaceport in French Guiana. The multi-band spacecraft will be exclusively used by the Indian Navy, although in 2014-15, ISRO is expected to launch GSAT-7A, which will be shared with the Air Force and the Army.[50] The GSAT-7 is expected to vastly improve the country's maritime security and intelligence gathering capabilities. According to ISRO, the satellite has a standard 2.5 tonne bus platform with a power handling capability of 2,600W. Its surveillance capacity will cover an area of 1,000 nautical miles, stretching

from the eastern coast of Africa to the Malacca Strait. With the successful launch of the GSAT-7 satellite, India has become the fourth country whose naval forces have a dedicated satellite group. The satellite was built as a platform to safely link up the Indian Navy's ships, submarines, aircraft, and command from land in real time. This is part of a long-term naval modernisation plan, which integrates the use of satellites and information technology. Its importance in strengthening India's overall Maritime Domain Awareness (MDA) capabilities is high. In the absence of the necessary blocks for an effective MDA, India will be handicapped in its ability to survey activities in the IOR. With increasing maritime trade and energy transportation as well as the evolving geopolitical dynamics in IOR, protection of Sea Lanes Of Communication (SLOCs) and maritime security should be of special significance to India.

Weaponisation

The successful testing of India's anti-ballistic missile (ABM) on March 6, 2011 can be considered a step towards the realisation of developing an indigenous ASAT capability. The need to develop indigenous Indian ASAT weapons was particularly noted after China's successful demonstration of its ASAT capability. This was reflected in then Foreign Minister Pranab Mukherjee's address at the National Defence Academy where he pointed to the need for developing more sophisticated mechanisms to tackle the threat posed by China. VK Saraswat, then Director-General of the DRDO, publicly acknowledged that India is developing and acquiring the necessary technologies needed to destroy an enemy satellite. Saraswat claimed India has developed the essential elements required to destroy a satellite–long-range radar, a missile and a kinetic kill vehicle. According to him, "Unlike a ballistic missile, a satellite has a predictive path. A satellite has a diameter of 1 metre while our BMD system can track and destroy targets less than 0.1 metres."[51]

The DRDO has also considered other avenues of space-based (or those targeting space) defence against ballistic missiles. The DRDO has given indications of alternatives such as the DURGA (Directionally Unrestricted Ray-Gun Array) and KALI (Kinetic Attack Loitering Interceptor).[52] These technologies have the capability to target satellites as well.

Need for an Aerospace Command

The setting up of the Integrated Space Cell can be considered the building block for the subsequent establishment of a fully functioning aerospace command. With outer space being dominated by a small number of major powers, numerous commercial non-state actors and the growing participation of nascent spacefaring nations, securing India's interest in space has become an imperative. Although space is a global commons, activities of the larger spacefaring nations including their military space programmes have driven India's need to militaristically secure its interests in outer space.

This requirement was articulated as early as in 1998 by then Chief of Air Staff Air Chief Marshal SK Sareen: "I have often emphasised that in the years ahead, the exploration of space-based resources for the conduct of air operations will assume increasing importance... The necessity to progress from an Air Force to an 'Air and Space Force' is growing in importance every day."[53] Five years later in 2003, then Indian Air Force Chief Air Marshal S Krishnaswamy said, "Any country on the fringe of space technology like India has to work towards such a command as advanced countries are already moving towards laser weapon platforms in space and killer satellites."[54] However, the debate on the setting up of an aerospace command truly gained momentum after China's ASAT test in 2007. Soon after the tests, former Indian Air Force Chief Air Chief

Marshal SP Tyagi said, "As the reach of the Indian Air Force is expanding it has become extremely important that we exploit space and for it you need space assets. We are an aerospace power having trans-oceanic reach. We have started training a core group of people for the 'aerospace command'."[55]

The changing nature of warfare and potentially greater integration of space capabilities as witnessed in some of the US operations in the two Iraq wars and Afghanistan should be sufficient drivers for India to institute an aerospace command. Other countries are learning from the US experiences. China, for example, has streamlined its capabilities and strategies. India cannot afford to ignore these realities.

Despite having come a long way in terms of technological capabilities, India is suffering from inadequate policy and institutional architecture that can ensure an efficient command and control regime. There is a need for a single agency to coordinate and manage the various aspects of India's ever-increasing space activities and requirements. Furthermore, a single entity will also streamline the avenues for better promotion of India's national interests. India's growing stature and role in the international domain means that its security concerns extend beyond its territorial boundaries. This implies that the Indian Armed Forces have to become "far more agile and dynamic with an ability to constantly understand, appreciate and respond to emerging situations."[56]

The following section discusses some of the important contextualising and key factors that should drive India to develop a military space programme.

IV. Contextualising and Key Factors

Militarisation and Weaponisation

It is important to draw the distinction between militarisation and weaponisation. Outer space can be said to have been militarised ever since the first communication satellite was launched into space. Militarisation of space primarily refers to the use of space-based assets for the enhancement and augmentation of terrestrial military capabilities. Today, armies around the world are using outer space assets for a variety of functions, as detailed above, including for monitoring and surveillance, command and control, early warning, navigation, and communications. The weaponisation of space, on the other hand, refers to space-or ground-based (air, sea, land) weapons targeting assets in space. It may further refer to weapons placed in orbit targeting assets on Earth. But these are by no means globally accepted definitions, either for space weaponisation or militarisation.

From the time of the launch of Sputnik in 1957, major powers and particularly the United States and the Soviet Union emphasised peaceful uses of outer space, at least in their official rhetoric. This in the initial years, as reflected in several UN resolutions on outer space, meant non-military in nature. However, after the US and the Soviets launched their early satellites, the US interpretation gradually moved to mean "non-aggressive" and the Soviets also came to accept this broader explanation.[57] By the 1960s, both the USSR and the US were fielding several satellites with direct military applications and thus the broader interpretation of peaceful uses of outer space was acceptable to both sides.[58]

The debate and distinction between these two terms (militarisation and weaponisation) continue to be more vague than ever and states interpret

these terms as per their national interests. In the absence of clarity of what constitutes a space weapon, this understanding has become further broadened to mean non-destructive. Therefore, while treaties and mechanisms have articulated non-placement of Weapons of Mass Destruction (WMD) in outer space, development of counter-space capabilities with an apparent "non-destructive" use is considered acceptable. Absence of a global understanding and common interpretation could spur greater insecurities in future.

Even as the definitional aspects of these terms continue to be an issue to be dealt with, space weaponisation has the potential to become real with renewed ASAT tests after a gap of nearly two decades, proliferation of small and mini-satellites, and new counter-space weapons and capabilities, among others. Counter-space capabilities could involve jamming signals or "directed energy weapons that emit a disabling burst of energy toward a target rather than firing a projectile at it."[59] Similarly, the US plans for space-based interceptors for its missile defence systems heighten the sense of vulnerability and competition. Meanwhile, scepticism among the western powers such as the US that China and Russia may be pursuing arms control measures—such as the draft treaty preventing the placement of weapons in outer space—as a diplomatic cover for their military space programmes is further fuelling insecurities. It is a fact that Beijing has a flourishing military space programme under the PLA leadership.

Unlike militarisation that has come to be within the acceptable limits of behaviour, space weaponisation has more threatening consequences for military balance, national and international security. Such developments could inherently mean that an arms race in outer space is in the making. These new trends should be important imperatives for India to reconsider its space policy.

Growing Weaponisation Trends

Superpower politics of the Cold War era and the subsequent rising-power dynamics of the 21st century have spawned an undeniable arms race in space. This arms race has resulted in a shift away from the mere militarisation of space to a trend towards actual weaponisation of space. The proven ASAT capabilities of USA, Russia and China are a testament to this trend. Both USA and Russia had demonstrated the use of nuclear and conventional detonation as capable of destroying or disarming their adversary's assets in space. However, these means threatened to seriously damage their own assets in the process. Then, the last few years saw China and the US use kinetic kill vehicles against satellites. Unfortunately, the resultant debris formed by the impact threatens to make space dangerous.

India has also been drawn into the debate of having a demonstrated ASAT capability. As mentioned above, China's demonstration of its ASAT capabilities has spurned concerns regarding the security of India's own space assets. India's progress with its missile interceptor programme has shown promise of adaptation for anti-satellite purposes.[60] While concerns have been raised regarding the feasibility of such a venture, India is wary of the passage of an ASAT-ban treaty (and the possible repetition of the NPT saga), with India not being able to demonstrate its ASAT capability. New Delhi's need to be a responsible international player has to be judiciously balanced with its ambition to be a more influential international actor—but given the contemporary tilt in favour of national security, India should not delay such a demonstration. Timing is also of essence and New Delhi must work its options wisely before it is too late.

The next section looks at the potential and need for larger private sector participation in order to promote burden-sharing with ISRO.

Bringing in the Private Sector

India's space programme has come a long way since its inception nearly half a decade ago. ISRO should undoubtedly be lauded for what it has achieved with the limited budget at its disposal.[61] ISRO has planned a total of 58 missions for the 12th Five Year Plan (2012-2017).[62] However, the time has come for a spurt in the growth trend established by ISRO. As noted by ISRO Chairman K Radhakrishnan, India's space programme can be galvanised with the involvement of the private sector.[63] This will bring about the much-needed boost to India's space programme. India has to enhance its capabilities, both its software and hardware. The infrastructure required in terms of number of launch pads as well as launch vehicles is significant. These are few areas that need urgent attention and the involvement of the private sector to share the burden may be the way to go.

There is keen interest and a sizeable number of private players are already involved in India's space programme. Some of the major participants include: Larsen &Toubro (L&T), Tatas, Godrej & Boyce, Walchand Nagar Industries, Hindustan Aeronautics Limited (HAL). Pune-based Walchand Nagar Industries and L&T are reported to have contributed significantly to India's maiden Mars mission as well: the former is believed to have manufactured rocket motor casings and nozzles for the mission whereas the latter had a "large role in building and installing the 32-metre-diameter antenna for deep-space tracking." L&T additionally built the large mono pulse-tracking radar that is installed at the Satish Dhawan Space Centre in Sriharikota.[64]

India's PSLV is one of the key programmes that ISRO is keen on handing off to the private sector given the huge demand for it. ISRO Chairman is reported to have said, "The PSLV is a reliable vehicle... there are

requirements of putting Indian satellites, and in the global market, the PSLV too has a niche. Capability is there, demand is there, now how to enhance the capacity to realize more PSLVs? As of now more than 400 industrial firms are working for realizing various elements of PSLV. Can we get the Indian space industry to realize the [entire] PSLV vehicle itself?"[65] It is believed that about 80 percent of the components for the PSLV are manufactured by the private sector.[66] Responding to the call for greater private sector participation, MV Kotwal, Board Member of L&T, President of Heavy Engineering and Head of L&T's space and nuclear business stated that "if ISRO is interested in partnering the Indian industry in overall management of the entire Polar Satellite Launch Vehicle programme and the communications satellite fabrication programme, it is a very welcome and necessary step. With its wide experience and expertise in project management, L&T would be positively inclined and well placed to take over the complete programme management with technical support from ISRO. In future, we could jointly explore global opportunities in these domains."[67] Launch vehicles are one of the key programmes that L&T has focussed on in the aerospace sector, with contributions to all of India's launch vehicles programmes–SLV-3, ASLV, PSLV, GSLV MK I, GSLV MK III. Future L&T plans include integration of PSLV launch vehicle; manufacturing of rocket engines; large systems and projects for Human Space Programme (HSP).[68]

As space is getting increasingly commercialised, India has to aim at creating a strategic industry around this sector in order that it is not left out—especially in the lucrative arena of satellite launches. According to the 12th Five Year Plan, the government plans to create a 250-acre Space Park next to the space complex at Sriharikota precisely with the aim of encouraging private players in large numbers.[69] In addition to the sound business sense of incorporating the private sector in India's space

programme, commercialisation in the US and Europe also makes the case for innovative potential brought to the table by private industries.

Thus, private sector participation has the potential to encourage greater research and development and innovation while reducing the burden on public spending. Unencumbered by red-tapism, profit motives have always proven to be an incentive, and if the Indian private sector has a free hand in promoting space diplomacy, industries will have great interest in pursuing innovation. This will be particularly significant for an invigorated military space programme, in order to achieve accelerated technology and capability development. This will also allow ISRO to focus on more hardcore space exploration programmes.

A clearer understanding of the global mechanisms and global debates in writing the rules of the road for outer space activities is particularly important for India to understand how such regimes might come to restrict India's options in the future.

Global Mechanisms

Even as outer space is becoming more useful for a variety of utilities to a large number of states and non-state actors, the reality is that outer space is crowded, congested and contested. In order to preserve outer space for future generations, several measures have been debated within the UN and other associated bodies. While all the major powers understand and acknowledge the challenges facing outer space today, at least in their rhetoric, the inability of these powers to agree upon a future course of action has been a major challenge. The near crisis of confidence among major powers has had a spill-over effect in the space arena as well. Moreover, the CD, where space security and arms control issues are

debated, has remained stalemated for the past 15 years, adversely affecting any attempt to establish rules of the road for space.

While there are a few mechanisms to manage space security, they appear to be inadequate for a variety of reasons. First, while bodies like the UN-Committee on the Peaceful Uses of Outer Space (COPUOS) are a good measure, military space activities are not part of the COPUOS mandate. The Outer Space Treaty (OST) is yet another excellent measure, formulated in 1967 after detailed negotiations among the then three major space powers–the United States, USSR and the UK. But there are loopholes in OST that could be exploited by states to pursue their own narrow interests. Second, a treaty formulated in the 1960s is far too old and outmoded to meet the range of new and emerging threats. As mentioned above, the lack of definitional clarity of many space security-related terms has provided ample scope for mischief. Terms and concepts such as 'peaceful activity', 'space weapon', 'defensive actions in space', and 'space weaponisation', among others, need to be clarified. Lastly, negotiating the Prevention of an Armed Race in Outer Space (PAROS) has not been easy. A resolution on PAROS was passed in the UN General assembly in 1981, but in the three decades since then, the CD has yet to have held a productive session on PAROS. Although there is near global consensus on the fact that outer space should be used solely for peaceful purposes (and hence the need for PAROS), differences among the major powers have come in the way of making PAROS a reality. PAROS has also come under criticism for the fact that the focus is entirely on arms race with no mention of space debris.

Mention must also be made of the draft treaty, The Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects (PPWT) proposed by China and Russia at the CD and the UN Group of Governmental Experts (GGE)

on space. The PPWT can be a good measure if and when it musters larger political support as it addresses one of the major challenges in space security–arms race in space. However, the biggest drawback of the PPWT is again the over-emphasis on arms race with no mention of space debris. The PPWT focus is on placement of weapons in outer space—but the bigger challenge today is ground-based weapons that can target assets in outer space, which has heightened fears of weaponisation of outer space. The GGE is another good political initiative under the UN that could promote mutual trust and encourage cooperation and openness while reducing tensions and misperceptions as a means to prevent intended or unintended conflicts. The 2012-2013 GGE is the third such group constituted under the UN.[70] The GGE report, acknowledging the various instruments, encourages states to adopt various guidelines and Confidence Building Measures (CBMs) to be pursued in earnest in order to ensure safe, secure and continued access to outer space.

Meanwhile, the EU-initiated Code of Conduct for outer space activities is also gaining traction. While the EU needs to be commended for spelling out fairly comprehensive measures, the process by which the EU went about developing the Code had raised several concerns. However, the EU appears to be making earnest efforts to narrow down differences in perception between the EU and the rest of the world, especially the developing countries. For instance, the new draft text that was produced in September 2013 after the first round of open-ended consultations held in Kiev is a significant improvement over the previous versions, and has incorporated many inputs from countries around the world. The language has been made tighter, more concise and has avoided some of the vagueness criticised in the earlier drafts. The new space code is particularly mindful of the interests of developing countries in establishing new avenues for greater international cooperation. The document has also

included several CBMs that have been suggested elsewhere such as the GGE report.

Active Promotion of International Rule-making

Furthering its military capabilities in outer space will help India achieve greater security in the fourth domain of warfare. Enhanced space security and its credibility as a responsible international actor will also advance India's role as an active participant in the process of international rule-making. As a major power in a rising Asia, India needs to be upfront and ensure that its interests are secured during international deliberations on how to govern this particular global common. India cannot, and must not, rely on its fellow nations to look out for its interests. India's considerable investment in space assets must get translated into a front-row seat in determining the laws that govern outer space activities. There are other benefits as well in terms of establishing a mechanism that will take into account security in a holistic manner. Even if India were to sign a mechanism that lacks a legal framework, New Delhi should ensure that it has built-in clauses to keep its options open in space should the security scenario in India's neighbourhood worsen significantly.[71] In addition to the material and financial stake in the kind of space rules being written, the political import of India's efforts in the normative process of establishing a code or a global space mechanism is high.

Furthermore, India is also uniquely placed as a developing country and as an established space power to bring together views and opinions of the many new entrants to the arena. India has come a long way, against many odds, to build a robust space programme. It must seek to channel this experience to bridge differing opinions from the North and the South. Contrary to the closed-door approach adopted by the European Union during the formulation of the draft Code of Conduct on outer space

activities, India has an opportunity to bring together nascent space powers from South America and South East Asia and to be a leading voice to ensure their common interests are being adequately put forth on the international platform. As an established space power, India has to sit at the high table with a proactive position that is considered and constructive and not reactive. India's role as a norm-developer and norm-shaper in this arena is significant.

Conclusion

Even as India continues with a policy of non-weaponisation and peaceful uses of outer space, the growing trend towards weaponisation in its neighbourhood and in the larger global context are beginning to cast influence on India's orientation as well. Despite the gradual shift that one can perceive in India's space programme, the change is neither clear nor definite. Making a distinction between India's civil and military space needs has been borne out of necessity rather than choice. It is now equally necessary for India to delineate its space programme into civilian and military components with clear-cut institutional architecture and better financial allocation. The delineation of the space programmes will also serve to promote greater transparency, which would further India's role and standing in the international system.

Although officials associated with India's space programme have repeatedly declared that India's space programme has never been short of financial resources, the reality is that both its institutional and financial resources are stretched too thin to be effective. India also needs to strengthen its rocket launching facilities to augment its capacity to effectuate a greater number of launches. The debate on a second and third launch pad is currently on.[72] A quick decision in this regard is important both from a commercial and national security perspective. The bread vs.

guns argument has been debated for decades in the Indian context and there have been criticisms on the Indian focus on strengthening its defence capabilities; however, the realities in India's neighbourhood are becoming compelling factors for New Delhi to have a dedicated military space programme with adequate resources at its disposal.

India needs to adopt a considered space policy that integrates both commercial and national security needs in a balanced manner. As former President and scientific advisor to the Prime Minister, Dr. APJ Adbul Kalam, commented, India has to shed the "fifth nation" syndrome and aim for the number one slot in selective fields including space. India can start by issuing a white paper on outer space and listing its long-term goals and objectives that would create momentum in the area of global governance of this global commons as well as international cooperation. Lastly, India's political leadership has to take ownership of this domain and dictate priorities and directions, including in the military domain, to the scientific bureaucracy for more effective and efficient pursuit of its national interests against the backdrop of the shifting balance of power.

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Observer Research Foundation
20, Rouse Avenue, New Delhi-110 002
Email: orf@orfonline.org
Phone: +91-11-43520020 Fax: +91-11-43520003
www.orfonline.org