INDIA'S ENTRY INTO THE ANTI-SATELLITE CLUB

DHIRAJ KUKREJA

INTRODUCTION

The Indian Space Research Organisation (ISRO) is the space agency of the Government of India (GoI), with a vision to "harness space technology for national development while pursuing space science research and planetary exploration."[1] ISRO was initially conceived as the Indian National Committee for Space Research (INCOSPAR), by Dr Vikram Sarabhai, to formulate the Indian space programme, under the leadership of the then Prime Minister, Jawaharlal Nehru; to begin with, it was placed within the ambit of the Department of Atomic Energy (DAE) in 1962, and became ISRO in 1969, while continuing under the DAE. It was only in 1972 that the GoI set up the Space Commission and Department of Space (DOS), and brought ISRO under the DOS; space activities, thus, became institutionalised under ISRO.

India's satellite programme began on April 19, 1975, with the launch of its first satellite, *Aryabhata*, by the Soviet Union. This was followed by the launch of the *Rohini*, the first satellite to be placed in orbit by an indigenous Satellite Launch Vehicle, the SLV-3, which was subsequently followed by the development of two other rockets, namely, the Polar

Air Marshal **Dhiraj Kukreja** is a former AOC-in-C of the Training Command of the IAF. He holds a post graduate degree in national security strategy from the National Defence University, USA.

1. "Vision and Mission Statements", www.isro.gov.in. Accessed on August 11, 2019.

Even as the importance of space in national security is being understood and acknowledged, India continues to maintain a policy of non-militarisation of outer space, persistently arguing against it in both domestic and international fora.

Satellite Launch Vehicle (PSLV) for placing satellites in the polar orbit, and the Geosynchronous Satellite Launch Vehicle (GSLV) for placing satellites into the geo-stationary orbits. With the development of these home-grown launch vehicles, with indigenously-developed cryogenic engines, ISRO placed India firmly on the 'world space map', to the extent that today, ISRO launches satellites for other nations too, and at a fraction of the cost of the 'Big-3'.

BACKGROUND TO THE INDIAN ANTI-SATELLITE MISSILE

ISRO has been exploring space for scientific research, cartography, earth observation, communications and a host of other uses. The initial satellites, Aryabhata and the Rohini series, were considered to be experimental satellites. Thereafter, the Indian National Satellite System (INSAT) was initiated, which is a series of multi-purpose geostationary satellites, built and launched by ISRO; this was followed by the Indian Remote Sensing (IRS) series, and Radar Imaging Satellites (RIS). Apart from these series, there has been a host of other satellite launches for meteorology, ocean monitoring, communication satellite for the South Asian Association for Regional Cooperation (SAARC) region, and navigation satellites as an indigenous Global Positioning System (GPS). ISRO is also working towards manned flight in space and has plans for building its own space station.

These space-based assets are not merely for civil purposes, but have military uses too. An Integrated Space Cell, under the Integrated Defence Staff Headquarters (IDS HQ) of the Ministry of Defence (MoD) has been set up to utilise more effectively the country's space-based assets for military purposes and to look into threats to these assets.[2] Even as the importance

2. Rajeswari Pillai Rajagopalan and Arvind K. John, "A New Frontier: Boosting India's Military Presence in Outer Space", *ORF Occasional* Paper#50, January 2014.

of space in national security is being understood and acknowledged, India continues to maintain a policy of non-militarisation of outer space, persistently arguing against it in both domestic and international fora. The potential use of space assets for enhancing national security, including technology dominance, was always understood by the political leadership, however, the objective was not given any importance, and, hence, remained on low priority. Indian space forays, therefore, comprised predominantly a civil space programme, even while remote sensing satellites in the past provided outputs for the military.

The political leadership seems to have appreciated that as space-faring nations across the world are assigning an increasingly militaristic role to their space assets, India's inaction will not only leave it unprotected, but also lagging behind in terms of critical capabilities. India's space policy articulation has, thus, been attempting to attain clarity, even though the GoI continues to adhere to its stance of opposing militarisation of space.

The launch of the GSAT-7 satellite, India's first dedicated military satellite, has shown that this policy is now undergoing a change; regional and global geo-political situations have steered India to change its approach. Despite a slow start, India is now 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. The political leadership seems to have appreciated that as space-faring nations across the world are assigning an increasingly militaristic role to their space assets, India's inaction will not only leave it unprotected, but also lagging behind in terms of critical capabilities. India's space policy articulation has, thus, been attempting to attain clarity, even though the GoI continues to adhere to its stance of opposing militarisation of space.

With an emphasis on non-militarisation, India continued to oppose the use of space assets for offensive capabilities. This was clearly manifested in its opposition to the US Strategic Defence Initiative (SDI), commonly known

as the Star Wars programme, in the 1980s and to the space race between the USA and USSR during the Cold War, including their respective Anti-Satellite (ASAT) tests. India, along with a majority of other nations, expressed criticism at these developments, since it was felt that they were contributing to the growing conventional and nuclear arms races. Smt Indira Gandhi, then prime minister, raised the issue at the UN General Assembly (UNGA) in September 1983. However, it was her Foreign Minister, Shri PV Narasimha Rao who, in a much more hard-hitting statement, said, "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."[3]

While the Indian stand reflected its aversion to militarisation of space for anti-missile or ASAT purposes, *per se*, India did show partiality to the use of space in other military activities, such as surveillance or communications, thus, agreeing to the use of space for passive purposes. It, however, raised the issue of differentiation between militarisation and weaponisation.

A change in India's reconsideration of its opposition to space militarisation became visible with the turn of the century. This was first perceptible in India's reaction to US President George W. Bush's National Missile Defence (NMD) speech in May 2001, and thereafter in India's own interest in a Ballistic Missile Defence (BMD) system (the author was a part of the audience, along with other international students, on the lawns of the National Defence University in Washington DC, where President Bush, accompanied by his Cabinet members, Colin Powell, Condoleeza Rice et al., declared to the world his intentions of proceeding towards NMD, with a reduction in nuclear forces). Even though India's statement, *per se*, supported the unilateral reduction of US nuclear arms and not the US missile defence plan, the quick reaction from India created an impact

3. "Rao Warns of Arms Race in Outer Space," *Strategic Digest*, vol. 14, no. 3, March 1984, p. 232, cited in Rajagopalan and John, n. 2.

equivalent to that of India supporting the missile defence plans, inviting huge domestic criticism for having displayed support to the NMD, when for all these years, it had spoken against the SDI!

Notwithstanding the domestic critics, India's strong opposition on non-weaponisation of outer space has eased since then, particularly after the Chinese ASAT test in 2007. The Chinese ASAT test also enabled the dismantling of some of the firewalls that existed within the Indian research and development institutions, bringing about cooperation amongst them, prominently between the Defence Research and Development Organisation (DRDO) and ISRO. The threat of the Chinese ASAT, successfully brought forth arguments for the protection of own space assets. In a speech at a conference on Aerospace Power in 2007, Minister of External Affairs, Shri Pranab Mukherjee, reflected on these signs of change 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 weaponisation."[4] At another lecture at the National Defence College, Shri Pranab Mukherjee argued, "....there are also new sets of challenges which China poses, such as the 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."[5] Despite such statements by the senior political leadership, the GoI continued to maintain its stance of non-weaponisation of space, thus, reflecting ambiguity and uncertainty in India's space policy.

4. Address by Shri Pranab Mukherjee, Minister of External Affairs, at the inaugural session of the international seminar on "Aerospace Power in Tomorrow's World," February 4, 2007, available at www.mea.gov.in. Accessed on August 1, 2019.

5. Address by Shri Pranab Mukherjee, Minister of External Affairs at the National Defence College, New Delhi, November 3, 2008, available at www.mea.gov.in. Accessed on August 1, 2019.

As of December 2018, the IRS system comprises the largest assemblage of satellites for civilian use in operation today in the world, which also have dual military use; of the 14 satellites in operation, four satellites are for the exclusive use of the military that include the GSAT-7 and 7A, which were launched for the Indian Navy and Indian Air Force respectively.

INDIA'S MILITARY SPACE PROGRAMME

With the changing geo-politics, in the region as well as in the world at large, resulting in an increasing emphasis on the display of hard power, even in space, India has been, slowly but surely, modifying its stance. Referring to the growing threat to India's space assets, more so after the Chinese ASAT test of 2007 and the US shooting down of its own satellite the following year, then Defence Minister Shri AK Antony, announced, on June 10, 2010, the formation of the Integrated Space Cell, under the aegis of HQ IDS, for better and more effective utilisation of the national space assets, as the first step towards an Integrated Space Command!

India's satellites and their launch vehicles have had military spin-offs since long. While the 150-200 km range Prithvi missile is not a by-product of the Indian space programme, the intermediate range Agni missile is a derivation from the programme's SLV-3. The IRS and INSAT satellites, mainly intended and used for civilian-economic applications, also have military off-shoots.[6] In 1996, the MoD had temporarily blocked the use of the IRS-1C by India's Environmental and Agricultural Ministries to monitor ballistic missiles near India's borders; in 1997, the Indian Air Force's (IAFs) "Air Power Doctrine" included, for the first time, the use of space assets for surveillance and battle management.[7] As of December 2018, the IRS system comprises the largest assemblage of satellites for civilian use in operation today in the world, which also have dual military use; of the 14 satellites in operation, four satellites are for the exclusive use of the military that include the GSAT-7 and 7A, which

6. "Indian Space Research Organisation", https://en.wikipedia.org/wiki/Indian_Space_Research_Organisation#Satellite_programmes. Accessed on August 2, 2019.

7. Ibid.

were launched for the Indian Navy and Indian Air Force respectively, the other two being the HySIS, and Microsat-R earth observation satellites.[8] Although most of the Indian satellites thus far, are not meant for dedicated military purposes, some have a spatial resolution of one metre or less, which can be put to good use for military applications. Apart from the four satellites mentioned above, some of the other noteworthy dual-use satellites are from the Radar Imaging Satellite (RISAT), and Cartography Satellite (CARTOSAT) series, which are designed for remote sensing and mapping of civilian areas, and assistance during natural disasters.

Today, satellites are an essential component for a well-coordinated and synchronised tactical capability, integrating weapon systems and platforms, missiles, radars and sensors, unmanned vehicles, electronics and communication networks, aerial capabilities, logistics and support systems, and defence forces spread across a vast geographical area.

India's troubled relations with its neighbours, Pakistan and China, could be considered as the main contributory factors that influenced its decision to pursue a military space programme. China's decision to achieve parity with the USA in space technology and in conventional weapons, coupled with India's own desire for national prestige and regional status, are the driving forces behind its space efforts. China's proliferation of space capabilities in India's neighbourhood is something that India is chary of; China has already launched satellites for Pakistan and Sri Lanka in 2011 and 2012, respectively; India definitely did not desire a repeat of what happened in the nuclear realm in South Asia in the 1970s and 1980s.

Today, satellites are an essential component for a well-coordinated and synchronised tactical capability, integrating weapon systems and platforms, missiles, radars and sensors, unmanned vehicles, electronics and communication networks, aerial capabilities, logistics and support systems, and defence forces spread across a vast geographical area. With the Revolution

8. "Integrated Space Cell", https://en.wikipedia.org/wiki/Integrated_Space_Cell. Accessed on August 2, 2019.

in Military Affairs (RMA), advancement in space capability has, thus, become an integral aspect of all military considerations. As an aspiring global and regional power, India needed to ensure that its defence capabilities were competitive, if not at par, with a majority of the other players. This could only be made possible if India developed its military assets in space and on the ground.

Development of the Indian economy is intrinsically linked to the effective utilisation of information readily made available through its space assets, for which, earlier, the country had to depend upon the goodwill of other nations and its own purchasing/bargaining power. India already has a vigorous and well established civil space programme, appreciated both within the country and amongst other space-faring nations, whose utilisation will only increase as the country develops. As the country's dependence on space-based assets increases, so will its corresponding vulnerability to adversarial attempts to "destroy, degrade, or deny"[9] India's capability in space. So far, it was the lack of political will which was holding India back from realising its full potential; today, there appears to be a change of thinking in that arena.

August 30, 2013, was a red-letter day for the Indian armed forces when a dedicated satellite was launched for the Indian Navy; the GSAT-7/INSAT-4F, also known as the *Rukmini*, launched aboard an Ariane-5 rocket from French Guiana, is a multi-band communication and surveillance satellite aimed to improve the maritime security by keeping a watch not just on the country's 7,000-km-long coastline, but also covering about 1,000 nautical miles (nm) from the east coast of Africa to the Malacca Strait. Apart from surveillance, the satellite provides seamless communication between the navy's aircraft, surface vessels, submarines, and shore-based command and control centres, thus, increasing the overall Maritime Domain Awareness (MDA). With increasing maritime trade and energy transportation by sea, piracy on the high seas off the Somalia coast, and the continuously evolving

9. KK Nair, "Bridging Rhetoric and Reality: Harnessing Space Capabilities for India's Defence", *Journal of the United Service Institution of India*, vol. CXXXVIII, no. 571, January-March 2008, available at http://www.usiofindia.org/Article/Print/ ?pub=Journal&pubno=571&ano=355, cited in Rajagopalan and John, n. 2.

geo-political situation from the South China Sea (SCS) towards the Indian Ocean Region (IOR), protection of the Sea Lanes of Communication (SLOCs) has become an essential part of national security; the satellite is likely to be replaced by another, the GSAT-7R, in 2020, for which the navy has already placed an order with ISRO in June 2019.[10]

The GSAT-7A satellite, a platform to aid air power, is an advanced communications platform in space, for the most part for the Indian Air Force (IAF) to interlink ground radar stations, air bases, Unmanned Aerial Vehicles (UAV), aircraft-to-aircraft and Airborne Warning and Control System (AWACS), in real-time. While the IAF is using 30 per cent of the capacity as on date, the Indian Army is also using the capabilities of the satellite for its helicopter and UAV operations. Launched on December 19, 2018, the satellite joined a long list of 320 dual-use or dedicated military satellites, more than half of which are operated by the USA alone, followed by Russia, China, and India, which has 14; to boost its network-centric warfare capabilities, the IAF is likely to get another satellite, the GSAT-7C, within a few years, although this platform has a life of about eight years.[11]

WEAPONISATION THROUGH ASAT

A need was felt to develop a multi-layered ballistic missile defence system to protect Vital Areas (VAs) from a missile attack, in the light of the threat from the country's neighbouring adversaries, China and Pakistan, mainly the latter, in view of the constant irrational threats of converting a conventional attack into a nuclear attack. The development of an anti-ballistic missile started in 1999, just after the Kargil War; after a series of tests conducted between 2005-07, on March 6, 2011, India successfully test-fired the interceptor missile, a modified Prithvi missile, for a high-altitude interception.

The successful testing of India's Anti-Ballistic Missile (ABM) can be considered a step towards the realisation of developing an indigenous ASAT

10. Manu Pubby, "Navy to Buy Rs 1,589 Crore Satellite from ISRO", *The Economic Times*, cited in "GSAT-7", https://en.wikipedia.org/wiki/GSAT-7#Capability. Accessed on August 5, 2019.

11. "GSAT-7A", Ibid.

capability, necessitated by the ASAT test by China in 2007 and USA in 2008. The requirement was also emphasised by the then Minister of External Affairs, Shri Pranab Mukherjee, in his speech at the National Defence College in November 2008 (see n. 5). Dr VK Saraswat, then director-general of the DRDO, also publicly acknowledged that India was indeed developing and acquiring the necessary technologies needed to destroy an enemy satellite, claiming that the essential elements required to destroy a satellite had been already developed.[12] Further progress and tests on the new exo-atmospheric interceptor missile, the Prithvi Defence Vehicle (PDV), culminated in a successful launch of the PDV in 2014, followed by a real-time interception test against a manoeuvring target in 2017, and then again in April 2019. The GoI nod for the execution of the ASAT test was given in 2016, after the PDV success, and the preparations began in earnest thereafter.

On March 27, 2019, the GoI announced that a modified version of the PDV, similar to the mid-course ground-based interceptor for ABM and officially named the PDV MkII, had been tested against a small satellite. While ISRO initially maintained that it had shot down a 'live' satellite, there was no mention in any subsequent statement giving the specific nomenclature of the satellite. It was in 2017 that ISRO had lost contact with one of its satellites, the RISAT-1, and it was presumed amongst the international space analysts and organisations that it was this that the ASAT test had targeted; ISRO had denied it and said in a news release that the target was the Microsat-R, a satellite specially launched for the test.[13] The ASAT test was code-named "Mission Shakti", and the prime minister announced the landmark success to the nation in a special telecast message. Such was the importance given to it!

After the announcement by the prime minister, it apparently emerged through circumstantial evidence that India may have attempted an ASAT test weeks earlier, but had failed. The Indian government had released, and then cancelled, a Notice to Airmen (NOTAM) for a missile launch from Abdul Kalam Island, earlier known as Wheeler Island, between February 10-

12. Rajagopalan and John, n. 2.

13. "2019 Indian Anti-Satellite Test", https://en.wikipedia.org/wiki/2019_Indian_anti-satellite_missile_test. Accessed on August 10, 2019.

12, 2019; there were also reports in the Indian media of a missile test against an "electronic target" on February 12; anonymous US government officials have reportedly told *The Diplomat* that they detected a rocket launch that failed about 30 seconds into flight. Outside experts confirmed that the date and time of the test corresponded with a pass of the Microsat-R, the eventual target that was destroyed on March 27, strongly suggesting the earlier launch in February was indeed intended to be an intercept.[14] Whether the target was the Microsat-R or the RISAT-1 is still a mystery!

THE AFTERMATH

The ASAT test has given India the potential to degrade and destroy the communication, surveillance and intelligence gathering capabilities of other nations by taking out their space-based assets. It is, therefore, a potent deterrent, which would make any country think twice before any misadventure against Indian assets. Apart from this, it has also successfully displayed the ability to intercept an Intercontinental Ballistic Missile (ICBM): another deterrent!

This is encouraging news indeed for India, but the ASAT test nevertheless disturbed many in the international community because of their valid fear that it would strengthen the momentum toward more debris-creating tests by other nations in the future. With this test, India joined the select club of the 'Big-3' with such means—the USA, Russia, and China being the other members. Although there may be other nations with such a capability, they have not demonstrated their intentions as yet; should further tests be carried out in the future, the debris in space would create a very inhospitable environment for the different types of space endeavours, making this an issue of concern.

The GoI was well aware of these risks in no small measure because ISRO has huge stakes in the peaceful uses of outer space. For a long time, ISRO's activities have concentrated solely on utilising space to uplift India's economic development, and, to meet that goal, it concentrated its efforts

14. Brian Weeden and Victoria Samson, "India's ASAT Test is Wake-up call for Norms of Behaviour in Space", Op-ed in *Space News*, retrieved from https://spacenews.com/op-ed-indias-asat-test-is-wake-up-call-for-norms-of-behavior-in-space/. Accessed on August 11, 2019.

In the days after the test, accusations quickly emerged on how the debris would now endanger other satellites. To counter such accusations, DRDO Chairman Dr. Sateesh Reddy, in a press conference, claimed that the kill-vehicle had hit the target in an "almost direct hit in the same plane," i.e. head-on, to minimise the spread of debris into the higher reaches of space.

to develop indigenous capabilities that have permitted it to produce everything from launchers to spacecraft. ISRO today is one of the six largest space agencies in the world with a diverse fleet of satellites, and reliable launch vehicles, pursuing impressive endeavours in space science and exploration; it has forged ahead in the utilisation of space to deliver significant developmental benefits, in areas ranging from distance education to telemedicine, to the Indian population as a whole.

Understanding the hazards posed, against the security requirement to protect own assets in space, India proceeded with the test, thus, inviting adverse reactions in the aftermath. In the days after the test, accusations quickly emerged on how the debris would now endanger other satellites. To counter such accusations, DRDO Chairman Dr Sateesh Reddy, in a press conference, claimed that the kill-vehicle had hit the target in an "almost direct hit in the same plane," i.e. head-on, to minimise the spread of debris into the higher reaches of space; the GoI also maintains that the test posed a negligible risk to operational satellites at higher altitudes since most of the debris fragments were reentering the earth's atmosphere within two days of the test, and the remainder would reenter within 45 days.[15]

This claim, however, has been met with scepticism, and may be rightly so. An in-depth analysis by a renowned space analyst, Dr Marco Langbroek, of publicly available data from both DRDO and the US military's satellite tracking network, shows that this test wasn't conducted as "responsibly"

15. Marco Langbroek, "Why India's ASAT Test Was Reckless", https://thediplomat.com/2019/05/why-indias-asat-test-was-reckless. Accessed on August 11, 2019. (*Dr Marco Langbroek is a space situational awareness consultant from the Netherlands and has conducted an in-depth analysis to support his claims.)*

as the Indian government had claimed, and has termed it as "reckless"! Debris fragments being tracked by the US monitoring stations indicate that fragments did end up orbiting at higher altitudes, well within the altitude range of operational satellites, including the International Space Station (ISS). Reports of the impact not being head-on, as claimed by the DRDO chairman in his media briefing, and the telemetry data released by DRDO, which includes a propaganda video with the time-line, apparently show an upward angle, which would eject the debris to higher orbits.[16]

The Microsat-R target satellite was in a low orbit of 300 km, which is much lower than that of the ISS and the debris has been confirmed as already being minimal, with most of the pieces having entered the atmosphere and disintegrating.

Jim Bridenstine, the NASA administrator, on April 1, 2019, was particularly critical of Mission Shakti, going on to say that it was "a terrible thing to create an event that sends debris at an apogee that goes above the International Space Station (ISS). That kind of activity is not compatible with the future of human spaceflight. It's unacceptable and National Aeronautics and Space Administration (NASA), needs to be very clear about what its impact on us is". While addressing the employees at NASA, he further stated that "the explosion is supposed to have created 400 pieces of debris, putting the ISS, and the astronauts in danger ... that they are actively tracking the objects, and 24 of them can be headed towards the orbit of the ISS".[17] This was immediately countered by an Indian industrialist, Anand Mahindra, who, on Twitter, commented, "A case of the pot calling the kettle black. From a nation that created most of the debris in space over decades, this is an audacious statement"![18] There are other independent space analysts and

16. Ibid.

17. "Let's Evaluate if India's Mission Shakti is an Actual Threat to the ISS", https://in.mashable.com/science/2761/lets-evaluate-if-indias-mission-shakti-is-an-actual-threat-to-the-iss

18. "Mission Shakti: Anand Mahindra Blasts NASA Over Comments on Space Debris", *Livemint*, April 4, 2019, https://www.livemint.com/news/india/mission-shakti-anand-mahindra-blasts-nasa-over-comments-on-space-debris-1554273093850.html. Accessed on August 12, 2019.

organisations, which have also commented adversely on the Indian success, and that the debris would not degrade in 45 days, as claimed by ISRO, but would take much longer. Having mentioned that, the actual probability of a collision seems to be close to negligible. The Microsat-R target satellite was in a low orbit of 300 km, which is much lower than that of the ISS and the debris has been confirmed as already being minimal, with most of the pieces having entered the atmosphere and disintegrating. As of August 9, 2019, there are reportedly 41 tracked pieces of debris in orbit.[19] Space debris is an unavoidable evil of almost every space mission, with over 30,000 pieces estimated to be floating around in space; ironically, a big portion of these is from ASAT missions conducted by the other countries in the past. One, therefore, really wonders, what if a piece of US debris damages the ISS—would NASA then too, pin the blame on India?

Reactions from nations were on predictable lines. While China and Pakistan were cautious in their comments, not really lauding India's achievements, both expressed a desire for "upholding peace and tranquillity in outer-space" and "prevent military threats". Russia welcomed India's statement that the test was not targeted towards any nation, and invited India to join the Russia-China proposal for the formulation of a treaty against weaponisation of space. When questioned by the members of the US Senate on India's compulsion to conduct such a test, the Commander-in-Chief (C-in-C) of the US Strategic Forces Command, Gen John E Hyten, made a mention about threats from space to Indian assets.[20]

Notwithstanding the comments, adverse or otherwise, the ASAT test of March 27, 2019, holds tremendous significance for India, giving it the deterrent against any hostile action against own space assets and the interception capability against an ICBM.

19. "Dangerous Debris from India's ASAT Test in March Continues to Zip Around in Earth Orbit", *Technology News, Firstpost*, August 9, 2019, as cited in "2019 Indian Anti-Satellite Missile Test", https://en.wikipedia.org/wiki/2019_Indian_anti-satellite_missile_test. Accessed on August 10, 2019.

20. "2019 Indian Anti-Satellite Missile Test", https://en.wikipedia.org/wiki/2019_Indian_anti-satellite_missile_test. Accessed on August 10, 2019.

WHAT NEXT?

Although the orbital debris from Mission Shakti is likely to be short-lived, its political repercussions could last much longer. Other countries with ballistic missile and hit-to-kill technologies may decide that they too need to 'join the club' with a similar capability demonstration. While India continues to claim that the test has not changed its commitment to peaceful uses of outer space, its actions show otherwise and may spur others to follow it. A share of the blame also goes to the US, Russia, and China, that have, all along, created the scenario that offensive counter-space weapons are an important measure of space power and prestige. All three countries are continuing with their efforts to develop, test, and deploy a wide array of offensive counter-space capabilities as they see space as an increasingly important arena for their national security and military capabilities. India, despite misgivings about motivating others to follow its example, judged its national security interests to be paramount and went ahead with the test.

The test validated several emerging Indian ballistic missile defence technologies; it can be concluded that the test had two main aims. One, it established a milestone at a time when competition in space is growing. China, India's regional and global rival, operates about 30 satellites, a majority of which would be used by the military. Apart from the successful high altitude ASAT test by China, it is also, reportedly, developing more ASAT weapons, including lasers, of its own. The second aim was to demonstrate India's capability to retaliate. While exhibiting its ability to target small, fast-moving objects at high altitudes, India has also displayed its capability in striking more difficult targets such as nuclear missiles, at comparatively lower altitudes.

Has the muscle-flexing penalised India diplomatically? The answer depends upon one's perception. It has to be agreed that this test was the first declared ASAT test after China blew up one of its own satellites in 2007, which provoked widespread international condemnation. China's test was at a much higher altitude than India's, at 865 km, debris from which generated almost a quarter of the catalogued objects in low earth orbit a few years

The USA, Russia and China, are investing heavily towards the development of a wide range of space warfare capabilities. To effectively secure its interests in outer space, hitherto used only for passive military uses, India will need a comprehensive military space policy and the necessary investments to realise its goals in an arena that is fast turning into an active military theatre.

later, putting other country's satellites at risk. In 2012, India had then reiterated that it would not carry out such a test just for this reason. Although, the current test was at a much lower altitude, it did create debris, some pieces of which may have been thrown in a higher orbit, as it occurred after the USA destroyed a wayward satellite of its own at about the same altitude. As noted earlier, comments and analysis reports have been harsh or neutral, as per the perception of their author!

Is India going to rest on its achievement after the ASAT test or is it moving ahead with more research, just as China is developing wide-ranging and diverse counter-space capabilities? China's development includes the capacity to mount sophisticated cyber jamming, or spoofing attacks on ground stations, with an aim to hijack or disturb the telemetry, tracking, and command and control systems.[21] Reportedly, India too is working on further ASAT development, such as Directed Energy Weapons (DEWs), lasers, Electro-Magnetic Pulse (EMP) weapons and co-orbital ASAT weapons.[22] Only the possession of such capabilities will then enable India to credibly deter China's space denial programmes below the levels of ultimate physical violence directed at various space systems. Simultaneously, and equally essential would be to establish new institutions that would integrate military activities with the larger civilian space infrastructure at the level of both planning and operations in real-time. In this context, the best deterrent

21. Ashley J. Tellis, "India's ASAT Test: An Incomplete Success", Carnegie Endowment for International Peace, April 15, 2019, accessed through https://carnegieendowment.org/2019/04/15/india-s-asat-test-incomplete-success-pub-78884. Accessed on August 10, 2019.

22. "2019 Indian Anti-Satellite Missile Test", Wikipedia, https://en.wikipedia.org/wiki/2019_Indian_anti-satellite_missile_test#Significance. Accessed on August 13, 2019.

for India would be to improve its capacity to use space, despite the inevitable Chinese interference, with some offensive capabilities.

CONCLUSION

In intercepting and destroying a satellite in orbit, India has signalled its determination to deter threats to its growing number of space assets. However, India needs to reconcile with a number of issues that are transforming the political and economic nature of outer space, which call for a reorientation of India's national strategy towards outer space. While the ASAT test is an indicator of India's resolve, it may not be enough to claim effective deterrence. The other great space powers, the USA, Russia and China, are investing heavily towards the development of a wide range of space warfare capabilities. To effectively secure its interests in outer space, hitherto used only for passive military uses, India will need a comprehensive military space policy and the necessary investments to realise its goals in an arena that is fast turning into an active military theatre.

Even as India advocates a policy of non-weaponisation and peaceful uses of outer space, with the growing trend to the contrary in its neighbourhood and in the larger global context, India's orientation has to transform. Despite the political leadership recognising this fact (hopefully), the gradual shift in India's space programme is neither clear nor definite. It is time now to make a distinction between India's civil and military space needs, which is borne more out of necessity rather than choice. It is now equally necessary for India to delineate its space programme into civilian and military components with a clear-cut institutional architecture and better budgetary support. The steps initiated thus far, namely, the dedicated military satellites, the better surveillance capabilities, the conduct of the ASAT test, the establishment of a space cell with the armed forces, and the proposed establishment of the office of the Chief of Defence Staff (CDS), should now be converted into firm policy structures as the next step.

After the ASAT test, many strategists in India have stressed the importance of India now having the capabilities to shape the security order in outer space. They recall that India's inability to conduct a nuclear weapon test before the nuclear Non-Proliferation Treaty (NPT) was finalised in 1968, had severely undermined India's position in the global nuclear order, affecting it till today. The policy-makers must prepare for the inevitable evolution in outer space being spurred by technological innovation, commercial competition, and geo-political rivalry. India, in collaboration with allies and partners, would need all its strategic pragmatism, legal acumen and diplomatic skill in shaping new rules for the formulation of international policies for the regulation of outer space.

Outer space is no longer just for lullabies for children; it has changed, and so should our policies!