Jane's 360

Wed, 10 April 2019

India's DRDO reveals additional details of recent ASAT missile test

By Rahul Bedi

New Delhi: India's government-run Defence Research and Development Organisation (DRDO) has revealed additional details about the successful test-firing on 27 March of its first anti-satellite (ASAT) missile that destroyed one of the country's own satellites in space.

Briefing the media on 6 April, DRDO head G Satheesh Reddy stated that the 13 m-high, three-stage interceptor missile, which was fitted with two solid-propellant rocket motor stages and a hit-to-kill capable 'Kill Vehicle' (KV), was employed to target the satellite under 'Mission Shakti' (Strength).

He said the KV's onboard advanced terminal guidance system, which featured a strap-down (non-gimballed) imaging infrared (IIR) seeker and an inertial navigation system that used ring-laser gyroscopes (RLGs), detected and tracked the 740 kg Microsat-R Earth observation satellite at an altitude of 283 km in low-Earth orbit (LEO).

The DRDO-designed satellite had been specially launched by the Indian Space Research Organisation (ISRO) two months earlier for the ASAT missile test, which had been under planning since 2016 and had also undergone numerous simulation trials.

Reddy explained that after the two rocket motor stages had taken the ASAT missile to the required height and velocity, the nose tip heat shield was ejected and the IIR seeker, located within the very front of the nose, locked onto the target satellite, guiding the KV towards it at a "closing speed" – the velocity of the target and KV combined – of 10 km per second.

Corrections to the KV's flight were made using a thrust-vector control (TVC) system comprising larger thrusters at the top of the KV's rear cylindrical body at roughly its centre of gravity and smaller thrusters near the rear of the KV. Although the DRDO showed videography of the tested TVC system used for the KV, it is not clear whether the thrusters are liquid or solid propellant-based, but they are most likely the latter.

Within seconds, the missile hit the satellite with a 10 cm accuracy, Reddy said, comparable with the "best reported performance of ASAT missiles".

He said the radar, data, and communication links of the DRDO-designed ballistic missile defence (BMD) system that were deployed across a wide ground span had effectively tracked the entire satellite interception by the ASAT missile.

"The ASAT missile's guidance and control algorithm was developed to intercept satellites [at an altitude of more than] 1,000 km, but the mission was planned at the lowest possible orbit of 283 km, well below the orbit of other space objects to avoid the threat of debris," said Reddy.

The interception, he stated, was "specially designed" to strike the satellite at an angle so as to ensure "minimal debris".

Reddy said the ISRO had "deliberately" launched the target satellite into an orbit under 300 km to ensure that it remained about 120 km below the International Space Station (ISS).

"Some of the debris has already decayed," the DRDO head said in response to US officials from NASA, who have claimed that 'Mission Shakti' has raised the danger of 200–300 pieces of debris from the targeted satellite striking the ISS by about 44%.

https://www.janes.com/article/87788/india-s-drdo-reveals-additional-details-of-recent-asat-missile-test

Wed, 10 April 2019

Mission Shakti: What Next?

By Laxman K Behera

In a remarkable technological feat and a clear demonstration of national resolve, India conducted Mission Shakti, an anti-satellite (ASAT) missile test, on March 27, 2019 by successfully engaging an orbiting target satellite at an altitude of nearly 300 km. In the process, it emerged as the fourth member of the exclusive club of space powers (US, Russia and China) that have had demonstrated ASAT capabilities. Mission Shakti demonstrates the "nation's capability to defend its assets in the outer space," besides vindicating the technological competence of the Defence Research and Development Organisation (DRDO), the exclusive research and development (R&D) department of the Ministry of Defence. That the feat was achieved with a totally home-grown technology was not only an icing on the cake, but a big boost to the on-going Ballistic Missile Defence (BMD) programme. Having achieved technological success and informing the world about India's new deterrent capability in space, the DRDO has a few more crucial tasks to perform before making possible the full exploitation of outer space for military purposes.

ASAT and BMD Programme

The ASAT test of March 27 is significant for several reasons. Apart from gaining India global status and a greater say in international negotiations on outer space, the test's real significance lay in the demonstration of the progress made in the BMD programme under which the DRDO is developing, in two distinct phases, a two-layered shield against hostile missile attacks. Under Phase-I of the programme, which envisages the interception of up to 2000 km range ballistic missiles in both the endo-atmosphere and exo-atmosphere in the altitude range of 15-25 km and up to 140 km, respectively, the DRDO has so far carried out 13 tests. With the required success achieved through these tests, Phase-I is now ready for operational deployment, possibly under the command of the Indian Air Force.

It is important to note that the missile used for the ASAT test was not part of the BMD programme's existing interceptor missile inventory, namely the Advanced Air Defence (AAD) missile for endo-atmospheric interception and the Prithvi Delivery Vehicle (PDV) missile for exo-atmospheric interception, though it has benefited from the DRDO's various missile developmental programmes, including BMD. A brand new three-stage missile with two solid rocket boosters, weighing 18 ton and measuring 13 metres, was independently developed for the ASAT test after the government go-ahead about two years ago. Developing a new missile in a short span of time, with 150-odd scientists working around the clock for the past six months, is indeed an accomplishment for the DRDO which is often subject to criticism for time and cost overruns as well as performance shortfalls of many of its programmes.

The greater significance of the ASAT lies in its technological spin off for Phase-II of the BMD under which the DRDO aims to intercept longer range missiles of 5000 km range at a higher altitude of up to 400 km. It is important to note that though the target Indian satellite of the March 27 test was hit at a range of 283 km, the missile is actually capable of shooting down hostile objects moving at 10 km per second at a far higher altitude of nearly 1200 km. The technological capability for intercepting such a high velocity moving target at a higher altitude has a direct bearing on Phase-II of the BMD programme which envisages intercepting missiles travelling with a similar or lesser speed at a greater distance. Besides, the new missile developed for the ASAT test in record time will boost the confidence of DRDO scientists to undertake the development of more advanced missiles required for Phase-II of the BMD programme.

ASAT Test: What Next?

Having demonstrated the technical feasibility, it is only natural that India would move towards weaponising this capability and all the associated space technologies so as to effectively deter adversaries from destroying Indian space assets. Going forward, this is where equally important challenges lie. To weaponise the ASAT capability and related technologies would require the government's support and provision of resources. More importantly, it also needs a comprehensive defence space security architecture encompassing a defence space command for operational control of the weapon, as well as a dedicated space research agency to harness the full military potential of space.

Defence Space Command

Though India has always advocated the peaceful use of outer space, the fact remains that space is increasingly being used by countries, particularly the US and China, for military purposes. China, which has made a giant stride in space capability, operates nearly 70 military satellites in orbit, which perform the tasks of communication, ISR (Intelligence, Surveillance and Communication) and navigation. China also established a Strategic Support Force (SSF) in 2015, integrating space, cyberspace and electronic warfare (EW) aspects into a joint command under the Central Military Commission.

Given this reality of the military utility of outer space, it is only logical that India exploits its new capability in the fourth domain of warfare to further national security interests. India made a modest beginning in this regard in 2001 by implementing a space based surveillance programme. A further impetus was provided when an Integrated Space Cell (ISC) was constituted in 2009 under Headquarters Integrated Defence Staff (HQ IDS) to coordinate the space-related aspects of the three defence forces. Now, this Cell needs to be upgraded to a dedicated defence Space Command to cater to all user services. It may be headed by a senior military officer, with a strong component of specialists from various scientific and technical organisations including DRDO, National Technical Research Organisation (NTRO) and the Indian Space Research Organisation (ISRO). The Command would also be responsible for the operational aspects of all space based platforms and associated assets, besides laying out the strategy and doctrine for space warfare.

Defence Space Research Agency (DESRA)

In addition to establishing a Space Command, India also needs to create a dedicated Defence Space Research Agency (DESRA) to harness the entire spectrum of space technologies with defence applications. Such an agency may be set up under the DRDO, which has gained a head start in this crucial area. Suffice it to mention that, apart from the ASAT capability, DRDO has also developed an Electro-Magnetic Intelligence Satellite (EMISAT), which was launched on April 01, 2019. Besides, with the successful design, development and deployment of the Agni series of missiles, the DRDO has the requisite capability to meet the launch-on demand for urgent satellite launches. Some of the technologies and areas that DESRA should exclusively focus upon include:

- Space Situational Awareness (SSA): Going forward, SSA would play a critical role in mapping and cataloguing space-borne objects, including those of potential adversaries, for the purpose of devising suitable counter strategies. This would require development and deployment of a vast network of telescopes, long-range radars, and space-based sensors and a dedicated pool of experts to undertake the required task.
- SIGINT/COMINT/ELINT/IMAGEINT Satellite: All these complex and military grade satellites are primarily used for fulfilling specific military and intelligence community tasks ranging from active and passive intelligence gathering, communication mapping and imaging using advanced techniques like high resolution optical imaging techniques, hyper spectral and spectral mapping, s*ynthetic-aperture radar* (SAR) and other ELINT capabilities.
- Formation Flying: To take advantage of the combined capability of a group of satellites flying in formation. Typically, swarm missions involving satellites are utilised for various tasks where

orbiting satellites operate in various formations to achieve a variety of objectives ranging from killing adversary satellites to undertaking coordinated intelligence gathering operations.

- Launch on Demand: To meet the urgent requirement of launching satellites in a matter of a few hours, if not days. This capability should include rapidly deployable launch vehicles, launch facilities (both mobile and stationary) and reconfigurable / retrievable launch vehicles, among others.
- Directed Energy Weapons (DEW): DEWs is fast emerging as an alternative to direct ascent ASAT missiles and are difficult to attribute to a source. DEWs include systems such as high power microwaves, precision high power lasers and light-directed energy capabilities. These technologies are essential since they provide an effective mechanism for contactless, non-kinetic means to achieve superiority in space.
- Electronic Warfare (EW): It involves jamming and spoofing technologies to disturb the electromagnetic spectrum and other mission critical systems which are essential for conducting wars in a network centric environment. Some of the examples include global positioning system (GPS) / navigation system / communication system. Like DEWs, EW is also difficult to attribute to the source.
- Rogue Satellites: Used to cause damage to adversary assets, these satellites use a combination of kinetic kill vehicles, high-power microwaves, lasers, jammers, robotic instruments and chemical sprayers.
- Greater Sophistication of ASAT: The technology demonstrated on March 27 may require continuous upgradation, in terms of miniaturisation of the missile, a more capable thruster and seeker, as well as multiple launch options (ground-, air- and sea-based), to make it more effective.

Questions may be raised as to why India would need a DESRA-like agency while its existing civilian counterpart, ISRO, is doing a fabulous job in space launch and satellite manufacturing and assembly. The answer lies in ISRO's civilian character, which enables it to access key technologies from other countries. ISRO is also committed to various international treaties that promote the peaceful, or non-military, uses of outer space. Changing ISRO's character to an overtly military one may not be in the best interest of the organisation's progress as well as the national interest. Hence the need for a military counterpart of ISRO.

Conclusion

With the successful conduct of Mission Shakti, India has demonstrated its capacity in space weapons. It has also demonstrated the increasing maturity of its Ballistic Missile Defence programme, the first phase of which is ready for operational deployment. Having demonstrated its ASAT capability, India now needs to weaponise the technology and, at the same time, harness all possible space-related military technologies to put in place an effective deterrent against potential adversaries. To achieve this, India has a few more tasks cut out before it. It needs a comprehensive space security architecture consisting of a dedicated Space Command for operational aspects of space weaponry and an exclusive Defence Space Research Agency under DRDO to focus on scientific and technical aspects that include, *inter alia*, space situational awareness; intelligence, surveillance and reconnaissance; directed energy weapons; electronic warfare; formation flying; and rogue satellites. It is only when India has a deployable ASAT weapon and a range of other space related capacities and capabilities to deter adversaries, can it claim to be a true military power in outer space.

(Views expressed are of the authors and do not necessarily reflect the views of the IDSA or of the Government of India.)

https://idsa.in/idsacomments/mission-shakti-lkbehera_090419

THE FINANCIAL EXPRESS

Wed, 10 April 2019

Boost for India's defence! BrahMos, world's fastest supersonic cruise missile, to have 500-km range

BrahMos Aerospace is a joint venture between India's DRDO and Russia's NPO Mashinostroyeniya. The missile is named after Brahmaputra and Russia's Moskva

By Debjit Sinha

BrahMos range to be extended! In a major boost to our armed forces' fire-power, India and Russia are planning to increase the target range of BrahMos supersonic cruise missile. BrahMos was tested with an extended range of around 450 kilometres in 2017. According to an ANI report, the two countries are now planning to increase the range of the world's fastest anti-ship cruise missile to 500 kilometres! According to Alexander Maksichev, the managing co-director of BrahMos Aerospace company, hypersound will be attained with this increase in range. The missile has a current speed of 2.8 mach and the speed of hypersound will be attained through modernisation, resulting in figures of more than 4.5 Mach, the official was quoted as saying by ANI. Apart from this, serial production of the supersonic cruise missile started in March, the report says.

BrahMos Aerospace is a joint venture between India's DRDO and Russia's NPO Mashinostroyeniya. The missile is named after Brahmaputra and Russia's Moskva.

BrahMos missile range, test, key facts

BrahMos missile has been inducted in the Indian Navy and Indian Army and has also been tested successfully from Indian Air Force's Sukhoi 30-MKI frontline fighter jet. The multi-platform BrahMos missile can be fired from land, sea, air and even under-water! Reports also suggest that India is working to make a BrahMos with a range of 800-km. The increase in the range of BrahMos missile has become possible after India got entry to the elite bloc of the Missile Technology Control Regime (MTCR). BrahMos is also the first Indian missile whose life was extended to 15 years. Defence Minister Nirmala Sitharaman said that this would save replacement cost of missile systems in the Indian Defence Forces.

In 2018, India also tested BrahMos supersonic cruise missile with an indigenous seeker. Currently, BrahMos Aerospace is developing BrahMos NG (or the next-generation BrahMos). It is the lighter version of the original supersonic cruise missile but has a range of 300 kilometres and speed of 3.5 mach. BrahMos NG which will be integrated on both the LCA Tejas and Sukhoi-30 MKI has also generated a lot of export interest.

https://www.financialexpress.com/defence/boost-for-indias-defence-brahmos-worlds-fastest-supersonic-cruise-missile-to-have-500-km-range/1542650/

The Tribune
VOICE OF THE PEOPLE

Wed, 10 April 2019

Shorten time frame for defence acquisitions

No country that is not substantially self-reliant in defence technology can aspire to become a dominant military power in its region. The essence of efforts to achieve self-reliance lies in acquiring defence technology through original research. The other option is to gain access to it through the transfer of technology

By Gurmeet Kanwal

Several committees have been appointed by the NDA government to review the defence procurement policies and procedures and recommend fresh guidelines. However, as the controversy over the acquisition of the Rafale fighter aircraft illustrates, the procurement and acquisition process continues to be plagued by procedural delays.

The aim of indigenisation of defence manufacture should be to make India a design, development, manufacture, export and servicing hub for weapons and defence equipment by 2025-30. Periodic reviews must be undertaken to learn from the experience gained in the implementation of the Defence Procurement Procedure (DPP) that was first formulated in 2006.

No country that is not substantially self-reliant in defence technology can aspire to become a dominant military power in its region. India is hungry for state-of-the-art defence technology, but has a low technology base. The essence of all efforts to achieve self-reliance lies in acquiring defence technology through original research. The other option is to gain access to it through the transfer of technology (ToT). Defence technology is proprietary and guarded zealously. The government concerned must be willing to allow the transfer by the selling company and the buyer must be prepared to pay for it.

No country will give India strategic weapons' technologies such as nuclear warhead and ballistic missile technologies, know-how on building nuclear-powered submarines and ballistic missile defence (BMD) technology. It is the responsibility of the Defence Research and Development Organisation (DRDO) to conduct original R&D into strategic technologies and this must continue.

The development of hi-tech weapon platforms like fighter-bomber aircraft and sophisticated defence equipment like over-the-horizon radars should be undertaken jointly in conjunction with India's strategic partners. The route adopted should be to form joint venture (JV) companies between Indian private sector firms and international defence MNCs. In these cases, the role of the DRDO and the Services HQ should be mainly supervisory and facilitatory. An excellent example is that of the BrahMos supersonic cruise missile, a joint development with Russia.

The design and development of low-tech items should be outsourced to the private sector, with the DRDO monitoring the progress of the projects. The Services HQ should establish their own design bureaus to inculcate a technology development culture. They should initiate R&D projects in their training institutions, especially for the purpose of product improvement during the life cycle of weapons systems and defence equipment.

At present, there are far too many DRDO laboratories. There is a need to close down those whose work can be outsourced to the private sector. Some R&D projects should be outsourced to universities and IITs to involve the institutions of higher learning in this important national endeavour.

At the policy level, many contentious issues remain to be resolved, including the privatisation of most of the ordnance factories and several defence PSUs. Publicly owned manufacturing facilities are always inefficient and seldom meet the laid-down production targets. It is not the business of the government to be in business.

Though FDI in defence manufacture has been increased from 26 to 49 per cent, this is still not attractive enough for the MNCs to invest in India. Given the time and effort that goes into locating a joint venture partner and the risks involved, they prefer to have a controlling stake, which is 51 per cent or more.

The existing offsets policy has not worked to India’s advantage. The defence industry’s ability to absorb hi-tech offsets is still limited. Absorbing 50 or even 30 per cent offsets is extremely difficult. It may be more prudent to consider offsets only in cases where the benefits expected to accrue will outweigh additional costs and Indian JV partners can absorb the technology that is brought in. While exports of defence equipment have been permitted, the procedures for according approvals and the regulatory framework need to be streamlined.

At present, the time frame for the acquisition of defence equipment is excessive. From the submission of a Statement of Case for a new acquisition to according approval in principle (Acceptance of Necessity or AON) takes six months to one year. Then the case goes into RFI (request for information) and RFP (request for proposals) stages and prolonged negotiations with the selected bidder.

The actual conclusion of the contract takes up to three years. The prolonged negotiations for the acquisition of the Rafale fighter aircraft are an example. The delivery of the contracted item begins more than two to three years later. Even according to the current DPP, this is excessive and must be cut down to less than one-third.

Close supervision during manufacture would help to avoid time and cost overruns. As the Services are the main stakeholders, officers of the armed forces should be positioned in manufacturing facilities for supervision. The Services find quality control grossly unsatisfactory. The Directorate of Quality Assurance (DGQA), the organisation responsible, comes under the Defence Secretary. The DGQA must be transferred to HQ Integrated Defence Staff so that it is directly answerable to the Chairman, Chiefs of Staff Committee (CoSC).

The government has begun the process of establishing Defence Economic Zones (DEZs) to provide incentives for indigenous defence manufacture. There is an inescapable need to establish an Institute of Defence Acquisition under the CoSC where all officers nominated for posts dealing with defence procurement can be trained.

The Defence Technology Board should undertake a holistic review of the entire gamut of defence procurement, including the DPP, the production process, R&D, the offsets policy, timely conclusion of contracts, quality control and accountability. The procurement of defence equipment is an extremely important facet of preparedness for future conflict and must not be allowed to fester as a permanent sore.

https://www.tribuneindia.com/news/comment/shorten-time-frame-for-defence-acquisitions/755565.html