

With giant strides in self-reliance, DRDO set to galvanise the forces

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By Anil Bhat

In August 2014, Prime Minister Narendra Modi sent out a strong message to Defence Research and Development Organisation (DRDO) by flaying it for what he referred to as harbouring the “chalta hai” (lackadaisical) attitude. He urged it to complete its projects before time to put India ahead in the world. With technology in defence sector changing fast, India is left behind because products that are “two steps ahead” come into the market “even before we conceptualise a system”, Mr Modi said.

Five years later in March 2019, the Prime Minister announced in a televised address to the nation that the anti-satellite (ASAT) missile test by Indian scientists had destroyed in a three-minute mission a decommissioned satellite nearly 300 km away. He commended India’s first test of such technology as a major breakthrough that establishes it as a space power and the fourth country to have used such an anti-satellite weapon after the United States, Russia and China. Termed as Mission Shakti (Power), the target of India’s first ASAT test by the DRDO on March 27 was a satellite in low earth orbit, which was hit with a kinetic kill vehicle.

India officially confirmed that the ASAT missile used in the test was a Ballistic Missile Defence interceptor and part of the Indian Ballistic Missile Defence Programme. The interceptor, a Prithvi Defence Vehicle (PDV) Mark-II, had a hit-to-kill capable kinetic kill vehicle. The 13 metres long three-stage missile was fitted with two solid-propellant rocket motor stages and the kill vehicle. DRDO chief G. Satheesh Reddy said that although some previously developed sub-technologies were used as a basis, the interceptor was a completely new missile capable of shooting down targets moving at a speed of 10 km per second at an altitude as high as 1,200 km. However, in order to minimise the threat of debris, the interception was performed against an object moving at 7.4 km per second at an altitude below 300 km. Dr Reddy said that the propulsive power of the interceptor missile can be increased to make it capable of targeting satellites at medium altitudes. The missile reportedly hit the satellite with an accuracy of less than 10 cm, which is comparable with the best reported performance of ASAT missiles. Some reports stated that the achieved accuracy was of a few centimetres. Dr Reddy also stated that the interceptor missile is capable of shooting down all the satellites present in Low Earth Orbit.

The 41st DRDO directors’ conference was held on October 15-16. Inaugurating the conference, defence minister Rajnath Singh said DRDO has made the defence forces of the country strong. He congratulated Dr Reddy and his staff for achieving a 100 days’ target and identifying milestones to commemorate 75 years of Independence as well as a roadmap for five years. He also urged the DRDO fraternity to imbibe the working ethos of former President A.P.J. Abdul Kalam and to aim for technologies that remain contemporary for the next 10-15 years.

Reiterating the “Make in India” motto, Mr Singh mentioned that the government is leaving no stone unturned in the areas of investment facilitation, skills enhancement, intellectual property protection and manufacturing infrastructure. Describing DRDO as the main centre for indigenous research and development, he expressed confidence in its likelihood of producing world-class weapon platforms and systems like combat vehicles, missiles, multi-barrel rocket launcher, unmanned aerial vehicle,

radar, electronic warfare systems, combat aircraft, propellants and explosives now and in the near future.

The inaugural function was attended by national security advisor Ajit Doval and the three services chiefs, General Bipin Rawat, Admiral Karambir Singh and Air Chief Marshal R.K.S. Bhadauria all of whom addressed the audience. On October 16, principal secretary to the Prime Minister, Dr P.K. Mishra, too participated.

Mr Doval appreciated DRDO for doing commendable work despite all challenges. He stated that the DRDO has a seminal role in making India technologically strong and that India should develop critical technologies indigenously.

General Rawat felt that DRDO has made major strides to ensure that needs of the services are met by providing various systems like artillery gun system, mines, anti-tank missile systems, and do on. He was confident that the future wars will be won with our indigenous systems.

Admiral Singh stated that the Indian Navy is efficiently using Varunastra, Maareech, Ushus, TAL and various other DRDO developed systems.

Air Chief Marshal Bhadauria appreciated DRDO's work in electronic warfare technologies, radars, composite materials for the light combat aircraft (LCA), airborne early warning and communications system, Astra and various other technologies. He also appreciated the capabilities of LCA Tejas and asked DRDO to develop the next generation aircraft AMCA, harnessing the technologies and experience of LCA.

Dr Reddy spoke about the successful development of many capability enhancing arms and equipment systems made by DRDO and added that for the first time, the theme for the 41st DRDO directors' conference is technology leadership for empowering India.

Two compendia, namely the DRDO-Industry Partnership: Synergy and Growth and DRDO Products with Potential for Export. DRDO Policy and Procedures for Transfer of Technology to support industry, were released and the new website of DRDO was launched. Dr Chitra Rajagopal, DG (Systems Analysis and Modelling) stated that DRDO is committed to equip our Armed Forces with internationally competitive systems so that they have a decisive edge in the battlefield.

Dr Mishra began his talk referring to a new initiative suggested by PM Modi that young scientists below the age of 35 years be given an opportunity to innovate and explore frontier areas and commended DRDO for setting up five young scientists' laboratories working in five niche technology areas like artificial intelligence, quantum technologies, cognitive technologies, asymmetric technologies and smart materials. Dr Mishra then suggested three R's, requirement, resources and relevance, as key factors in determining our country's quest for advancement in emerging technologies.

At the Vibrant Goa Global Expo and Summit 2019, held at Goa University, Taleigao, Goa, between October 17 and 19, DRDO signed 30 licensing agreements for transfer of technology with 16 Indian companies, including three start-ups. This is a major boost of ToT to the defence industry for end use of the Armed Forces.

Indian Armed Forces are procuring ready-to-eat meals, survival ration and emergency flying ration products from companies that have acquired ToT from DRDO. While these products with high nutrition value and higher shelf life cater to the requirements of the Armed Forces deployed in inhospitable terrain, these technologies are also useful for the larger interest of society.

The list of weapons and equipment produced/successfully tested by DRDO since 2016 at least is long and impressive and has proved that where there is political will, sound direction and support from the government, DRDO can make India's armed and security forces stronger and better equipped.

Missile programme a key success: DRDO Chief

What are DRDO's outstanding achievements?

DRDO in the last six decades has achieved major successes in terms of technologies, products, processes and systems. For us, each one of these achievements is important because it has established maturity of technologies within the country and helped us in achieving self-reliance over a period of time. I would consider the missile programme as one of our key success areas. Apart from that we have also developed various kinds of radars for different roles like surveillance, tracking etc. to provide inputs to weapon systems. A number of sonars have also been developed for Indian Navy. In addition, a lot of EW systems for land, air and sea have been developed for surveillance and counter-measures. LCA Mk1, MBT Arjun, Multi-Barrel Rocket System-PINAKA, Ballistic Missile Defence (BMD) Programme and the recently conducted Anti-Satellite Missile (ASAT) programme have been our other major achievements. For most of these systems, we are one among 5-7 countries in the world to have developed such capabilities independently.

Many of DRDO's achievements have proved to be good technology demonstrators, particularly in the field of missiles, but have they been produced in enough numbers?

We are following concurrent engineering to manufacture the missiles through our production partners. Therefore, all the missiles developed by DRDO have been realized with a significant contribution from the Indian Industries. It is important to note that the production order is governed by the procedures of the Defence Procurement Procedure (DPP) and quantities are produced in accordance with the requirements approved by the Government for defence products and systems. Our Industries have the capability to produce the numbers demanded by users based on DRDO technology.

What are the responses from Indian industry for Make in India? In the past, there have been many cases when defence PSUs have been nominated to produce a weapon system or some equipment. What is the present status?

The response from Indian Industries for "Make in India" has been phenomenal. We have been supporting the industries with our technologies in order to enable them to produce indigenous systems for the armed forces. We have been enabling Indian industries with R&D activities also. Defence PSUs have been traditionally nominated to produce weapon systems because required infrastructure for large scale integration was not available in private sectors till a few years ago. The integration requirements for weapon system are capital intensive; which was one of the deterrence for participation of private industries in these fields. However, with the 'Make in India' policy more and more private industries are willing to invest. I am optimistic about the weapon systems being produced by the private industries in the near future.

Which arms/equipment have been produced to counter terrorism and which of them have been/will be produced for Central Armed Police Forces and state police forces?

Many products developed by DRDO have found application in Counter Terrorism and Counter Insurgency operations. Some of the major products for counter terrorism and counter insurgency operations are insas rifles, weapon locating and tracking systems, remotely operated explosive and breaching devices, multi-mode hand grenade, less lethal plastic bullets, remotely operated vehicle, different types of jammers and low-cost surveillance systems. We are also fully prepared to develop new advanced systems or adopt/modify existing systems for different requirements projected by agencies involved in counter terrorism and counter insurgency activities.

What are DRDO's plans for the future?

DRDO has set a target for itself to achieve a complete self-reliance in terms of missiles, radars, sonars, torpedoes, armaments and EW systems. We intend to have no import for these systems in the next four to five years' time. We are working on the cutting-edge technologies which will be required for futuristic weapon systems. We will be offering our technologies to industries for an early realization of products and also to support R&D facilities in the industries. We shall use indigenous resources to develop major platforms and weapon systems. We are also looking at creating a pool of researchers, in the academia, by carrying out joint research in areas of mutual interest. Our focus will also be to support Start-ups through Technology Development Fund (TDF). Time and cost

management of all projects is another priority area for us. We have worked out our plans and roadmap for 2-3 years, 5 years and 10 years to achieve self-reliance for defence equipment.

There was criticism reported in the media about the Arjun Main Battle Tank and the Tejas Light Combat Aircraft. Would you like to share what was the work done on both these systems to make them acceptable to the users.

MBT Arjun is one of the most potent fighting platforms in its class. The inputs of the users have been consolidated and roadmap has been evolved to offer MBT Mk-IA. It has gone through the tests also.

LCA MK-I has been accepted in Indian Air Force and FOC (final operational clearance) was given during Aero India Show 2019. HAL is geared up to produce these aircrafts as per scheduled requirements.

(The writer, a retired Army officer, is a defence and security analyst based in New Delhi)

<http://www.asianage.com/india/all-india/131119/with-giant-strides-in-self-reliance-drdo-set-to-galvanise-the-forces.html>

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Development of Ladakh and DRDO

By Dr. sudarshan Kumar

Ladakh, “the land of high passes” decorates the northern most region of erstwhile Jammu and Kashmir State and India. It carries great historical and geo strategic significance since ancient times. The passes of Ladakh region interconnect some of the economically and politically significant zones of world like South Asia, China, Central Asia and Middle East since time immemorial. This, in the past formed the basis of a constant endeavour of Rulers/ Kings to have Ladakh region as a part of their kingdom thus leading to successive invasions at different times. Consequently, in the year 1834, the Sikh general Zorwar Singh under Raja Gulab Singh invaded and conquered it. Later, the execution of treaty between British East India company and Raja Gulab Singh on 16th march 1846 laid the foundation of Dogra rule in the state of Jammu & Kashmir and Ladakh became a part subsequently. The successive Dogra rulers ruled the state for nearly hundred and one years and ladakh remained a princely state till Maharaja Hari Singh signed the instrument of accession on 26th October 1947. During this period, Dogra rulers extended the boundaries beyond Banihal and conquered Gilgit, Baltistan and other northern areas. Thus the state of Jammu and Kashmir became one of the largest state of undivided India and had an area of around 2,22,236 sq km. But post independence era witnessed a wavering and tumultuous course. 72913 sq km area (Gilgit, Baltistan and northern areas especially Hunza and Nagar) was illegally occupied by Pakistan and nearly 33510 sq km area (Aksai Chin) was annexed by China. Furthermore, 3180 sq km area(Shaksgam tract) has been acceded to China by Pakistan. The region of Ladakh owing to its geostrategic location has massive security constraints and immense critical unavoidable security purview. The possession of Ladakh region by virtue of its strategic location can not be ignored as it is a boost to the country’s defence preparedness. Ladakh provides a physical approach to the frozen battle field connecting to the rest of the country. To the west of Siachen Glacier, across the Saltoro ridge lies Pakistan occupied Gilgit and Baltistan, east of it lies China occupied Akasi Chin. The possession of Siachen Glacier by Indian forces has made it impervious to China and Pakistan from linking to Kashgar-Xigate road thus benefiting India. This further endorses the urgency to develop this important land and the recent bifurcation is the first step in this direction. Ladakh shares it’s border with Tibet to the east, Lahul and Spiti district of Himachal Pradesh in south, Jammu and Kashmir and Baltistan to the west and south west corner, Xingjing

Karakoram pass in the north. Ladakh is the coldest desert with the highest elevation at Salro Kangri (7742M) and the lowest elevation (Indus river) of 2250M, a total population of around 274289. The height of the terrain and its undulating areas thus characterizes harsh climatic conditions encompassing low humidity (20-40 %), low atmospheric pressure (493 mm Hg), high wind velocity, very low annual precipitation and sub zero temperatures of up to -40oC during winter months. The harshness of conditions can be adequately acknowledged by the plight of a man sitting in the sun with his feet in shade, who can have sun stroke and frost bite at the same time. These harsh conditions are further ameliorated by the sparse and scanty vegetation leading to very low moisture in the atmosphere. Rains are rare. Also snow fall may occur in the months of July and August due to high mountains all around. It also experiences heavy snow fall during winter. Thus the area remains cut off from the outside world for nearly six months. More over 90% of the population is constituted by the tribes scattered throughout the region . Therefore the biggest challenge for the authorities is how to improve the socio economic conditions of the masses living in this harsh environment. The creation of Union Territory of Ladakh by Modi 2.0 government for speedy development of this highly strategic region is a first step in this direction. Hence the cost effective sustainable technology will be the key for carrying out sustainable development in the field of agriculture, water management, connectivity, waste management, health care, education and employment generation. DRDO had developed number of technologies, which can foster the development of this newly created Union Territory of Ladakh in the above mentioned fields. Firstly, in the field of agriculture especially for growth of vegetables, and animal fodders, Agro Animal technologies developed by Defence Institute of High Altitude Research (DIHAR) Laboratory of DRDO have found wide acceptance among the local farmers of Ladakh region who are able to grow 48 different types of vegetables through out the year. Annually these farmers are producing around 4500 MT vegetables and 1192 MT of animal fodders and 25% milk. This has also helped in employment generation in the region, besides upliftment of their socio-economic conditions. The farmers are earning around 70-80 million rupees every year. The model of production by farmers and supply through co-operative society is very well functional in UT Ladakh. This model can be replicated in high mountain regions in other parts of the country as well. Besides DIHAR has also established Dairy Herds for distribution of high yielding progeny, developed Packages for practice for rearing of poultry in high altitude, Survival garden for medicinal plants and Solar Poly House Dryer for high altitude areas.

Secondly, there is scarcity of water in this cold arid region. Hence judicious use of water in irrigation, drinking and daily use is an inescapable necessity. Hence, standardized low cost Drip Irrigation System(DIHAR)and Back Pack type high altitude Water Purifier(DLJ) with capacity around 12-18 l/hr have been developed to cater the needs of people in high altitude areas.

Thirdly, the connectivity to this remote area is the back bone for sustainable all round development. Although Border Road Organization and State Government departments are primarily responsible for improving the connectivity of remote areas of this highly sensitive region yet for emergency purpose High Yield Polymer Concrete Composite (developed by Defence Laboratory Jodhpur (DLJ),a DRDO laboratory has a lot of potential application.

Fourthly, the most important aspect is the establishment of ultra infrastructure in medical diagnostics in Ladakh region. Also inter connecting the various health cares units with tele medicine system for providing health care to the door step will bring revolution in health care sector . The authorities at the helm of affairs in the new UT must examine this aspect. This type of technology is available in the country and can be customized as per requirement. Besides, Central Government Health Scheme (CGHS) must be extended to both serving and retired employee of Union Territory of Ladakh and Jammu and Kashmir by opening number of CGHS wellness centers in the Union Territories.

Fifthly, niche technologies viz Alcohol Gel for food warming , Biodigester technology for resolving the problem of un-decomposed human waste , Hybrid Generators for en cashing Solar Power and

numerous other technologies are available in the country for use in high altitude areas. Lastly we need to mention about abundant potential for tourism development in this region which needs to be explored. Various measures for its promotion should be undertaken which will further aid in the region's all round development.

The author is of the opinion that Modi 2.0 Government's decision of complete integration of Jammu and Kashmir with Union of India and bifurcation in two Union Territories viz Ladakh and Jammu & Kashmir is mainly to expedite all round development in these two union territories and also to ensure the fruits of innovative technologies are harnessed in each region by each section of society. However the implementation of program and adaptation of technologies will depend on the mind set of initiator and acceptor. Also bottom up consortium approach for initiation of new projects in the region will yield faster and meaning full results as compared to that of top down approach. (The author is former Director General DRDO & Special Secretary MOD GoI)

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