

DRDO: Achievements and Way Ahead

Defence Research & Development Organisation (DRDO) is India's largest and most diverse research organisation, with the vision of making India prosperous by establishing world-class science and technology base and providing Defence Services decisive edge by equipping them with internationally competitive systems and solutions. DRDO is a mission mode organization that works in various areas of military technology which include aeronautics, armaments, combat vehicles, electronics, instrumentation engineering systems, missiles, materials, naval systems, advanced computing, simulation and life sciences. DRDO works under Department of Defence Research and Development of Ministry of Defence, toward production of world class weapon systems and equipment in accordance with the expressed needs and the qualitative requirements lay down by the three services.

DRDO was formed in 1958 by the merger of the then already functioning Technical Development Establishment (TDEs) of the Indian Army and the Directorate of Technical Development & Production (DTDP) with the Defence Science Organisation (DSO). Starting as a small organisation with 10 laboratories, today, DRDO is a network of more than 50 laboratories which are deeply engaged in developing defence technologies.

DRDO is responsible for strong defence capabilities of India and the pace of developments and innovations accelerated after Make in India initiative. The technological advancement made by DRDO and the participation of private and public sector defence contractors increased the capability of manufacturing in India in the field of combat vehicles, missiles, multi-barrel rocket launcher, unmanned aerial vehicles, radars, electronic warfare systems, sonars, torpedoes, bridging systems, combat aircraft, sensors, NBC technologies, parachutes, combat free fall systems, propellants and explosives, detonators, communication systems, armaments systems, cyber systems, etc. .

A large number of missiles, submarines, tanks etc. were developed by DRDO that are helpful in the long run for the country to achieve self-reliance in defence sector. The Indian Ballistic Missile Defence Programme is an initiative to develop and deploy a multi-layered ballistic missile defence system to protect from ballistic missile

attacks. It is a very ambitious and technology intensive project as this kind of capabilities are with only 2-3 countries in the world.

Agni-V, an inter-continental Ballistic Missile with a range more than 5000 km, has put India in the elite club of nations who possess Inter Continental Ballistic Missiles. This missile can be used for India's ballistic missile defence shield. Nirbhay is a long range, subsonic cruise missile developed by the Defence Research and Development Organisation's premier laboratory Aeronautical Development Establishment in Bangalore. This missile can fly at the height of a tree so it's difficult to catch it by enemy radar. The development of this missile is a breakthrough for India as this missile is comparable to Pakistan's Babur and USAs Tomahawk. INS ARIHANT, Nuclear Powered Ballistic Missile Submarine is fitted with USHUS sonar, developed by DRDO lab, for detecting and tracking enemy submarines, surface vessels and torpedoes and can be used for underwater communication and avoiding obstacles.

BRAHMOS, a Super Sonic Cruise Missile is the world's fastest cruise missile in operation. It will make India the only country with supersonic cruise missiles in their army, navy, and air force. DRDO conducted successful test-firing of the Medium Range Surface-to-Air Missile (MRSAM) and the Long Range Surface-to-Air Missile (LRSAM) that were developed jointly with Israel. The missiles are meant to handle any kind of aerial threats including fighter aircraft and helicopters. The Nag, anti-tank missile joins Agni, Prithvi, Trishul and Akash. The Nag is a lock-on-before-launch (LOBL), fire-and-forget, anti-tank guided missile, can be fired from land or air based platforms and is meant to tackle modern battle tanks and other heavily armoured tanks. There is a high chance of neutralising the target with a single missile. The MBT Arjun is a third generation main battle tank developed by Combat Vehicles Research and Development Establishment (CVRDE), a DRDO lab in Chennai, for the Indian Army. Arjun Tank is equipped with high resolution day and night vision devices which are supported by laser range finder.

The development of INSAS (Indian Small Arms System) rifle was a big achievement for the country as it replaced all the outdated rifles and their export was also stopped. INSAS has been included in the top 10 weapon systems developed by

DRDO because of its mass induction in the services and export to various countries. The assault rifle and LMG variants have been adopted by the Indian Armed Forces, Central Armed Police Forces, Indian Paramilitary Forces and police forces. On the international level India has exported a certain number of these rifles to Nepal, Bhutan and Oman.

The Light Combat Aircrafts- Tejas were jointly developed by Hindustan Aeronautics Limited (HAL) and Aeronautical Development Agency (ADA). The Tejas is capable of carrying four tonnes of weapons. The aircrafts are capable of firing air-to-air missiles, and dropping laser guided bombs. DRDO successfully carried out the maiden flight of the Rustom-II, an unmanned aerial vehicle (UAV). The UAV is combat capable and can be equipped with electro optic sensors, radar, electronic intelligence, communication intelligence and situational awareness payloads. It is a big achievement for India as its sub systems were developed and manufactured entirely in India, with the participation of private companies. The Dhruv Helicopter has become the first major Indian weapons system to have secured large foreign sales.

Varunastra, a ship launched heavy weight torpedo, also known as an underwater missile is an important milestone in pushing India towards self reliance when it comes to underwater defence capabilities. The torpedo was developed by Naval Science and Technological Laboratory (NSTL) in partnership with Bharat Dynamics for Indian Navy. It is manufactured by using 95 per cent of indigenous parts and is capable of taking down stealth submarines in deep or shallow waters.

DRDO has made first indigenous composites Sonar dome as a result of which India joined a select group of countries capable of manufacturing such structures. The Sonar dome is attached to the bottom of ships, and scans the seas for submarine threats. Successfully manufacturing the Sonar Dome indigenously means that India now has the capability for manufacturing more advanced structures, such as entire ship hulls. There are land based and aerospace applications that stand to benefit from the advancement in manufacturing capabilities.

Armament Research and Development Establishment (ARDE) and the High Energy Materials Research Laboratory (HEMRL), research wings of the DRDO based in Pune designed Penetration-cum-Blast (PCB) and Thermo baric (TB) Ammunition

meant specifically for the Arjun tank. This mixture is far more explosive for the same amount of weight.

The Portable Telemedicine System (PDF) for Armed Forces was developed by the Defence Bioengineering and Electro-medical Laboratory (DEBEL), Bengaluru. The system is a means of providing remote assistance to injured personnel in a field hospital or a ship out at sea. The rugged and portable system is capable of taking various readings including blood pressure, temperature, heart rate, and includes an electrocardiogram. This system is going to save many soldiers' lives.

But these developments, achievements and advancements came with a price, higher than expected. Several DRDO projects such as the Light Combat Aircraft Tejas, Nag missile, Long-range Surface-to-Air missile project and the Airborne Early Warning and Control System projects have been delayed by many years and seen several cost overruns. So, India invested a lot than required compared with the benefits reaped. Moreover, most of the investments have been made a long time ago but India is still waiting to enjoy the benefits. Hence, it is the biggest challenge for DRDO to complete projects on time within budget.

India has the third largest armed forces in the world but due to an underdeveloped defence manufacturing sector, India is one of the largest importers of conventional defence equipment in the world. According to the Government of India, India imports approximately 60% of its defence requirements. While the Indian DPSUs and private sector suppliers produce combat aircraft, naval vessels, heavy trucks, and other military equipment, they invest little in research and development, resulting in slow development of new generation technologies. As a result, India's Defence Industrial base is underdeveloped till now. Make in India initiative has tried to make India self-sufficient in production but that is still very less compared with the requirements. Hence, it is another challenge for DRDO to reduce the imports and save money that can be used for other purposes.

In spite of all the efforts by DRDO, one report in year 2017 by the Comptroller and Auditor General (CAG) shook the hopes of Indians and made everyone to think about the real capabilities of India. The report came at a crucial time when India was on the verge of war with China. Audit found that the system delivered by Bharat

Electricals Limited (BEL) was deficient in quality. Out of 80 missiles received up to November 2014, 20 were test fired during April-November 2014. Six of these missiles i.e., 30 % failed the test. Preliminary failure analysis report revealed that the missiles fell short of the target, had lower than the required velocity, and also there was malfunctioning of critical units like Servo Control Unit and Connector. Two missiles had failed to take off because the booster nozzle had failed. These deficiencies posed an operational risk during hostilities,” the report added. This leads to another challenge for DRDO to focus on quality of products manufactured and not only on quantity. DRDO has to make products which are reliable to make India confident of its defence capabilities.

The procurement of raw materials for developing weapons is also very important. There is a need to build extremely deep competencies on electronics. Modern war-fighting machines have a disproportionately high content of electronics, often outstripping other aspects like protection and delivery. Electronics poses a unique challenge whereby the technology cycle is often much shorter than procurement cycles of the government.

India is surrounded by authoritarian regimes, and located within the arch of Islamic terrorism. Insurgents, Maoists, and dissident groups within India have posed a great challenge to national security. Resources of the Army, Air force and the Navy are already at an all time low and are over stretched, undermining the capability of the Indian military machine to fulfil its primary role of coping with the challenges of external threat. The Indian Navy now faces the prospect of confronting the Chinese Navy in the Indian Ocean. The competitive interests of the two rapidly growing economies for energy and transit can transform the Indian Ocean in to an area of bitter conflict in the near future.

On the other hand, DRDO and the associated industry continue to devour precious resources that the nation can ill afford but have proved totally incapable of making the nation self reliant in respect of contemporary military hardware. Tanks and ICVs are night blind without night sights. Pakistan forces equipped with night vision devices will be sitting behind blind Indian mechanized forces since modern wars will be fought largely at night.

So, to keep the country safe from every possible danger and Indian Union intact, it requires investments in right direction, investments not only on production but on research also. There is a need to empower DRDO to make it capable of overcoming every challenge. This will surely make India, the strongest nation, the developed nation, able to protect itself as well as its neighbours.