Defence Research and Development Organisation (DRDO)

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- DRDO works under the administrative control of Ministry of Defence, Government of India.
- It is working to establish world class science and technology base for India and provides our Defence Services decisive edge by equipping them with internationally competitive systems and solutions.
- Dr G. Satheesh Reddy is the incumbent Chairman of DRDO.

How did DRDO Originate and Grew?

- DRDO was established in 1958 after **combining Technical Development Establishment (TDEs)** of the Indian Army and the **Directorate of Technical Development & Production (DTDP)** with the **Defence Science Organisation (DSO).**
- Starting with 10 laboratories, **DRDO has now grown to a network of 52 laboratories** which are deeply engaged in developing defence technologies covering various disciplines, like aeronautics, armaments, electronics, combat vehicles, engineering systems, instrumentation, missiles, advanced computing and simulation, special materials, naval systems, life sciences, training, information systems and agriculture.
- Presently, the Organisation is backed by over 5000 scientists and about 25,000 other scientific, technical and supporting personnel.
- Several major projects for the **development of missiles, armaments, light combat aircrafts, radars, electronic warfare systems** etc are on hand and significant achievements have already been made in several such technologies.

What is the Mission of DRDO?

- Design, develop and lead to production state-of-the-art sensors, weapon systems, platforms and allied equipment for our Defence Services.
- Provide technological solutions to the Services to optimise combat effectiveness and to promote well-being of the troops.
- Develop infrastructure and committed quality manpower and build strong indigenous technology base.

What is the Integrated Guided Missile Development Programme (IGMDP)?

- IGMDP was brain child of renowned scientist **Dr. APJ Abdul Kalam.**
- It was intended to attain self-sufficiency in the field of missile technology.
- After keeping in mind the requirements of various types of missiles by the defense forces, the program recognized the need to develop five missile systems.
- The IGMDP formally got the approval of Indian government on July 26, 1983.
- It brought together the country’s scientific community, academic institutions, R&D laboratories, industries and the three defence services in giving shape to the strategic, indigenous missile systems.
- The missiles developed under IGMDP are:
    - Short-range surface-to-surface ballistic missile – **Prithvi**
    - Intermediate-range surface-to-surface ballistic missile – **Agni**

- Short-range low-level surface-to-air missile – **Trishul**
- Medium-range surface-to-air missile – **Akash**
- Third generation anti-tank missile – **Nag**

- The Agni, which was initially conceived as a technology demonstrator project in the form of a re-entry vehicle, was later upgraded to a ballistic missile with different ranges. Dr. Kalam played a major role in the development and operationalisation of Agni and Prithvi missiles.
  - After achieving the goal of making India self-reliant in missile technology, DRDO on January 8, 2008, formally announced successful completion of IGMDP.

  - Recently, a new generation nuclear capable ballistic missile Agni-P (Prime) was successfully test-fired by the Defence Research and Development Organisation (DRDO) from Dr. APJ Abdul Kalam island off the coast of Odisha, Balasore.

    - Agni-P is a new generation advanced variant of the Agni class (under IGMDP - Integrated Guided Missile Development Program).

Missile System of India	
Missile	**Features**
Agni I	▪ Single stage, solid fuel, Medium Range Ballistic Missile (MRBM). ▪ Using solid propulsion booster and a liquid propulsion upper stage. ▪ Range of 700-800 km.
Agni II	▪ Intermediate-Range Ballistic Missile (IRBM). ▪ Range more than 2000 km.
Agni III	▪ Two stage IRBM ▪ Support a wide range of warhead configurations. ▪ Strike range of more than 2,500 Km
Agni IV	▪ Two stage missile powered by solid propellant. ▪ Can fire from a road mobile launcher. ▪ Range is more than 3,500 km. ▪ Equipped with indigenously developed ring laser gyro and composite rocket motor.
Agni V	▪ Three-stage solid fueled, indigenous Inter-Continental Ballistic Missile (ICBM). ▪ Capable of carrying 1.5 tonnes of nuclear warheads. ▪ Latest and most advanced variant in terms of navigation and guidance, warhead and e ▪ After induction in the military, India will join an exclusive club of countries like the US, F capability. ▪ Canister launches missile system for operational flexibility. ▪ Range is more than 5,000 km.
Agni P	▪ Canisterised missile with range capability between 1,000 and 2,000 km. ▪ Many advanced technologies including composites, propulsion systems, innovative gui introduced. ▪ The missile would further strengthen India's credible deterrence capabilities.
Trishul	▪ Short-range, quick reaction, all weather surface-to-air missile designed to counter a low ▪ Has necessary electronic counter-measures against all known aircraft jammers.
Akash	▪ Medium-range, surface-to-air missile with multi-target engagement capability. ▪ Multiple warheads capable. ▪ High-energy solid propellant and ram-rocket propulsion system.
Nag	▪ Third generation ‘fire-and-forget’ anti-tank missile with a range of 4-8km. ▪ Developed indigenously as an anti-armour weapon employing sensor fusion technologi ▪ HELINA (Helicopter Launched NAG) is the air-to-surface version of the NAG integrated i

Prithvi	▪ First indigenously built ballistic missile under IGMDP. ▪ Surface-to-surface battle field missile. ▪ Demonstrates higher lethal effects and high level capability with field interchangeable ▪ Range from 150 km to 300 km.
BrahMos	▪ Supersonic cruise missile. ▪ Being developed with Russia as a private joint-venture. ▪ Multi-platform cruise can strike from various types of platforms. ▪ Among the world fastest supersonic cruise missiles with speeds ranging between Mach ▪ A 'fire and forget' weapon i.e. requiring no further guidance from the control centre onc
Nirbhay	▪ Subsonic missile, supplement to the BrahMos. ▪ Capable of being launched from multiple platforms on land, sea and air. ▪ A terrain hugging, stealth missile capable of delivering 24 different types of warheads c ▪ Can reach up to 1,000 km.
Sagarika	▪ Submarine-Launched Ballistic Missile (SLBM) ▪ Being integrated with India's nuclear powered Arihant-class submarine. ▪ Range - 700 km.
Shaurya	▪ A variant of the K-15 Sagarika. ▪ Submarine- nuclear-capable missile. ▪ Aims to enhance India's second-strike capability.
Dhanush	▪ Sea-based, short-range, liquid propellant ballistic missile. ▪ Naval version of Prithvi II. ▪ Maximum range 350 km.
Astra	▪ Beyond-visual-range air-to-air missile using a solid-propellant. ▪ In terms of size and weight, one of the smallest weapon developed by the DRDO. ▪ Active radar seeker to find targets. ▪ Electronic counter-measure capabilities. ▪ Designed to intercept and destroy enemy aircraft at supersonic speeds in the head-on
Prahaar	▪ India's latest surface-to-surface missile with a range of 150 km. ▪ Primary objective is to bridge the gap between the unguided Pinaka multi-barrel rocket ▪ Have high maneuverability, acceleration and accuracy.

What are the Other Programmes of DRDO?

- **Mobile Autonomous Robot System:**
  - MARS is a smart robust robot to handle land mines and Inert Explosive Devices (IEDs) which helps the Indian Armed Forces to disarm them from far distances despite hostile surroundings.
  - With some add-ons, this system can even be used to dig the ground for the object and defuse the Improvised Explosive Device by various methods.
- **Highest Terrestrial Centre in Ladakh:**
  - DRDO's centre in Ladakh is at 17,600 feet above sea level at Changla near Pangong lake which is intended to serve as a natural cold storage unit for the preservation of natural and medicinal plants.
- **Other Recent Developments by DRDO:**
  - **Extreme Cold Weather Clothing System (ECWCS)**
  - **'Pralay'.**
  - **Controlled Aerial Delivery System.**
  - **Pinaka Extended Range (Pinaka-ER) Multiple Launch Rocket System (MLRS).**
  - **Supersonic Missile Assisted Torpedo System (SMART).**
  - **Advanced Chaff Technology.**
  - **Akash-NG & MPATGM.**

What are the Issues faced by DRDO?

- The Standing Committee on Defence during 2016-17, expressed concerns over the inadequate budgetary support for the on going projects of DRDO.
- The committee notes that out of total defence budget, the share of DRDO was 5.79 per cent in 2011-12, which reduced to 5.34 per cent in 2013-14.
- Government’s lethargic revenue commitments towards DRDO have put major projects involving futuristic technology on hold.
- The DRDO also suffers from inadequate manpower in critical areas to the lack of proper synergy with the armed forces.
- Cost escalation and long delays have damaged the reputation of DRDO.
- Even after 60 years of DRDO formation, India still imports a large share of its defence equipments. In the period 2013-17, India is the world’s largest importer of defence equipment, accounting for 12% of the global total, according to the Stockholm International Peace Research Institute.
- DRDO's list of successes is short- primarily the Agni and Prithvi missiles. Its list of failures is much longer. The Kaveri Engine is running late by 16 years and the cost has escalated by around 800 per cent.
- DRDO is big on promise and small on delivery. There is no accountability. Nobody is taken to task for time and cost overruns.
- In 2011, the Comptroller and Auditor General (CAG) put a serious question mark on DRDO’s capabilities. "The organisation, which has a history of its projects suffering endemic time and cost overruns, needs to sanction projects and decide on a probable date of completion on the basis of a conservative assessment of technology available and a realistic costing system," its report stated.
- The CAG report also revealed that not all technologies developed by DRDO were suitable for use by the armed forces. The three services have rejected 70 per cent of the products developed at the Armament Research and Development Establishment (ARDE), Pune, in the last 15 years costing Rs 320 crore because the products did not meet their standard and requirement.
- The technology development agency is also largely responsible for the fact highlighted by General V.K. Singh that 97 per cent of the army's air defence is obsolete.
- DRDO is just tinkering with World War II equipment instead of working on cutting-edge technology.
- Even if systems are acquired from abroad and DRDO is meant to service them, if it fails. This leaves critical gaps in national defence.

What can be the Way Forward?

- DRDO should be restructured in a leaner organisation as suggested by the committee chaired by **P. Rama Rao** for external review of the agency in February 2007.
- The committee also recommended for setting up a commercial arm of the organisation to make it a profitable entity, besides cutting back on delays in completing projects.
- DRDO former chief V.K. Saraswat has called for the setting up of a Defence Technology Commission as well as a bigger role for DRDO in picking production partners for products developed by the agency.
- DRDO should be able to select a capable partner company from the outset, from the private sector if necessary.
- DRDO has taken some steps in the direction as it is considering long-term contracts with Indian information technology (IT) vendors such as Tata Consultancy Services Ltd (TCS) to build software solutions for defence projects, shifting its strategy of awarding deals to the lowest bidders on short-term projects.
- DRDO’s move to outsource is a right move and will open lot of opportunities benefiting the Indian companies.
- In Its document "DRDO in 2021: HR Perspectives’’, DRDO has envisaged a HR policy which emphasized on free, fair, and fearless Knowledge Sharing, Open book management style and Participative Management. This is a step in right direction.