

The Defence Research and Development Organization (DRDO) is an agency of the Republic of India, charged with the military's research and development, headquartered in New Delhi, India. It was formed in 1958 by the merger of the Technical Development Establishment and the Directorate of Technical Development and Production with the Defence Science Organization. It is under the administrative control of the Ministry of Defence, Government of India.

With a network of 52 laboratories, which are engaged in developing defence technologies covering various fields, like aeronautics, armaments, electronics, land combat engineering, life sciences, materials, missiles, and naval systems, DRDO is India's largest and most diverse research organization. The organization includes around 5,000 scientists belonging to the Defence Research & Development Service (DRDS) and about 25,000 other scientific, technical and supporting personnel.

Defence Research and Development Organization (DRDO) was established in 1958 by amalgamating the Defence Science Organization and some of the technical development establishments. A separate Department of Defence Research and Development was formed in 1980 which later on administered DRDO and its 50 laboratories/establishments.

Some of the major products/systems developed by DRDO and accepted/inducted by Armed Forces are:

Platforms:

- ✚ Light Combat Aircraft 'Tejas'
- ✚ Remotely Piloted Vehicle 'Nishant'
- ✚ Pilotless Target Aircraft 'Lakshya-I'
- ✚ Main Battle Tank 'Arjun Mk-I'
- ✚ Armoured Amphibious Dozer Mk-I
- ✚ Armoured Engineer Recce Vehicle
- ✚ NBC Recce Vehicle
- ✚ Bridging Systems 'Sarvatra'

Sensors:

- ✚ Airborne Early Warning & Control (AEW&C)
- ✚ Integrated Sonar System for EKM Submarine.
- ✚ Hull Mounted Sonar.
- ✚ Short Range Battle Field Surveillance Radar
- ✚ Weapon Locating Radar 'Swathi'
- ✚ 3D Low Level Light Weight Radar 'Aslesha' Mk-I
- ✚ 3D Surveillance Radar 'Revathi'
- ✚ Electronic Warfare System for Navy 'Sangraha'
- ✚ Electronic Warfare System for Army 'Samyukta'
- ✚ Electronic Warfare System 'Divya Drishti'
- ✚ Electronic Support Measure 'Varuna'
- ✚ Commander's Thermal Imager Mk-II for T-72, T-90 and BMP tanks
- ✚ Holographic Sights for Small Weapons

Weapon Systems:

- ✚ Akash Weapon System
- ✚ Prithvi Missile for Army and Air Force
- ✚ Supersonic Cruise Missile 'BrahMos'
- ✚ Multi Barrel Rocket Launcher System 'Pinaka' Mk-I
- ✚ Torpedo Advanced Light
- ✚ Heavy Weight Ship Launched Torpedo 'Varunastra'

Soldier Support Systems:

- ✚ Computerised Pilot Selection System for Indian Air Force
- ✚ Telemedicine System for Navy
- ✚ Submarine Escape Suit
- ✚ Flame Retardant Gloves
- ✚ NBC products

Radars

- ✚ Multifunction Phased Array Radar and 3D Surveillance Radar for Akash Missile Weapon System (Rajendra & 3D CAR respectively)
- ✚ Low Level Light weight 2D Radar for mountainous terrain Air Defence (Bharani)
- ✚ 3D -Tactical Control Radar for Air Defence
- ✚ Short Range Battle Field Surveillance Radar
- ✚ Weapon Locating Radar
- ✚ Through wall detection Radar
- ✚ Ground Penetration Radar
- ✚ Multifunction Phased Array Radar and 3D Surveillance Radar for Akash Missile Weapon System (Rajendra and 3D CAR respectively)
- ✚ Active Phased Array Radar for AEW&C
- ✚ Low level 2D Air Defence Radar (Indra-2)
- ✚ 3D Low Level Light Weight Radar (Aslesha)
- ✚ 3D Medium Range Surveillance Radar for Air Defence (Rohini derivative of 3D CAR)
- ✚ 4D Active Array Medium Power radar for AD role (Arudhra MPR ready for user trials)
- ✚ Ground Controlled interception
- ✚ SAR for UAVs (in development; prototypes delivered and in trials)
- ✚ Maritime Patrol Radar for fixed and Rotary Wing Aircraft (superseded by more advanced system)
- ✚ Maritime Patrol Radar with RS and ISAR (XV-2004)
- ✚ 3D Medium Range Surveillance Radar for ASW Corvettes
- ✚ Coastal Surveillance Radar (CSR)

Missile systems

The Integrated Guided Missile Development Programme (IGMDP) was launched by the Indian Government to develop the ability to develop and design a missile locally, and manufacture a range of missile systems for the three defence services. The programme has seen significant success in its two most important constituents – the Agni missiles and the Prithvi missiles, while two other programmes, the Akash SAM and the anti-tank Nag Missile have seen significant orders. The Trishul missile, a programme to develop

a tri-service short-range SAM faced persistent problems throughout its development, and was shut down in 2007.

- ✚ Prithvi ballistic missiles
- ✚ Agni ballistic missiles
- ✚ Akash SAM
- ✚ Trishul SAM
- ✚ Nag anti-tank missile
- ✚ Brahmos missile
- ✚ Shaurya
- ✚ Sagarika
- ✚ Sudarshan
- ✚ DRDO Glide Bombs
- ✚ Prahaar Missile

Computing technologies

DRDO has worked extensively on high speed computing given its ramifications for most of its defence projects. These include supercomputers for computational flow dynamics, to dedicated microprocessor designs manufactured in India for flight controllers and the like, to high speed computing boards built around Commercial Off The Shelf (COTS) components, similar to the latest trends in the defence industry.

Supercomputing: DRDO's ANURAG developed the PACE plus Supercomputer for strategic purposes for supporting its various programmes. The initial version, as detailed in 1995, had the following specifications: The system delivered a sustained performance of more than 960 Mflops (million floating operations per second) for computational fluid dynamics programmes. Pace-Plus included 32 advanced computing nodes, each with 64 megabytes(MB) of memory that can be expanded up to 256MB and a powerful front-end processor which is a hyperSPARC with a speed of 66/90/100 megahertz (MHz). Besides fluid dynamics, these high-speed computer systems were used in areas such as vision, medical imaging, signal processing, molecular modeling, neural networks and finite element analysis. The latest variant of the PACE series is the PACE ++, a 128 node parallel processing system. With a front-end processor, it has a distributed memory and message passing system. Under Project Chitra, the DRDO is implementing a system with a computational speed of 2-3 Teraflops utilising commercial off the shelf components and the Open Source Linux OS.

Processors and other critical items: DRDO has developed a range of processors and application specific integrated circuits for its critical projects. Many of these systems are modular, in the sense that they can be reused across different projects. These include "Pythagoras processor" to convert cartesian to polar coordinates, ANUCO, a floating point coprocessor and several others, including the ANUPAMA 32-bit processor, which is being used in several DRDO projects.

The way ahead for DRDO is to increasingly involve the private sector corporations and business leaders in production of major defence equipments. The participation of our

academia must also grow. It must actively play its designated role of seeding futuristic defence technologies and take up directed basis research in their colleges and universities.

DRDO is protecting the Indian citizens from a long time and will continue to do so.