



DRDO's Deep Tech Efforts for Defence

For Prelims: [Defence Research and Development Organisation \(DRDO\)](#), [Light Combat Aircraft, Tejas](#), [Pinaka](#), [Akash](#), [radars and electronic warfare systems](#), [nanotechnology](#), [biotechnology](#), [Agni](#), [Prithvi Missile Series](#), [Tejas Light Combat Aircraft \(LCA\)](#), [Akash Missile System](#), [BrahMos Missile](#), [Arjun Main Battle Tank \(MBT\)](#).

For Mains: Achievements of DRDO, Challenges faced by DRDO and steps that can be taken.

Source: [BL](#)

Why in News?

The [Defence Research and Development Organisation \(DRDO\)](#) is set to launch a new initiative aimed at **advancing emerging military technologies**. It will fund five deep-tech projects, with each project receiving up to Rs 50 crore, to promote the **indigenisation of defence products and strengthen national security**.

- This initiative is supported by a Rs 1-lakh crore fund announced in the [Interim Budget 2024-2025](#) to drive transformative research in the defence sector.

What are the Key Points About the Projects?

- **Objective:**
 - DRDO aims to **reduce reliance on imports of systems**, subsystems, and components required by the tri-services through indigenisation.
 - By focusing on futuristic and disruptive technologies, DRDO will seek innovative solutions for concepts that are not currently available in India or globally.
- **Futuristic and Disruptive Tech:**
 - DRDO has identified **three broad categories** for inviting proposals: indigenisation, futuristic and disruptive technology, and cutting-edge technology.
 - It primarily **focuses on advancing research in futuristic and disruptive technologies**, such as [quantum computing](#), [blockchain](#), and [artificial intelligence](#).
 - **Futuristic and disruptive technologies** are innovations that significantly **transform or revolutionise existing industries, markets, or societal norms** by introducing new methods, products, or services.
 - Globally, similar programmes are led by state defence research organisations, such as the [US DARPA \(United States Defense Advanced Research Projects Agency\)](#) which DRDO is using as a model for its deep tech initiative.
 - Investments in these deep tech projects will be executed through [DRDO's Technology Development Fund \(TDF\)](#).
 - The TDF has been collaborating with private industries, especially [MSMEs](#) and **start-ups**, to develop military hardware and software needed by the armed forces.

Defense Advanced Research Projects Agency (DARPA)

- DARPA is a **research and development agency under the United States Department of Defense**, focused on developing emerging technologies for military applications.
- Its objective is **to design and implement research and development projects** aimed at pushing the boundaries of technology and science, often addressing needs beyond immediate military requirements.

What is the Defence Research and Development Organisation (DRDO)?

▪ About:

- DRDO is the **R&D (Research and Development) wing** of the **Ministry of Defence** with a vision to empower India with cutting-edge defence technologies.
- Its **pursuit of self-reliance** and successful indigenous development and production of strategic systems and platforms such as **Agni and Prithvi series of missiles, Light Combat Aircraft, Tejas, multi-barrel rocket launcher, Pinaka, air defence system, Akash, a wide range of radars and electronic warfare systems, etc.** have given quantum jump to India's military might, generating effective deterrence and providing crucial leverage.

▪ Formation:

- It was formed in 1958 from the amalgamation of the **Technical Development Establishment (TDEs)** of the Indian Army and the **Directorate of Technical Development & Production (DTDP)** with the **Defence Science Organisation (DSO)**.
- DRDO is a network of more than 50 laboratories which are deeply engaged in developing defence technologies covering various disciplines, like aeronautics, armaments, electronics, combat vehicles, engineering systems etc.

▪ Technology Clusters of DRDO:

- **Aeronautics:** Focuses on designing and developing aviation technologies, including aircraft, **Unmanned Aerial Vehicle (UAVs)**, and advanced materials.
- **Armament and Combat Engineering:** Develops weapon systems, artillery, and ammunition for the armed forces.
- **Missiles and Strategic Systems:** Specializes in missile technology, including ballistic missiles, cruise missiles, and tactical missile systems.
- **Electronics and Communication Systems:** Works on radar systems, communication devices, and electronic warfare systems for military applications.
- **Life Sciences:** Develops technologies for human survival in extreme environments, such as protective gear, life-support systems, and combat casualty care.
- **Materials and Life Sciences:** Focuses on advanced materials, **nanotechnology**, and **biotechnology** for defence applications.

What are the Achievements of DRDO?

System	Description
Agni and Prithvi Missile Series	Successful development of ballistic missile systems , significantly enhancing India's strategic capabilities.
Tejas Light Combat Aircraft (LCA)	An indigenous multi-role fighter aircraft, designed and developed by DRDO in collaboration with other agencies.
Akash Missile System	A medium-range surface-to-air missile system that provides air defence support to the Indian Army and Air Force.
BrahMos Missile	World's fastest supersonic cruise missile , developed in collaboration with Russia.
Arjun Main Battle Tank (MBT)	Arjun Main Battle Tank (MBT) is an indigenous battle tank designed for the Indian Army, featuring advanced firepower, mobility, and protection systems.
INSAS Rifle Series	INSAS Rifle Series is an indigenous design and development of small

	arms, including rifles, for the Indian armed forces.
Light Combat Helicopter (LCH)	Developed to meet the operational requirements of the Indian Army and Air Force .
NETRA UAV	NETRA UAV is an indigenous unmanned aerial vehicle designed for surveillance and reconnaissance operations.
Submarine Sonar Systems	Development of sonar and underwater communication systems for the Indian Navy's submarines.

What are the Challenges Faced by DRDO?

- **Delays in Project Execution:** Many DRDO projects, such as the **development of advanced weapon systems and aircraft, have faced significant delays**, affecting timely deployment and causing cost overruns.
- **Technology Gaps and Dependence on Imports:** Despite a substantial production and R&D base, the Indian defence industry **lacks the technological capability to independently design and manufacture major systems**, critical parts, components, and raw materials, leading to continued reliance on imports.
 - This limited technological depth is a key factor behind the Indian government's preference for licensing the manufacture of many major defence systems.
- **Budgetary Constraints:** The budget allocation for **the DRDO increased to Rs 23,855 crore in FY 2024-25**, up from **Rs 23,263.89 crore in FY 2023-24**.
 - Despite this increase, the **budget growth remains modest**, not aligning with the government's strong emphasis on modernisation and the indigenisation of defence technology.
- **Collaboration with Industry and Academia:** While DRDO is trying to increase collaboration with private industries and academic institutions, aligning them efficiently with defence R&D requirements remains a challenge.

Way Forward

- **Strengthening Industry Collaboration:** DRDO should enhance partnerships with private industries, MSMEs, and **start-ups** to **accelerate innovation and the development of cutting-edge defence technologies**, promoting efficient technology transfer.
- **Focus on Time-bound Execution:** Implementing **stricter project timelines and adopting agile project management techniques** can help mitigate delays and ensure timely delivery of critical defence systems.
- **Increased Investment in R&D:** Allocating additional resources and consistent funding for research and development will empower DRDO to bridge technological gaps and reduce reliance on foreign imports.
- **Fostering Global Collaborations:** Expanding collaborations with international defence research agencies and fostering joint ventures can help DRDO acquire advanced technologies and expertise in emerging areas.

Drishti Mains Question:

Analyze the significance of DRDO's technology clusters and highlight notable achievements in recent years. How do these achievements contribute to India's strategic autonomy?

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims:

Q. In the context of Indian defence, consider the following statements: (2009)

1. The Shourya missile flies with a speed of more than 8 Mach.

2. The range of Shourya missile is more than 1600 km.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Ans: (d)

Q. Which one of the following is the best description of 'INS Astradharini', that was in the news recently? (2016)

- (a) Amphibious warfare ship
- (b) Nuclear-powered submarine
- (c) Torpedo launch and recovery vessel
- (d) Nuclear-powered aircraft carrier

Ans: (c)

Mains:

Q. How is S-400 air defence system technically superior to any other system presently available in the world? (2021)

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