

# HI-TECH MANUFACTURING SEGMENT



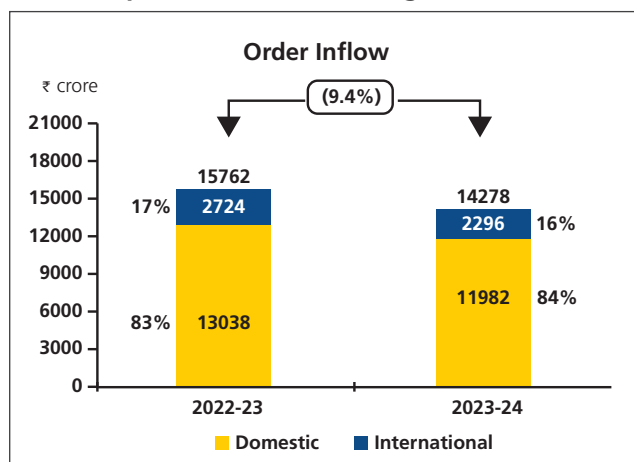
TA Crystallizer and PTA Crystallizer for Mega PX-PTA project at IOCL Paradip Refinery, Odisha

## The Hi-Tech Manufacturing Segment comprises:

- a) Heavy Engineering Business
- b) Precision Engineering & Systems Business

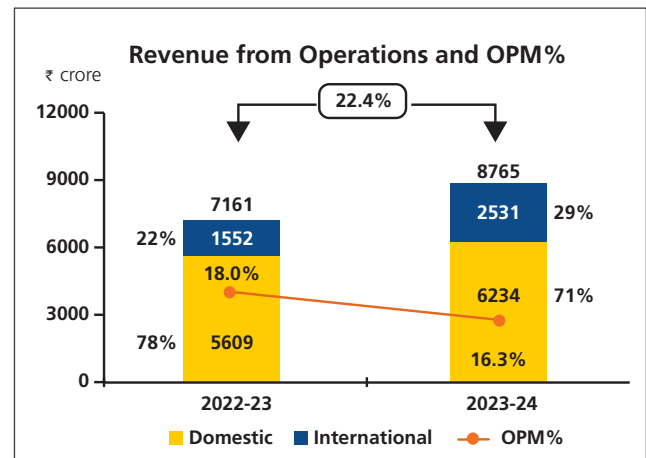
The Defence Engineering business has been renamed as L&T Precision Engineering & Systems business with effect from April 01, 2024. This is in line with the vision to pursue opportunities in emerging deep-tech sectors like Precision Manufacturing and Electronic systems in Defence, Aerospace, and other industries.

## Financial performance of the segment



The Hi-Tech Manufacturing segment achieved order inflows of ₹ 14,278 crore during FY 2023-24, registering a decline of 9.4% over the previous year, mainly on account of deferment of orders in Precision Engineering & Systems

business. The share of international orders decreased to 16% in the current year from 17% in FY 2022-23.



The Hi-Tech Manufacturing segment achieved revenue of ₹ 8,765 crore for the year, registering a growth of 22.4% y-o-y due to a pick-up in execution momentum. The share of international revenue in FY 2023-24 was at 29% of the total revenue of the segment as compared to 22% in the previous year, on account of higher opening international order book.

The segment's operating margin declined to 16.3% from 18.0%, mainly due to cost overruns in a few jobs and the change in job mix.

Funds employed by the segment as on March 31, 2024, at ₹ 1,353 crore declined over the corresponding figure on March 31, 2023, by 49.0%, mainly due to higher



*OxO Reactor for BASF Guandong Integrated Project, China*

customer advances on receipt of large orders in the Precision Engineering & Systems business. The Heavy Engineering business also contributed through improved customer collections.

## Heavy Engineering Business

### Overview

L&T Heavy Engineering business is a global leader in the manufacturing of Engineered-to-Order Hi-Tech Reactors and high-pressure & temperature Heat Exchangers for Refinery, Petrochemicals, Fertiliser, Oil & Gas, and Nuclear Power plants.

The A. M. Naik Heavy Engineering complex at Hazira is a globally benchmarked state-of-the-art, fully integrated, and digitally-enabled manufacturing complex. Its capability spectrum spans across in-house Engineering & Technology centres, besides having a highly talented team committed to a safe and sustainable work culture. The business is globally recognised for its impeccable track record of timely and quality deliveries while creating new international benchmarks. The business has implemented extensive digital Industry 4.0 technology in its manufacturing & operations.

The business is organised into the following Product Business Units (PBUs):

- The **Reactor & Pressure Vessels (RPV)** PBU specialises in the fabrication of Hydro-Processing Reactors, Tubular Reactors, Gasifiers, Ammonia Converters, Urea Reactors, Coke Drums, Fluid Catalytic Cracking (FCC) Reactor – Regenerator system, Oxidation Reactor, Titanium Cladded
- Equipment, LNG/Gas Processing Pressure Vessels and Heavy Columns
- The **Heat Transfer Equipment (HTE)** PBU specialises in Molten Salt Reactor System, Ammonia & Urea Exchangers, High-Pressure Screw Plug Heat Exchangers, Methanol Converters, Propylene (PO) Reactors, Vinyl Acetate Monomer (VAM) Reactors and Fired-Tube Waste Heat Boiler packages
- The **Process Plant Internals (PPI)** PBU specialises in proprietary internals for Reactors and Ammonia Converter Baskets, Chemical Vapor Deposition (CVD) reactors for polysilicon plants, which are manufactured using materials like Stainless Steel, Duplex/Super Duplex Stainless Steel, Inconel, Monel, Hastelloy, Titanium, Zirconium, etc.
- The **Modification, Revamp & Upgrade (MRU)** PBU offers value-added end-to-end solutions for FCC (Fluid Catalytic Cracking) revamps, Crude Distillation Unit/ Vacuum Distillation Unit revamps, Multi-Shutdown Facility revamps, Urea Reactor Life extension, Coke Drum repairs, Heat Exchanger revamp, Urea energy-saving projects, debottlenecking/capacity enhancement of Oil & Gas units, and emergency repairs for the process plant industry
- The **Nuclear** PBU specialises in key equipment for steam supply systems in nuclear power plants. It manufactures key components of the nuclear island like Steam Generators, End Shields, Pressurisers, Safety Heat Exchangers, Reactor Header Assemblies, Calandria, End Fittings, etc.
- The **Special Fabrication Unit (SFU)** fabricates critical Titanium Piping Spools, complex internals for Gasification Plants, Loop Reactors, Primary Quench Exchangers (PQE), and filter vessels for the petrochemicals sector



*Ammonia Converter and Basket for OCI Beaumont, USA*

- The business also has one of the world's largest Forge Shops. **L&T Special Steels and Heavy Forgings Private Limited (LTSSHF)** is a joint venture with the Nuclear Power Corporation of India Limited (NPCIL). It is one of a kind in Southeast Asia with all the operations for making heavy forgings under one roof

## Business Environment

The current FY 2023-24 has continued to witness the fallout of the prolonged Russia-Ukraine war, the Israel-Hamas conflict, and the persistent U.S.-China tensions. These geopolitical events have led to overall economic uncertainty and higher operational risks, like rising freight costs and delayed deliveries. Despite these headwinds, the business has continued its progress across most of the segments.

On the domestic front, the business has seen traction in large-scale private projects like solar photovoltaic GIGA factories & refinery revamps.

The Modification, Revamp and Upgrade (MRU) business, identified as a Lakshya 2026 growth initiative, has taken off well both in India and GCC countries. Clients are increasingly opting for revamps and deferring greenfield investment projects. Euro-5 compliance norms in GCC, fertiliser energy-saving projects in India and revamping of ageing plants are key drivers for the MRU business.

In the nuclear power sector, fleet procurement for the Indian Pressurised Heavy Water Reactor (IPHWR) is in progress, albeit at a slower pace.

Volatility in the cost of input materials and high energy prices are having an impact on the margins of the Forging business, which are being neutralised partly by stepping up energy conservation. Global forging companies are able to compete better in prices due to relatively lower energy costs.

## Major Achievements

On the International front, Business has won major orders like:

- IEFCL (Indorama Eleme & Fertiliser Chemicals Ltd.) Train-3 Ammonia Plant, Nigeria – A first-ever complete package of PEQs (Proprietary Equipment), CEQs (Critical Equipment), and Steam Drum
- Fertiglobe - Harvest Ammonia Plant, UAE – Order for Ammonia Converter & Basket
- Perdaman Australia – Complete package of Urea Equipment
- PTT Glycol Company, Thailand – 1<sup>st</sup> direct order for 2 nos. Scientific Design Ethylene Oxide Rx
- PDH-PP (Propane Hydrogeneration - Polypropylene) Plant, Turkey – 1<sup>st</sup> order Ceyhan Polypropylene, Uretim A.S, Turkey

In the domestic sector, the business continues to dominate by winning a total of 10 Urea PEQs in a row in the current financial year. CVD (Chemical Vapor Deposition) Reactor and Offgas Coolers are breakthrough orders with large business potential for the Polysilicon Project of RIL Giga factories.



*HDS Reactor for IOCL Panipat DHDT project, Haryana*

The MRU business secured the largest order from Petro Rabigh, KSA, for Ethane Cracker revamp and HOFCC (High Olefin Fluidised Catalytic Cracking Unit) debottlenecking. This will unlock new opportunities with Aramco JV companies in KSA. The MRU business has also secured a number of orders on a nomination basis in the domestic market, including the largest domestic order from Nayara Energy for Coke Drum replacement.

The business has also successfully and timely delivered the World's Heaviest Ammonia Converter for OCI Beaumont, USA; the World's Heaviest Coke Drums for Pemex's Salina Cruz Refinery, Mexico; and SS Heaviest Removal Column for Pluto Train 2 Project, Australia. Further, the business also delivered Loop Rx of the IOCL P-25 project for the first time & Titanium pools for Assam Bio-Refinery.

The business was granted four patents for its innovative designs and processes.

The Nuclear business has surpassed its earlier benchmark of 36 months to manufacture Steam Generators in 33 months. The business has also qualified to manufacture the forgings for Framatome's Pressuriser Design for the first time.

LTSSH team has completed 16 out of the 24 sets of forgings for Nuclear Steam Generators; 70% delivery of the critical forgings for a prestigious strategic programme; India's biggest Pelton Runner Forging (~49 MT) for Idukki Hydro project in Kerala, and 1<sup>st</sup> set of Titanium Forgings for the country's strategic programme named 'Samudrayaan – India's Deep Ocean Mission'.

## Significant Initiatives

iRUDRA is an end-to-end digital transformation programme focussed on enhancing product reliability, cost competitiveness, and customer & employee experience. Foundational solutions like plant connectivity, cybersecurity, and middleware, are its strong backbone.

Leveraging LTIMindtree's iNXT platform for IIoT, 112 critical machines have been connected, enhancing quality, productivity, and support for the 'Express Delivery Programme'.

The acceleration of automation initiatives, as mentioned below, continued during the year, contributing to significant improvement in productivity:

- ▣ Automated Circumferential Seam Setup Station
- ▣ Robotic External Welding Station
- ▣ Overlay UT Automation
- ▣ AI-Based UT & Visual Inspection

## Outlook

In the domestic market, the Union Cabinet approved a viability gap funding scheme for Coal Gasification projects in January 2024 and multiple mega projects in the refinery and petrochemicals sector. The business expects a continuation of large-scale private projects in solar photovoltaic Giga Factories and petrochemical segments.

Climate change is expected to provide sustainable growth in view of the demand for renewable diesel and biodiesel plants (which are more eco-friendly) and enforcement of clean fuel standards – Renewable Energy Directive (RED) II, Renewable Fuel Standard (RFS), and Low Carbon Fuel



*Coke drums each weighing 450 MT for Numaligarh Refinery Limited, Assam*

Standard (LCFS) in developed countries. Oil-to-Chemicals projects drive growth in the petrochemicals sector (especially in Asia) and LNG sector (especially in the USA and the Middle East).

The MRU business expects sustainable increased demand and a stronger foothold in GCC for energy efficiency, emission reduction, and crude-to-chemical projects.

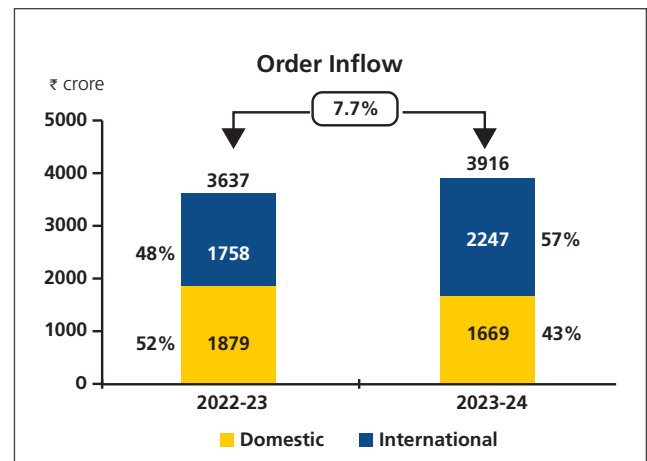
COP28 has been a historic event for the nuclear energy sector. India plans to triple its nuclear power generation capacity to 22.5 GWe by 2031. NITI Aayog and the Department of Atomic Energy (DAE) are exploring the possibility of repurposing retiring thermal power plants with small modular nuclear reactors. Anushakti Vidhyut Nigam Limited (ASHVINI), a JV between NTPC and NPCIL, will focus on fast-track construction of 6 X 700 MWe Pressurised Heavy Water Reactor (PHWRs) as a part of the Fleet Programme in support of climate change and towards achieving Net Zero emissions target.

The business is targeting special projects like Laser Interferometer Gravitational-Wave Observatory (LIGO) and Medical Isotope Reactors. A successful historical track record in the Fusion Reactor project (ITER) has opened new business opportunities for the ITER organisation. The business is well poised to benefit from the momentum in the nuclear sector.

The business remains positive in its outlook for order prospects despite as many as 60+ countries, including many in India and the European Union, going into elections, which may lead to a lot of uncertainties in decision-making on upcoming prospects.

The digital as well as the various organisational excellence initiatives of the business are expected to result in improved productivity and higher value creation on a medium to long-term basis.

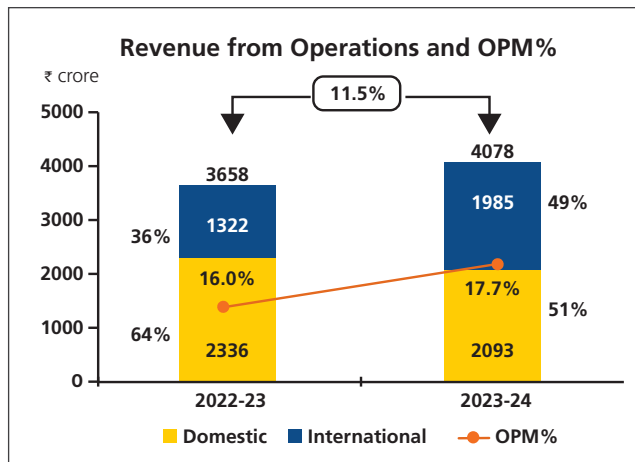
**Financial performance of the business**



The Heavy Engineering business recorded an order inflow of ₹ 3,916 crore for the year ending March 31, 2024, higher by 7.7% as compared to the previous year, mainly due to the receipt of a high-value international order in the Modification, Revamp & Upgradation (MRU) business. The share of international orders increased to 57% in the current year from 48% in the previous year.



Naval vessel RFA Argus from Royal Fleet Auxiliary (RFA) UK, for repairs at L&T Shipbuilding's Kattupalli Shipyard, Tamil Nadu



The Heavy Engineering business's revenue of ₹ 4,078 crore grew by 11.5% on a y-o-y basis, with higher execution of orders in the MRU business. The share of revenue from international operations has increased to 49% compared to 36% in FY 2022-23.

The operating margin of the business improved from 16.0% to 17.7% due to execution cost savings and a better job mix.

## Precision Engineering and Systems Business

### Overview

L&T entered the various strategic sectors, such as nuclear power, aerospace, and defence, in the sixties, early

seventies, and mid-eighties, respectively, as a part of the Company's focus on building a strong and self-reliant India by leveraging its precision and systems engineering capabilities. This was well ahead of the opening up of these sectors for private industry participation, beginning with Defence in 2001 and Space in 2020.

During the preceding one and a half decades, L&T was associated with the Defence Research & Development Organisation (DRDO) while concurrently contributing towards the Indian Navy's 'A Builders Navy' aspiration by developing platform-specific equipment and systems across classes of Naval platforms with in-country value addition. As for the Space sector, the business continued to be a trusted partner to ISRO across every segment of Space activities across Boosters and wide-ranging hardware for Space Launch Vehicles and Satellites, test facilities, material independence, Satcom infrastructure, and Deep Space Communication Network.

Since the constitution of a separate business vertical in 2017, the business has grown from strength to strength and earned recognition in the aerospace and defence segments, as L&T Defence. Reflecting the Company's vision to pursue opportunities in emerging deep tech sectors like precision manufacturing, advanced electronics systems, AI, additive manufacturing, autonomous platforms, and digital technologies, including Industry 4.0 in Defence & other industries, the business has been renamed as L&T Precision Engineering & Systems with effect from April 01, 2024.

Having built a portfolio of products, systems, platforms, and solutions, and correspondingly a basket of technologies, the business provides concept-to-design-to-delivery customised solutions across chosen strategic



### Close-In Weapon System (CIWS)

segments with a focus on indigenous design and emphasis on creating Indian Intellectual Property (IP).

The business is structured to provide direction to various segments of operations, as under:

- ▣ Marine Platforms, Equipment, and Systems
- ▣ Land Platforms, Equipment, and Systems
- ▣ Aerospace Systems

The business is headquartered in Powai, Mumbai and its operations extend across India. It also includes R&D centres, Product Design & Engineering Centres, and the following dedicated production centres:

- ▣ A. M. Naik Heavy Engineering Complex at Hazira (near Surat) for manufacturing, integration, and testing of armoured & allied land platforms and hulls, as well as pressure-proof structures for underwater platforms
- ▣ The shipyard at Kattupalli (near Chennai) caters to new builds and repair of marine platforms
- ▣ Strategic Systems Complex for weapon launch systems, sensors, engineering equipment and control systems at Talegaon (near Pune)
- ▣ Precision Manufacturing & Systems Complex (PMSC) for aerospace systems manufacturing, equipped with Centres of Excellence for Advanced Composites and Additive Manufacturing at Coimbatore
- ▣ Strategic Electronics Centre at Bengaluru

These work centres are complemented by R&D Centres at Powai and Bengaluru, and Product Design, Development & Engineering Centres for Armoured Platforms & Weapon Systems, Sensors, Engineering Equipment and Aerospace

Systems at Powai, Talegaon, Hazira, and Coimbatore, as well as Design & Engineering Centres for Underwater Platforms and Warships at Powai and Chennai.

Since its inception, the business has built a portfolio of wide-ranging, indigenously designed and developed products, systems, solutions, platforms, and technologies. The business has indigenously conceptualised, engineered, built, and supplied over 250 systems and products, with more than 50 of them having been delivered in serial production mode. The business model is uniquely differentiated through its focus on in-house technology and product development, innovation for serial production, and mature and equated partnerships with domestic as well as global majors, both in the government and private sectors. Besides the supplies, the business offerings also include providing support during installation, commissioning, field evaluation trials, through-life support, and obsolescence management. These capabilities enable the business to maintain its market leadership position amongst the private sector defence industry and be future-ready, given the Government's push for higher indigenisation and autonomy through the 'Aatmanirbhar Bharat Abhiyan'.

L&T's participation in the defence sector stems from its ethos of being a builder of the Indian nation. Various sustainability and risk assessors of defence-related businesses do recognise the right of countries to defend themselves and the need to develop & produce defence-related products to fulfil security, peacekeeping, and humanitarian needs. This is well-acknowledged in the current era of multiple regional conflicts where nations have increased their spending on defence to be able to be equipped for self-defence and ensure national security.



### Offshore Patrol Vessel

It is noteworthy that the business' sole customer & regulator, the Indian Government, is committed to non-proliferation under the 'Weapons of Mass Destruction and their Delivery Systems (Prohibition of Unlawful Activities) Act, 2005'. India is also a signatory to the Missile Technology Control Regime (MTCR), a multilateral export control regime, and a party to the Wassenaar Arrangement – a voluntary export control regime that limits the destabilising proliferation of sensitive technologies. Further, India has voluntarily adopted a 'No First Use' (NFU) Policy (PIB notification dated January 4, 2003) that is enshrined in the commitments of the Cabinet Committee on Security (CCS). India's application to join the Nuclear Suppliers Group (NSG) in 2016 is also under discussion. The Company recognises the need to act responsibly in carrying out its business related to the defence sector, implement internal controls and stay committed to respecting human rights.

While maintaining its position as a leading player in the Indian Defence Sector, ***the business does not manufacture any explosives or ammunition of any kind, including cluster munitions or antipersonnel landmines or nuclear weapons or components for such munitions. The business also does not customise any delivery systems for such munitions.***

Leveraging its prowess in technology development for about four decades, the business is incubating the following new business segments in FY 2024-25:

- ▣ Precision Products: This segment will manufacture precision products that are characterised by their adherence to high reliability and critical specifications

- ▣ Electronics Products and Systems: This segment will design, develop, and realise critical hardware and application software that would have wide applications across industries

### Business Environment

With the Government of India initiating substantive policy reforms in the past years and allocating higher budgets for indigenous defence acquisition, the macro picture has improved for this sector. In FY 2023-24, Acceptance of Necessity (AoNs), which would trigger capital acquisition worth ~ ₹ 3.6 trillion, has been accorded, of which greater than 80% of this acquisition will be from Indian industries.

The defence supply chain ecosystem continues to witness challenges on account of geopolitical dynamics. The prevailing wars and increased NATO spending have caused the overloading of global OEM capacities, mainly in the European region. The volatile geopolitical situation has also provided a new perspective on the impact of emerging and disruptive technologies and their deployment in combat. However, in this segment, the company has developed a robust and resilient supply chain over the years, with self-reliance as the primary focus and in-house design capabilities. The business is also constantly developing and diversifying its supply chain with an emphasis on indigenisation to assure autonomy to the Indian Armed Forces.

On the Aerospace front, the opening of the sector in 2020 and the Indian Space Policy 2023 provide opportunities to the private sector for participation in end-to-end space





### *L&T's AMOGH - Autonomous Underwater Vehicle for surveillance*

activities, from building launch vehicles and satellites to downstream space data collection and dissemination. The launch services segment is also emerging as a business opportunity for the Indian Industry with the potential transfer of technology of ISRO's Small Satellite Launch Vehicle, which the company targets to operationalise on the back of industrialising the production of Polar Satellite Launch Vehicle (PSLV) for which the Company has teamed-up with Hindustan Aeronautics through a consortium. The launch of the first industry-built PSLV is expected in calendar year 2024. Today, the business is involved in the assembly and integration of launch vehicles for ISRO to build in-house capability to position and eventually begin to offer 'Launch on Demand' services as a business model.

## Major Achievements

During the year, the business has achieved multiple successes, uniquely reaffirming L&T's positioning as a 'nation-builder' through a series of Make-in-India programmes. These include:

- A breakthrough in securing a contract from MoD - IAF for High Power Radars (HPR) that would provide long-range threat detection capabilities for the Air Force
  - The signing of a previously negotiated contract for the supply of indigenously developed Close-in Weapon Systems (CIWS) to the Indian Air Force, which provides the last layer of air defence to vital assets and vital points across the country
  - Unveiling India's first light tank developed indigenously with DRDO at its Armoured System Complex in an unprecedented time frame of 18 months
- Award of a supply order to develop and trial evaluate Tactical Communication System to serve as a mobile communication backbone for the Indian Army under a 70% Government Funded Make-I scheme
- Develop and realise Air Independent Propulsion (AIP) energy modules for retro-fitment in the Indian Navy's Project P75 Kalvari class diesel-electric submarines
- Accord of Technical Evaluation Clearance for the bid for Indian Navy's Project P75-I for the acquisition of 6 diesel-electric submarines with AIP under the strategic partnership model, in association with Navantia of Spain
- Delivering mission-critical flight hardware for ISRO's Chandrayaan-3, Aditya-L1 Mission, and Human Spaceflight Gaganyaan Programme
- New benchmarks were established by all work centres in terms of accelerated realisation of systems and equipment (serial production category) by deploying Industry 4.0 techniques. Noteworthy ones include the supply of the first lot of Modular Bridging Systems in record time from bulk production clearance and the supply of Large Survey Vessels to Garden Research Shipbuilders & Engineers Ltd. (GRSE) from Kattuppalli Shipyard
- The Kattupalli Shipyard created history by signing a Master Ship Repair Agreement with the US Navy and undertaking repairs of two US Military Sealift Command. It also enhanced the longstanding collaboration between the UK and India in the maritime domain by undertaking and supporting the maintenance of two Royal Fleet Auxiliary ships
- Conduct extensive development and validation trials of Autonomous Underwater Systems



*Courtesy ISRO*

*L&T has provided critical subsystems for most of India's space missions*

- Successful development and validation trials of medium- and high-speed unmanned aerial targets. This effort was also awarded the Society of Indian Defence Manufacturers (SIDM) Championship Award 2023 for import substitution
- Award of Green Channel Certificates for multiple land and marine systems and platforms by Quality Assurance agencies of the Indian MoD, based on the demonstrated levels of quality along with mature processes of quality assurance during the execution of major orders

## Significant Initiatives

R&D and innovation have been the backbone of the Precision Engineering and Systems business since its inception, and the business continues to invest in R&D to develop technologies and products. Various R&D initiatives in the development of high-precision sensors, directed energy beam combiners, unmanned and autonomous system technologies, and the deployment of AI-based solutions have been undertaken during the year.

The business has established its proficiency by leveraging Industry 4.0 practices across its operations. Focussed digital initiatives have accelerated productivity and business excellence.

While providing a safe working environment for men and materials, the business continues to focus on the triple bottom line, viz. Social, Environmental and Financial, as well as green initiatives. It has achieved a significant y-o-y reduction in water and energy consumption at its campuses, in line with L&T's sustainability focus and carbon & water neutrality targets.

## Outlook

The capital acquisition budget for Defence witnessed a moderate increase of ~5% y-o-y in the interim budget for FY 2024-25, resulting in an overall budget of ₹ 1.72 trillion, mainly for aircraft & aero engines, army vehicles, and naval fleet. The same is expected to be reset with the historical long-term average growth of 11-12% in the regular budget expected in July 2024. The budget for the FY 2024-25 has also proposed setting up a ₹ 1 trillion corpus fund in line with the country's aspiration to develop capabilities in the deep tech sector.

The indigenous defence production crossed ₹ 1 trillion in FY 2022-23. Additionally, the Government has set an ambitious target of ₹ 3 trillion of domestic production with ₹ 50,000 crore defence exports by FY 2028-29, coupled with over 150 programmes having been identified for acquisition under the 'Make' route of DAP 2020, which focusses on indigenous design, development and manufacturing, is all expected to gather steam over the next five years for the procurement of systems/platforms for domestic use with the government also facilitating exports of these products.

The business is well poised to leverage the Government's thrust on 'Aatmanirbharta' to gain strategic autonomy through domestic production and win new opportunities in shipbuilding, artillery equipment, combat engineering equipment, and long-range communication equipment in India as well as select regional markets.

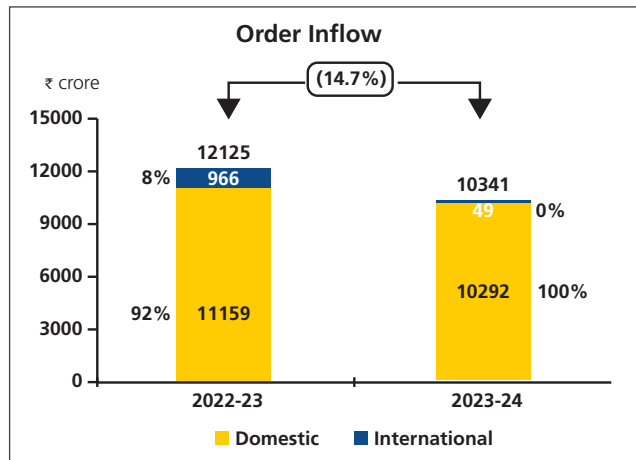
The Indian space sector is fast emerging as a sunshine sector and promises to see tremendous growth in the coming times. The business has been a trusted industry



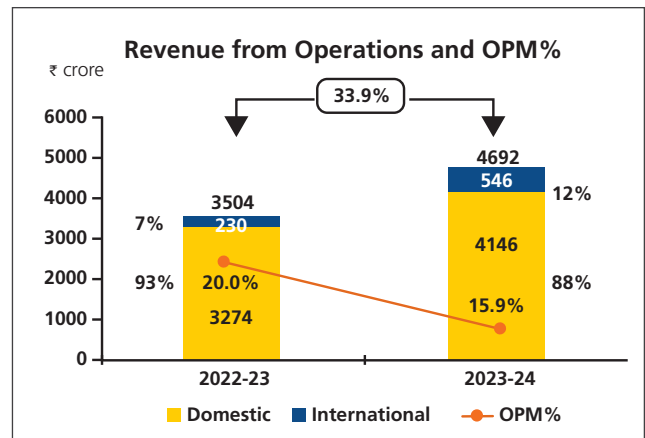
**Launch Tracking C&S Band Radar**

partner to ISRO and has contributed to the indigenous capability of the Indian space sector for over five decades. The reforms announced in the space sector will enable private sector companies – like L&T, to take on the complete manufacture and integration of launch vehicles as well as satellite bus manufacturing and provide associated services.

**Financial performance of the business**



The Precision Engineering & Systems business recorded an order inflow of ₹ 10,341 crore, registering a decline of 14.7% y-o-y, mainly due to the deferment of a few orders and due to a higher base. During the year, the business secured a large value order from the Ministry of Defence. No major international orders were received during the year.



Benefitting from a higher opening order book, the Precision Engineering & Systems business earned revenue of ₹ 4,692 crore during FY 2023-24, higher by 33.9% compared to the previous year. The share of international revenues increased to 12% from 7% in the previous year with the ramp-up in the execution of export orders.

The operating margin declined to 15.9% from 20.0% in the previous year, largely reflecting the stage of execution and job mix.