

# HI-TECH MANUFACTURING SEGMENT

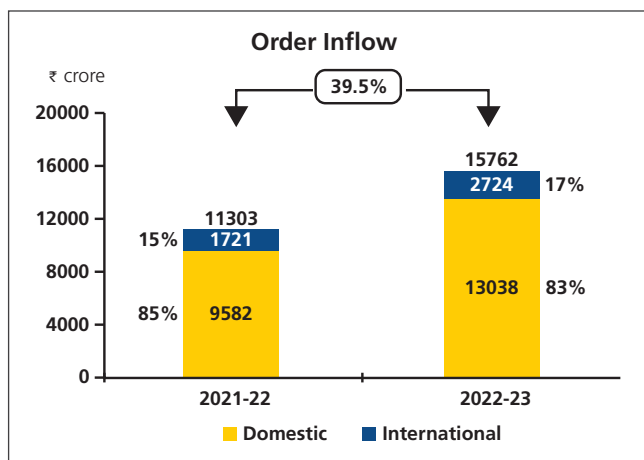


*Vinyl Acetate Monomer Reactor for China*

## The Hi-Tech Manufacturing segment comprises:

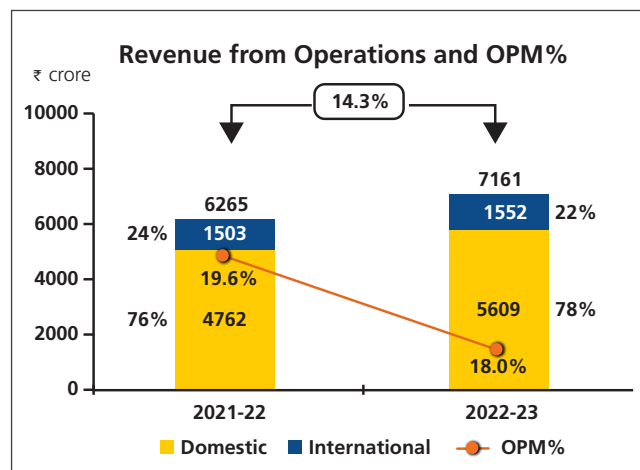
- (a) Heavy Engineering Business
- (b) Defence Engineering Business

## Financial performance of the segment



The Hi-Tech Manufacturing segment achieved order inflows of ₹ 15,762 crore during FY 2022-23, registering a growth

of 39.5% over the previous year, mainly on account of higher domestic orders in the Defence business. The share of international orders increased to 17% from 15% in FY 2021-22.



The Hi-Tech Manufacturing segment achieved revenue of ₹ 7,161 crore for the year, registering a growth of 14.3% y-o-y, due to a pick-up in execution momentum mainly in the Heavy Engineering business. The Defence Engineering



*FCCU Package being manufactured onsite at Refinery in Barmer, Rajasthan*

business' revenue registered marginal growth over the previous year as the existing jobs in the portfolio are in their early stages of execution. The share of international revenue in FY 2022-23 was 22% of the total revenue of the segment as compared to 24% in the previous year.

The segment's operating margin declined to 18.0% from 19.6%, mainly due to execution delays revolving around supply chain issues and a change of job mix in the portfolio.

Funds employed by the segment as at March 31, 2023, at ₹ 2,651 crore declined over the corresponding figure on March 31, 2022, by 1.8%, mainly due to higher customer advances on receipt of large orders in the Defence business. The Heavy Engineering business was however impacted due to client fund constraints and logistics challenges, resulting in a build-up in contract assets on non-achievement of billing milestones.

## Heavy Engineering Business

### Overview

L&T's Heavy Engineering business is a global leader in the manufacturing of Engineered-to-Order equipment 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 and fabrication complex. The acclaimed in-house engineering capability has been built around a highly talented team adopting the latest technology and 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 the Industry 4.0 methodology 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 Acrylic Acid Reactor System, Ammonia & Urea Plant Exchangers, High-Pressure Heat Exchangers, Methanol Converters, Propylene (PO) Reactors, Vinyl Acetate Monomer (VAM) Reactors and Fired-tube Waste Heat Boilers.



*Steam Drums for PKN Orlen Olefins Expansion Project, Poland*

The **Process Plant Internals** (PPI) PBU specialises in proprietary process plant internals for Reactors and Ammonia Converter baskets. A large variety of critical internals for advanced refining processes are manufactured using materials like Stainless Steel, Duplex / Super Duplex Stainless Steel, Inconel, Monel, Hastelloy, Titanium, etc.

The **Modification, Revamp and Upgrade** (MRU) PBU offers value-added end-to-end solutions for FCC 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 and emergency repairs for the process plant industry.

The **Nuclear** PBU specialises in key equipment for steam supply systems for 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. It supplies critical components for Fusion Reactors (ITER), Fast Breeder Reactors, Casks/Canisters for handling spent fuel and critical equipment for strategic programmes.

The **Special Fabrication Unit** (SFU) fabricates critical Titanium Piping Spools, complex internals for Gasification Plants, Loop Reactors and Primary Quench Exchangers (PQE) for the petrochemicals sector.

The **Forge Shop** business also has one of the world's largest Forge shops. L&T Special Steels and Heavy Forgings Private Limited (LTSSHF), a joint venture with Nuclear Power Corporation of India Limited. LTSSHF meets the critical custom-made heavy forging requirements of sectors like Nuclear and Hydrocarbon.

## Business Environment

The FY 2022-23 began with the Russia-Ukraine war and its after-effects on supply chains and logistics, cancellation of orders and high commodity prices. The business continued to thrive despite the above challenges.

The business does face foreign competition in domestic projects. To have a level playing field, the business is proactively working through industry associations to influence concerned ministries to mitigate the risks associated with the inconsistencies in the implementation of public procurement under *Atmanirbhar Bharat* and to ease / simplify certain processes applicable under Quality Control Order (QCO).

The business has observed a surge in demand for Renewable Diesel and Bio Diesel plants (which are more eco-friendly). Enforcement of clean fuel standards – Renewable Energy Directive (RED) II, Renewable Fuel Standard (RFS) and Low Carbon Fuel Standard (LCFS) in developed countries, is





*OHCU Reactor for IOCL Barauni BR-9 Expansion Project, Bihar*

providing sustainable growth in demand in this sector. Oil-to-Chemicals provide additional growth momentum in the mid to long term in the petrochemicals sector (especially in Asia) and LNG sector (especially in the USA and the Middle East). Globally, momentum is witnessed in Blue and Green Ammonia projects in the fertiliser sector.

On the domestic front, the Government has approved multiple mega projects in the refinery and petrochemicals sector. Traction is also being seen in large-scale private projects, viz., Oil-to-Chemicals and Solar Photovoltaic (Giga factories).

The Modification, Revamp and Upgrade (MRU) business, identified as a Lakshya 2026 growth initiative, has taken off well, both in India and in the GCC countries. Increasingly, clients are opting for revamps and upgrades and deferring greenfield investment projects. This business has entered into energy efficiency enhancement projects in the domestic fertiliser sector, which will unlock further business potential.

Nuclear power has garnered support in view of climate change and pressure on all nations to achieve 'Net Zero' emission targets. NITI Aayog and the Department of Atomic Energy (DAE) is exploring the possibility of replacing / retiring Thermal Power plants with Small Modular Reactors. Anushakti Vidhyut Nigam Limited (ASHVINI), a JV between NTPC and NPCIL will focus on the fast-track construction of 6 X 700 MWe Pressurised Heavy Water Reactor (PHWRs).

The business is targeting Special Projects like Laser Interferometer Gravitational-Wave Observatory (LIGO) and Medical Isotope Reactor. The good track record in the Fusion Reactor project (ITER) has opened further business opportunities from ITER Organization.

## Major Achievements

On the international front, the business has won multiple marquee orders, viz., the World's Largest Coke Drum and Breech Lock High-Pressure Heat Exchanger; Heaviest Chromium Molybdenum Vanadium steel (CrMoV) reactors from Pemex, Mexico; 1<sup>st</sup> breakthrough order for the Blue Ammonia project from Air Products; World's Largest Ethylene Oxide (EO) reactor order for BASF, Germany; World's Largest Ammonia Converter for OCI Beaumont and KBR; and Renewable Diesel reactors for Shell, Singapore. During the year, the business supplied critical equipment to new markets like Israel and Egypt.

In the domestic sector, the business continued its dominance in Urea Reactors by securing its 12<sup>th</sup> Urea Reactor order. Vertical Plate Coke Drums and Loop Reactors were breakthrough orders secured during the year, with large business potential.

The MRU business secured the largest domestic order for GSFC Urea Revamp Project which is expected to unlock opportunities for energy efficiency projects in the domestic fertiliser sector.



*Zirconium heat exchanger for PTA Project, Turkey*

The Nuclear business is on track to create new benchmarks in the fleet orders of Steam Generators and End-shields. It also successfully secured the ISO 19443 certification (first time by any company in India). The Special Fabrication Unit (SFU) moved up the value chain by delivering complex Air Steam Rings for HRRL, manufacturing Seismic Stoppers for the National High-Speed Rail Corporation Limited (NHSRCL) and Loop Reactors for an IOCL project (all the equipments have been manufactured for the first time in India).

LTSSHF has successfully delivered forgings for Steam Generator and stainless-steel plates for the End-shield for the NPCIL fleet orders. In the Hydrocarbon sector, the Company has received orders for the supply of shells for IOCL and Singha refinery, Singapore.

## Significant Initiatives

The business is embarking on an end-to-end digital transformation programme, viz., iRUDRA, which aims at creating a digital thread across the entire business value chain, with one set of unified data. All standalone systems will be seamlessly connected through a Data Lake which will enable strong analytics and provide insights for real-time, critical managerial decisions. Initiatives like Design and Estimation Automation will drastically improve office productivity and the accuracy of design and estimates through analytics. Real-time visibility of project progress and cost control alongside scenario analysis facilitates better project monitoring.

The acceleration of automation initiatives, as below, contributed to significant improvement in productivity:

- ▣ Smart Wireless Bot for Non-Destructive Examination (NDE) and Surface Roughness Measurement
- ▣ Auto-evaluation of Time-of-Flight Diffraction (TOFD) and Phased Array Ultrasonic Testing (PAUT) in non-destructive testing
- ▣ Drone-based Remote Refractory Inspection and Assessment
- ▣ Digital Factory Twin

Improving competitiveness for products like Renewable Diesel Reactor, HP Screw Plug Heat Exchangers and Heavy Columns and Vessels has been identified as a major initiative to increase market share.

LTSSHF focused on mastering manufacturing technology and achieved one of the lowest (2%) rejection rates for the Nuclear and Hydrocarbon sectors across the globe.

## Outlook

Despite geopolitical uncertainties, the Indian economy is expected to report healthy growth in FY 2023-24. On the domestic front, the business expects launch of new projects in coal gasification, petrochemical industries, and Giga factories for Solar Photovoltaic (PV). The MRU business expects a sustained increased demand and getting a stronger foothold in the GCC region.



*Reactor Shell forgings from LTSSHF for Indian refinery*

In the international segment, it is expected that the uptrend of investment in renewable diesel projects, petrochemical and LNG sectors is likely to continue. The business also expects a similar positive momentum of opportunities in Renewable Fuel / Petrochemical projects in the USA and Southeast Asia, LNG projects in the USA and the Middle East and Fertiliser projects in Australia, the USA and the Middle East.

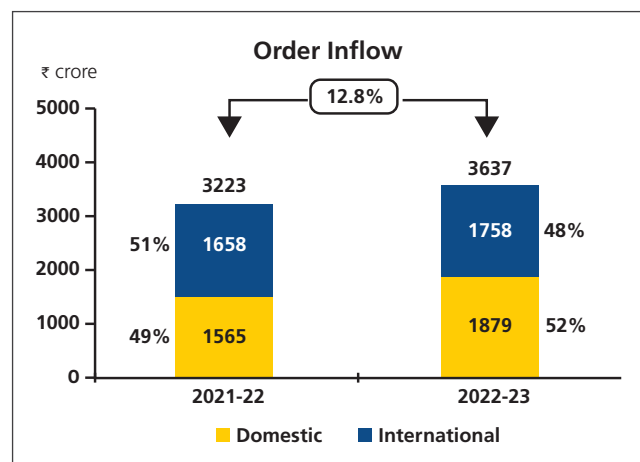
The Nuclear business is pursuing opportunities in Small Modular Reactor (SMR) technology development and proof of concept initiatives with NPCIL and NTPC. The Government's localisation push for the Kundankulam Nuclear Plant project is expected to generate additional business opportunities. Mega science projects from ITER and the Department of Atomic Energy (DAE) are closely tracked by the business. The foreign technology programme continues to progress at a slower pace on account of a lack of commercial viability. Fleet Order procurement for the strategic sector is also expected in the next 2 to 3 years, and the Nuclear business is well poised to tap this opportunity.

The demand for heavy forgings is largely dependent on the outlook of the Nuclear, Defence, Hydrocarbon, Thermal and Hydropower industry segments. LTSSHF is currently the only certified indigenous producer of large and heavy critical forgings and thick plates.

The business remains positive in its outlook for order prospects. However, in view of the recent geopolitical situation, commodity price escalations have created cost pressures on the contracts under execution. Digital and

organisational excellence initiatives are expected to result in improved productivity and higher value creation in the medium to long term.

### Financial performance of the business



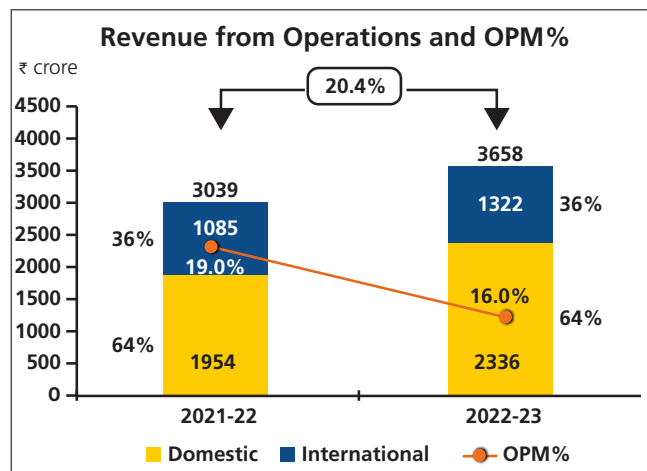
The Heavy Engineering business recorded an order inflow of ₹ 3,637 crore for the year ending March 31, 2023, higher by 12.8% as compared to the previous year, mainly due to receipt of orders from the Fertilisers & Petrochemicals business. The share of international orders decreased to 48% from 51% in the previous year.





*Visual for representational purpose only*

*L&T executed critical portions of India's first nuclear-powered submarine*



The Heavy Engineering business revenue of ₹ 3,658 crore reflected a strong growth over ₹ 3,039 crore of the previous year, with higher execution of orders in the Refinery sector. The share of revenue from international operations has remained steady at 36% in FY 2022-23.

The operating margin of the business declined from 19.0% to 16.0%, mainly due to time and cost overruns. Execution delays due to supply chain issues, challenges around logistics and additional cost provisions in an international project resulted in a lower margin during the year.

## Defence Engineering Business

### Overview

L&T entered the Defence sector in the mid-80s as a part of the Company's strategic focus on building a strong and self-reliant India by leveraging its precision engineering capabilities. This was well ahead of the opening up of the sector for private industry participation in 2001. During the preceding one and a half decades, L&T has been associated with the Defence Research & Development Organisation (DRDO), while concurrently contributing to the Indian Navy's 'A Builders Navy' aspiration, by enabling in-country value addition.

Having built a portfolio of products, systems, platforms and solutions, and correspondingly a basket of technologies, the business provides concept-to-design-to-delivery wide-ranging, solutions across chosen defence segments with a focus on indigenous design and emphasis on creating Indian Intellectual Property (IP). The portfolio includes the development and production of naval (submarines, underwater platforms and warships) and land platforms (armoured systems, howitzers, air defence guns), engineering systems for such platforms, weapon delivery systems with fire control solutions, radar systems & sensors, sub-systems for missile and space launch vehicles and avionic products.

The business is headquartered in Powai, Mumbai and its operations extend across India, and include two R&D



Courtesy ISRO

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

centres, three Design & Engineering Centres and dedicated production centres:

- ▣ Armoured Systems Complex for manufacturing, integration and testing of armoured and allied platforms and an Underwater Platform Hull Manufacturing facility at L&T's A. M. Naik Heavy Engineering Complex at Hazira (near Surat)
- ▣ Shipyard at Kattupalli (near Chennai)
- ▣ Strategic Systems Complex for weapon, sensor and engineering systems at Talegaon (near Pune)
- ▣ Precision Manufacturing & Systems Complex for manufacturing aerospace and missile subsystems, 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, a Design and Engineering Centre for Weapon, Sensors and Engineering Equipment at Powai and Talegaon and Design and Engineering Centres for Submarines and Warships at Powai and Chennai.

### **The business is structured into two Strategic Business Groups (SBGs):**

- ▣ Defence & Aerospace
- ▣ Defence Shipbuilding

#### **Defence & Aerospace**

Since its inception, the Defence and Aerospace (D&A) business has built a portfolio of wide-ranging indigenously

designed and developed products, systems, solutions, platforms and technologies. The business has indigenously developed more than 250 defence systems and products and more than 50 of them have 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, mature and equated partnerships with global majors, as well as with the Indian Defence industry, both in the Government and in private segments. Besides the supplies, the business offerings also include providing support during installation, commissioning, field evaluation trials and through-life support, which includes obsolescence management. These initiatives enable the business to maintain its market leadership position in the private sector, which augurs well, given the Government's push for higher indigenisation through *Atmanirbhar Bharat Abhiyan* and the Government's support for exports in the Defence segment. The business also has a joint venture with MBDA, a global leader in missiles and missile systems.

#### **Defence Shipbuilding**

The Defence Shipbuilding business offers end-to-end solutions for the design, construction of defence ships and refit services. The business owns and operates a greenfield mega defence shipyard at Kattupalli, near Chennai, located across a sprawling 980-acre complex. The Kattupalli Shipyard is India's largest shipyard, with the first phase spread, across 150 acres, being operational for more than a decade. The design and construction of the yard is modelled to adopt global best practices, such as modular construction, construction under





*Offshore Patrol Vessel*

covered shops, use of a ship-lift with dry and wet berths, etc., These practices enable simultaneous construction of different classes of vessels until near completion on land and subsequently launching them through the ship-lift. It is the only Indian shipyard with Industry 4.0 practices, thereby enhancing construction efficiency, cycle time and consistent build quality.

A dedicated Warship Design Competency Centre in Chennai is equipped with the latest integrated 3D design, analysis and product lifecycle management tools that are interfaced with project management and ERP systems, in line with global best practices.

The Kattupalli Shipyard has been largely engaged in new builds and refits / repairs of defence ships of the Indian Navy and Indian Coast Guard. Since its inception, the yard has built and delivered 85 ships of various types ranging from Fast Patrol Boats to Heavy Lift Vessels. The majority of these ships have been designed in-house in the Warship Design Competency Centre. The business has also delivered Interceptor Boats, Offshore Patrol Vessels (OPVs) for the Coast Guard and high-speed Border Guard Boats for a friendly foreign nation, ahead of schedule. The capability of the business to achieve on-time or ahead of contractual delivery performance in all the contracts for defence vessels is unique in the Indian shipbuilding industry. A significant benchmark was attained by the shipyard in delivering the 2,130 MT class OPV and completing the entire acceptance trials in its maiden sea sortie of the vessel to affirm the design and build quality in record time. The shipyard has undertaken refits and repairs of

over 100 defence and commercial vessels for both Indian and foreign customers.

L&T's participation in the Defence Sector stems from its ethos of being a Builder to the Indian Nation. Various sustainability risk standards for defence also recognise the right of countries to defend themselves and the need to develop and produce defence related products to fulfil security, peacekeeping and humanitarian needs. It may be noted that India 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, 2023) that is enshrined in the commitments of the Cabinet Committee on Security's (CCS), and 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 this business, 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.***



*K9 Vajra-T at Republic Day Parade rehearsal, New Delhi*

## Business Environment

With the Government of India initiating substantive policy reforms in the past three years and allocating higher budgets for indigenous acquisition, the macro picture has improved for the Defence business. In FY 2022-23 Acceptance of Necessity (AoNs) for capital acquisition worth ~ ₹ 2.7 trillion has been accorded, of which 99% of the procurement will be from Indian industries.

The supply chain ecosystem continues to witness a few challenges on account of the geopolitical dynamics around the world. However, the business has developed a robust and resilient supply chain over the years with self-reliance as the primary focus. The ongoing geopolitical situation has also provided a renewed perspective on kinetic and non-kinetic modes of wars and the impact of emerging and disruptive technologies and their usage.

The corporatisation of the Indian Ordnance Factory Boards (OFB) has unlocked the potential of the factories and is expected to enhance the efficiency of defence production within the country and rationalise available capacity and infrastructure.

On the Aerospace front, the Government has approved the Indian Space Policy 2023, which outlines the roles and responsibilities of ISRO, space sector PSU - New Space India Limited (NSIL) and Indian National Space Promotion & Authorisation Centre (INSPACe). The policy also opens up the sector for private participation in end-to-end space activities from building and launching launch vehicles

and satellites to downstream space data collection and dissemination. INSPACe will play the role of Regulator and the Promoter / Facilitator and single-window hand-holder to Non-Government Organisations entering the space sector. The business has witnessed traction through orders being placed by the NSIL for the building of PSLV launch vehicles.

## 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:

- ▣ Successful delivery of multiple land and naval weapon launch systems and engineering systems to the Indian Armed forces
- ▣ New benchmarks established by work centres in terms of accelerated realisation of systems and equipment (serial production category). Noteworthy ones include the supply of Large Survey Vessels to GRSE from Kattuppalli Shipyard, the supply of Naval Weapon Launch systems from SSC Talegaon, and Space Launch Vehicle Hardware (PSLV & GSLV) from PMSC Coimbatore
- ▣ The Kattuppalli Shipyard has created history by becoming the first Indian Shipyard to carry out repair works of United States Navy ships, i.e., USNS Charles Drew and USNS Matthew Perry
- ▣ The R&D and Design & Engineering teams continued their focus on emerging technologies to develop a range of



*Modular Bridging System*

products and solutions that are intended to future-proof the business. Unmanned systems solutions were developed and validated across four domains (Underwater, Surface Warfare for naval, land and air domains).

## Significant Initiatives

Evolving through collaboration, the business has identified and signed MoUs / agreements with strategic partners to enhance business opportunities, both in domestic and international markets. R&D and innovation have been the backbone of the defence business since its inception and the business continues to invest in R&D to develop technologies and products.

The business has established its proficiency by leveraging Industry 4.0 across multiple R&D, Design & Engineering Centres and Production Work Centres that extend from equipment and systems to the building of complete platforms, such as warships, submarines and armoured systems.

Focused digital initiatives have led to accelerated productivity and achieved business excellence by means of meeting key deadlines, the evolution of innovative technologies and processes that could adapt to provide through life support, training, digital quality assurance and control, trial evaluation and acceptance.

The business continues to focus on the triple bottom line and green initiatives. It has achieved a significant y-o-y reduction in water and energy consumption, in line with L&T's sustainability focus, carbon and water neutrality targets. The facilities continue to excel in the utilisation of green energy in operations.

## Outlook

In a volatile geopolitical backdrop, most countries across the world are expected to step up defence spending. In India, the experiences that have taken place at the borders over the recent years have catalysed the innovative adaptation of existing weapons / platforms for high-altitude operations as well as the development of indigenous weapons / platforms to meet the adverse environmental conditions and build force multipliers. This has brought about a renewed focus on the expeditious completion of trials of systems and their accelerated deployment.

While the Defence Capital Acquisition budget witnessed a moderate increase (~7% y-o-y) in the budget year FY 2023-24 over the previous financial year, the allocation for procurement from domestic industry has been enhanced from 68% to 75% of the total capital procurement budget, thereby resulting in a potential scaling up of domestic capital spend from ₹ 84,600 crore in FY 2022-23 to ₹ 100,000 crore in FY 2023-24. The Government has provided a major impetus for defence exports, with targeted exports of USD 5 billion in FY 2025-26.

The Defence Production Policy is being recast into a draft Defence Production and Export Promotion Policy (DPEPP), which is under consideration for implementation. The DPEPP has laid emphasis on building a robust defence industry with the inclusion of the private sector on a level playing field basis. Over 150 programmes have been identified for acquisition under the 'Make' route of DAP 2020 which focuses on indigenous design, development and realisation through Indian sources. Contracts worth ₹ 500,000 crore are expected to be placed on Indian industry within the next five years for the procurement of systems / platforms covered in the indigenisation lists.

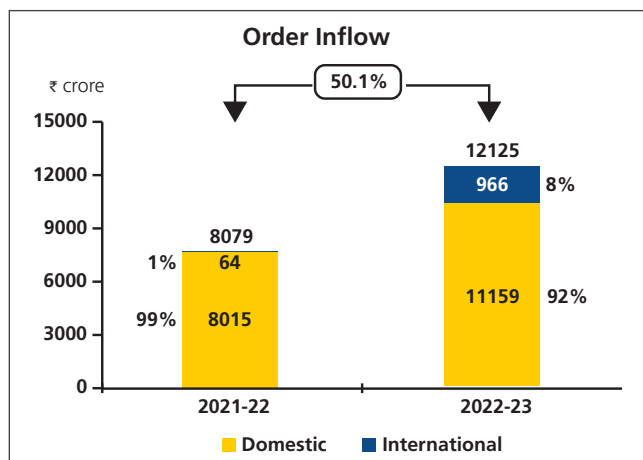




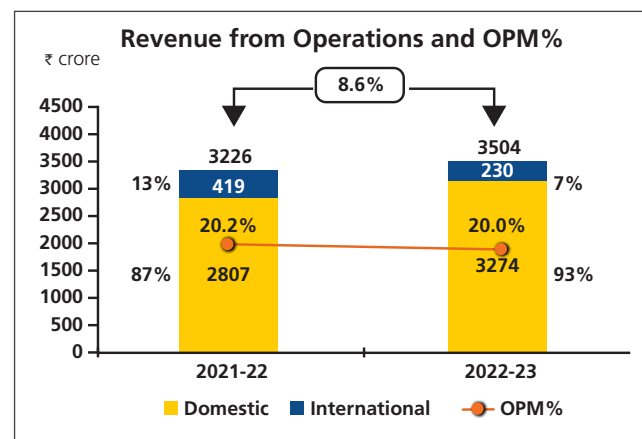
*Pinaka Multiple Rocket Launch System*

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

### Financial performance of the business



The Defence Engineering business recorded substantial growth of 50.1% y-o-y in order inflow by bagging some large value domestic orders aggregating to ₹ 12,125 crore, compared to ₹ 8,079 crore in the previous year.



Benefitting from a higher opening Order Book, the Defence Engineering business earned revenue of ₹ 3,504 crore, higher by 8.6% compared to the previous year. The share of international revenues decreased to 7% from 13% in the previous year with the tapering of an international order in shipbuilding.

The operating margin remains stable at 20.0% compared to 20.2% in the previous year.