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Introduction

Kautilya, in Arthashastra, has stated that “*The king, the minister, the country, the fort, the treasury, the army, and the friend are the elements of a sovereign state, in this, a prosperous treasury and a strong army bring strength to the sovereignty*”. A strong army, besides the personnel, needs a constant supply of good quality weapons, war like equipment to be able to keep the state safe and secure. Defence production is thus intrinsically linked to the safety and security of a nation, and since ancient times, India has had a civilisational continuity in demonstrating technological ingenuity in metallurgy, war machines and an organised military industrial system. Medieval India saw mastery in Ship Building, advanced steel production and rocketry, with Indian raw material for gunpowder reaching as far as the shores of North America. This paper brings about the core of defence production in India from the Ancient times till today. For those interested in history, it will expand the knowledge of how India’s defence production fared through different times, while for those who are interested in the resurgence of the Indian defence industry, it will open eyes to what is happening in the current era that will shape India’s future. This paper, in essence, tries to situate defence production as a historical legacy and a strategic imperative for modern India.

Ancient India

- Proto-Industrial Scale of the Indus Valley Civilisation. In India, the epic Mahabharata tells us of supernatural weapons with destructive properties very similar to the contemporary nuclear ones. However, the earliest evidence of organised production of defence equipment comes from the Indus Valley Civilisation (c. 2500 BCE). It was “Proto-Industrial Scale Production”, i.e. through decentralised cottage industries, rather than factories. Horse drawn Chariots, Swords, Spear Heads, Helmets, etc found at Sinauli (c. 2000–1800 BCE), in Western Uttar Pradesh point towards structured mechanised armed forces.¹ Metallurgy was also improving, with weapons made from copper, then bronze and post 1500 BCE more lethal and durable from iron, showing a technological shift towards improvement. Ground work was being done for forging, casting, and heat treatment techniques that would later be developed for more brilliant metallurgical advances.
- Centralised Defence Production in the Mauryan Era. During the Mauryan era (c. 322–185 BCE), defence production became more centralised. Book II of the famous Arthashastra of Kautilya gives us the roles of the superintendents of metal, forest produce, armoury, chariots, etc. Collectively these appointments-maintained ownership of mines and metal resources, regulated weapon manufacturing, ensured quality control, and managed arsenals and stockpiles for wartime readiness. Each person’s responsibilities are meticulously stated in book, bringing out how the overall defence production was maintained as per the kingdom’s needs, with overall state control.² Ancient India also saw use of numerous mechanical war devices (Yantras) as Development of War Machines and Siege Technology such as Catapults and Ballista like Machines and other defensive fortification tools, showing knowledge of Mechanics and Engineering Principles.³

Medieval India

Technological Innovations in Medieval Indian Warfare

- The First Indian Blue Water Navy. The most interesting development was of the Naval Industry under the Cholas. With their immense navy, they were able to

project their power across Southeast Asia and control the waters for trade and commerce. The Chola navy comprised not of war ships, but merchant ships adapted for warfare, there was a naval industry which used intricate wooden designs to develop ships of varying categories, from small coastal sloops to large ocean-going warships. These would often sail over hundreds of nautical miles for commerce or conflict. The ships were uniquely made with keels of teak, planks stitched with strong coir fibres, caulked and made waterproof using tree resin and oils. These made the ships flexible instead of rigid making them absorb the impact of strong ocean waves and shallow coral. The Chola raids on South East Asia are studied even today, specially the 1025 CE raid on Srivijaya Empire, in which the Chola Navy under Rajendra Chola-I, sailed across the Bay of Bengal. It traversed over 4000 nautical miles, through the Sunda Strait striking at the capital city of Palembang capturing King Sangrama Vijayottunggavarman of Srivijaya Indonesian Empire and returning victorious after many battles, through the Malacca Strait.⁴

- Metallurgical Mastery. Interesting Indian weapons like the Katar, an “H” grip punch dagger from 14th Century South India, and the Pata Gauntlet Sword were revolutionary in design and superior in metallurgy. The Wootz Steel, a high-carbon crucible steel from 3 BCE South India Tamil lands, was valued more than gold by many kingdoms and was traded to West Asia (Middle East) to be forged into the famous “Damascus Swords”.⁵ Another example is the Sinc Distillation process of 6 CE in the famous Jawar Mines of Rajasthan. Sinc was then used to make alloys like Brass for utensils, coins and weapon fittings and in Ayurvedic medicines. Who can forget the famous Gupta era Iron pillar of Delhi, which has stood out in the open for over 1600 years without any rust.⁶ Indian Metallurgy had matured centuries before other regions of the world started their own processes.
- Superior Gun Smithy. Indian gun smiths starting with the Mughals used Forge Welding Technique to make guns of all sizes, these were generally superior to the European Cast Iron ones of that era. Mastering composite construction of guns using precision tooling many portable artillery pieces were available with

the Mughals. An interesting piece of equipment of that era, “Yarghu”, was a 16-Gun Barrel cleaning equipment using bullock power that shows the engineering expertise available in those times.⁷ In the South, the Bahmani and Bijapur States were adopting Turkish systems and developed the Trunnions System with cylindrical pivots for vertical aiming and Swivel Mechanisms for 180 ° horizontal movement.⁸ Hyder Ali and Tipu Sultan, in the late 18th century, would introduce to the British in battles their famous and the world’s first, iron-cased Mysorean Rockets with a range of 2 Km, captured and studied by the British later.⁹ In the North, Maharaja Ranjit Singh had consolidated the Sikhs into one powerful empire which was self-sufficient in all its weapons needs. Trained by Europeans, his artillery arm was horse drawn and over 100 gun strong; his state arsenals in Lahore mass-produced matchlocks, mortars, and horse-drawn high-mobility heavy cannons, patterned on the East India Company Army.¹⁰

Specialised Artisan Communities and the Gunpowder Trade from India

- **Metalworking Communities.** The Agaria community in Central and East India and the Asur tribe spread over Bihar, Odisha and Karnataka were known for Iron Smelting.^{11,12} The iron from these artisans was worked upon by the Lohars (Blacksmiths) who had mastered the art of treating iron through various methods to make weapons, agriculture implements and defensive equipment. Spread all over India, these artisans were invaluable to rulers and kings, they were deeply interlinked to the development of metallurgy, as suggested by their name “Lohar”, taken from the word “Loha”, which means iron. An offshoot of the Lohars was the Gadia Lohars of Mewar Rajasthan, a wandering people who lived in Bullock Carts and moved from place to place with their Workshops, depending on where their services were required.¹³ Perumkollan community of South India (Perum means great and Kollan means smith), or the great blacksmiths supplied Iron based weapons to South India. The Sikligars were the weapon fabricators for the Sikhs, originally Rajputs who moved to Punjab, joined the Sikh faith and provided metal working talent to the Sikh Empire. In the East, the Ahoms had exceptional gunsmiths and an appointed officer, “the Kharghariya Baura”, whose task was to administer the firearms department and ensure the readiness of guns and gunpowder for the Ahom Army.¹⁴

- Gunpowder India and the Lubana Banjara Sikhs. Saltpetre (potassium nitrate) is an indispensable ingredient in making Gunpowder, while European countries had tried to make saltpetre from animal urine, the quality was poor and the capacities were too low. India and predominantly Bihar became the major saltpetre producing “powder chamber”, area of the world, by extraction through nitrate rich soil. The entire saltpetre trade of India to rest of the world was controlled by the “Lubana Banjara Sikhs”.¹⁵ Their network connected saltpetre manufacturing locations in Bihar to Kingdoms in India, Ottoman Empire and Europe and they were known to be fair, denying the saltpetre to none. After the battle of Plassey in 1757 and concluding with the Anglo Sikh Wars, the entire system was taken over by the British, who then monopolised saltpetre and gunpowder production, favouring some and excluding others, till large quantities was found in South America. It is interesting to note that Indian Saltpetre was also sought by both the Confederate and Union armies during the American Civil War (1861 – 1865).¹⁶

Colonial Transformation of India’s Defence Industry

- Decline under British Rule. The artisan communities dealing with metalwork, gunpowder, and weaponry in medieval India were extremely specialised, often hereditary, and essential to the military and economic stability of the Indian states. However, the Indian artisan communities with skills to produce war equipment declined under the British rule. In a systematic manner, which followed a pattern where the artisans would first lose patronage of the local kings, followed by monopolisation by British trade and lastly suppression of indigenous manufacture and innovation through rules. By passing the Criminal Tribes Act (1871) and the Arms Acts (1878), entire tribes and communities were declared criminals to prevent their skills from proliferating and stop the manufacturing of weapons and defence equipment.^{17,18} Concurrently the British took over the saltpetre production, ensuring total monopoly over defence production in India.
- From Regional Patronage to Colonial Control. From local communities producing defence equipment through patronage of Indian Kingdoms, defence

production in Indian became centralised under the British. The coming up of British controlled Ordnance Factories and curb on local arms manufacturing through rules and regulations, the artisan base was dismantled. The first Ordnance Gun and Shell Factory was established on 1801 at Cossipore Kolkata West Bengal, the Bombay East India Company's Naval Facility was converted into a British Naval Dockyard in early 19th Century.¹⁹ Also, Ordnance Factories were commissioned at Ishapore for manufacturing of rifles and small arms, Dum Dum for manufacturing cartridges and shell casings and Gun Carriage Factory at Jabalpur for Artillery Guns and related hardware.

- World War I Mobilisation and Industrial Support. During World War II, it was mainly rifles ammunition and gun carriages that were produced and supplied, to equip more than a million Indian men who volunteered to fight for the British. Tata Steel, then Tata Iron and Steel Company (TISCO) had been established in 1907, it scaled up production to assist British War efforts. India also provided over 170,000 animals and some 3,700,000 tons of non-fighting supplies and stores.²⁰ With British controlling all defence production in India and the skilled artisan community in decline, technology and innovation were rather ignored. India had become dependent on British Industrial Capacity for its defence and a technological gap ensued, that also brought about decline in Indian skill development for maintaining an ecosystem which could support defence production.
- Between the World Wars. From the end of World War I to the beginning of World War II, the defence production in British India remained limited. For the British, India had proved to be a crucial manpower reservoir rather than a defence production hub. The ordnance factories continued to produce small arms, gun carriages and non-fighting equipment, and India was deliberately left out of heavy armament production to prevent indigenous autonomy. No heavy weapons or capital ships were made in India during this period, a stark contrast to the glorious ancient and medieval times. The principal adverse effect was not that India was left behind with respect to defence industrialisation, but that

the ecosystem with essential skill levels required to sustain a modern defence industrial production base was not developed.

- 1939 to end of World War II. From a very humble start in 1939, India started producing vast amounts of armaments, steel, cloth material and other supplies for the British campaign. The Industrial growth was centred around increasing production capacity of British owned Ordnance Factories, which began producing huge volumes of weapons, ammunition and explosives. Mr Walchand Hirachand established the Hindustan Aircraft Limited (now Hindustan Aeronautics Limited HAL) for assembling, repairing and overhauling aircrafts, marking India's entry into the aviation industry.²¹ No big capital ocean going ships were built in India, but a number of Basset-class Trawlers for mine-sweeping and anti-submarine operations, Harbour Defence Motor Launches, Tugs and Barges for port logistics and Assault Craft for amphibious operations were made in various Indian Ports. Tatas were the major industrial power, supplying over 110 grades of steel while DCM provided Chemicals and Birla and Arvind Mills cloth, jute etc.²² India by the end of World War II, had become the world's fourth largest Defence Production Industrial Power behind USA, Russia and UK. The rise of India's industrial base was directed for British wartime needs and not for indigenous autonomy, the production was focussed on low to medium technology war equipment while advanced weapon systems during the war were procured from USA or UK. This wartime expansion and experience created the skill sets and technical base which could have been used to increase the overall industrial ecosystem in India, however, this industrial capacity contracted post-independence and was subsequently lost.

Defence Production Independent India

From 1947 to 1962

- Foundations of Post-War Industrial Policy and Defence Production. After the World War II, a plan was made by the leading industrialists of India known as the Bombay Plan; this was being looked at as the way forward for India towards consolidating Indian industry post the war expansion.²³ India became independent in 1947, and while the constitution was still being written, an

“Industrial Policy Resolution”, dated 06 Apr 1948, was released by the government in the centre. This was followed by the industries (Development & Regulation) Act, 1951, and another Industrial Policy Resolution on 30th Apr 1956.^{24,25} These three documents laid down the foundations of India’s mixed economy and state-led industrialisation, giving a framework where the government took control of the strategic sectors dealing with defence production. From 18 ordnance factories at the time of independence, the number rose to 22 with the addition of four more factories from 1945 to 1962.

Research and Development and Defence Research and Development Organisation (DRDO). Prior to 1958, there were three technical and scientific organisations that were working as separate entities.

- Technical Development Establishments (TDEs) had a pre independence beginning in the Chief Inspectorate of Mechanical Transport (1929, Chaklala) and Inspectorate of Scientific Stores (1939, Rawalpindi). These were later lost to Pakistan post-independence and raised again in India to cover weapons, ammunition, instruments and electronics with emphasis on testing, reverse engineering and limited indigenous design work.
- Directorate of Technical Development & Production (DTDP), which was allied towards technical development and production standards of Indian Ordnance Factories under the Ministry of Defence.
- Defence Science Organisation (DSO) had been established in 1948 under Prof DS Kothari as its first scientific advisor to the defence minister, to tackle basic military problems. The DSO laid the foundations for many technical divisions that remain even today.

On 01 Jan 1958, the Indian government merged these three into the Defence Research and Development Organisation (DRDO) for elementary research and development of small-scale tactical equipment.²⁶

Wars in the Himalaya's Catalysts in 1962 and 1999

- Post-1962 Expansion and Modernisation of India's Defence Production. The 1962 war was a military loss that opened up the need for enlargement of the armed forces and enhanced defence production. It uncovered critical gaps in India's defence readiness, which then led to a huge quantitative and qualitative increase in production. There was a colossal increase in the Ordnance Factory Industrial Complex from 18 to 41 factories. The Department of Defence Production (DDP) was created in 1962 to centralise and accelerate indigenous manufacturing.²⁷ A heavy vehicle factory was established in Avadi (Chennai) for the production of tanks and other armoured vehicles, and the Gun Carriage Factory in Jabalpur and the Field Gun Factory in Kanpur were tasked to manufacture Indigenous Artillery Guns. Production moved from low technology ammunition and light weapons to licence manufacturing of high technology Aircrafts, Tanks and Ships. There were a mix of both Western / NATO origin platforms (Gnat, Jaguar, Avro, Vickers Mk 1 Tanks and Leander Class Frigates) and USSR / Warsaw pact platforms (Mig 21, T-72 Tanks and Talwar Class Frigates). The point to note is that during this period and even beyond, it was mainly licence production and not indigenous production.
- Ordnance Factory Board (OFB). As the number of Ordnance Factories increased, there was felt a need of a more structured management and this came in the form of Ordnance Factory Board (OFB) established on 02 Apr 79 of the.²⁸ With its headquarters in Kolkata, it had 41 Ordnance factories organised into five operational clusters:
 - Ammunition & Explosives
 - Weapons, Vehicles & Equipment
 - Materials & Components
 - Armoured Vehicles
 - Ordnance Equipment (Clothing & Parachutes).
- Private Sector. The private sector was opened up to source ancillary supplies for major platforms, and some entities, like the HAL, were asked to increase production capacity under tight state control. Overall, the public sector

undertakings (HAL, ordnance factories, shipyards) became the dominant players in defence production, while a small segment of the private sector developed into subcontractors to these PSUs. In 1991, economic liberalisation was initiated, making India a market-oriented economy. However, the defence production was largely kept out of the reach of the private sector. It would need tremendous lobbying and pressure through decades and finally the Kargil war in 1999 to commission studies which would find gaps in defence production and lead to reforms bringing in the private sector into defence production.

- Kargil War May - Jul 1999 and its Impact. It was a brutal war fought at great heights lasting months, and within three days of the end, the Kargil Review Committee (KRC) had been constituted to examine the conflict.²⁹ The KRC identified serious systemic failures, and later a Group of Ministers (GoM) was established to address the same and look into "Reforming the National Security System". The 2001 Group of Ministers (GoM) Report led to a complete overhaul of India's defence needs and intelligence apparatus.³⁰ It impacted the Defence Production and Procurement System, creating a dedicated procurement organisation in the Defence Procurement Board (DPB) and the Defence Acquisition Council (DAC).³¹ The Private sector was finally allowed into the defence sector with the edict of 24% Foreign Direct Investment (FDI) being allowed. The report of the GoM focused on Indeginisation, advocating DRDO to develop core technologies while involving private sector for production. The Defence Procurement Procedure (DPP) was issued in 2002, a direct outcome of these reforms, providing a formalised manual for future capital acquisitions.³² The GoM also recommended formulating a dedicated export policy to encourage Indian defence exports to friendly foreign nations.

From Kargil in 1999 to 2018 / 2019

- From 2001, thanks to certain government decisions taken post-audit of the Kargil War, Indian Defence Production underwent a major transformation. Private companies entered the defence sector through licensing, many joint ventures with PSUs were signed and some export routes opened. Almost 600 licences were issued to private companies, yet their overall participation remained sub-optimal considering that the Indian Industry in other sectors

during this period, was competing with and many times outperforming their foreign counterparts (e.g. Automotive Industry). Also, despite these reforms, the defence production of major platforms and assemblies in India remained mainly licence manufacturing and not through indigenous OEM participation.

- Kelkar Committee. In 2004, the Kelkar Committee was commissioned by the Government of India through the Ministry of Defence to recommend changes in the defence procurement procedures in vogue and to increase the private participation in the defence sector.³³ The committee had observed that the private sector had many disadvantages compared to the public sector undertakings and gave 40 recommendations. Of these, by 2010, as per an answer to a parliament question, 30 recommendations had been adopted and 01 had been dropped. Many of the recommendations of this committee were later adopted in 2014 under the “Aatmanirbharta”, and “Make in India”, initiatives. Some relevant ones adopted during this time period were:
 - The Defence Offset Policy for contracts valued at ₹300 crore and above,
 - Providing relevant information with respect to the 15-year Long Term Integrated Perspective Plan (LTIPP)
 - Keeping the Private Sector informed of the future technological requirements through the Technology Perspective and Capability Roadmap (TPCR) and other similar public-released information.
 - Modification of DPP to promote MSME’s participation in Defence Production.

- The Defence Procurement Procedure. A curated structure made for transparency for India’s Defence Acquisitions, was the Defence Procurement Procedures (DPP) providing guide lines which were first laid out in 1992, the first procedural document came out in 2002 after the Kargil War, known as DPP 2002. Thereafter, a number of iterations came out. DPP 2003, 2005, 2006, 2008, 2011, 2013 and 2016; each edition addressed specific challenges of its time, laying down standardised processes for procurement, indigenisation, and industry involvement. The DPP became both a procedural manual and a policy

instrument. The Indigenous Content (IC), which was not clearly defined in DPP 2002, started as 30% from 2005, and by DPP 2016, it changed to 40% for Indigenously Designed Developed and Manufactured (IDDM) and 60% for those that were not Designed and Developed Indigenously.³⁴ Through work done by the Kargil Review Committee (KRC) and the report of the GoM in 2001, the defence procurement for the armed forces increased in a transparent manner. There was also an increase in the defence production, but it was mainly PSU-oriented with marginal private industry participation. There were many challenges that were faced; the investment in defence research and development during this period remained negligible, and there was total technological dependence on foreign OEMs. Also, there was very slow movement towards indigenisation, with the country paying exorbitant sums for maintaining an armed force, which relied heavily on foreign support.

The Era of Reforms

Policy Changes and Indeginisation

The Make in India initiative of the government in the defence sector started in 2014; liberalised industrial licencing for private players. In 2016 the new DPP was released with Buy Indian - Indian Design Developed and Manufactured (IDDM) as the most favoured category for Defence Procurement.³⁵ In Apr 2018, the iDEX or Innovations for Defence Excellence scheme was launched which aimed at providing unique technological solutions for modernising the Indian Armed Forces.³⁶ However, the movement towards reducing the foreign dependency for Defence Requirements was slow, as majorly the Indian Armed forces were still using Foreign Platforms (Tanks, Aircrafts and Ships) and were equipped with foreign weapon systems. Covid in 2019 / 2020 shook the world but the effects were felt more in the Indian defence ecosystem as the supply chains for maintaining these foreign platforms slowly choked. With almost 70% of our platforms being of Russian Origin, the lack of maintenance items for keeping the Land Sea and Air Platforms in service conditions further amplified after the start of the Ukraine Russia War in 2022. The long-drawn war showed us that we required to be self-reliant "Aatmanirbhar", in defence production encompassing all aspects of keeping the Land, Sea and Air fighting platforms in top service conditions. The government addressed this head-on with two definitive approaches: one was a

slew of policy changes, and the other was a firm push for indigenisation. Both these approaches were aimed at becoming self-reliant in defence related equipment and have seen a major shakeup of the Defence Production ecosystem of India.

Reforms in the Defence Sector

- Defence Production Policy 2018. On its release, the stated focus was on realising self-reliance or “Aatmanirbharta”. This was to be accomplished by reducing dependence on foreign defence imports by increasing domestic capability. The shift was towards supporting a competitive indigenous defence production ecosystem, with increased contribution of private players from large industrial houses to medium, small and even startups complementing the existing PSUs. The aim was to make India a world leader in Defence Manufacturing.³⁷
- Defence Production and Export Promotion Policy (DPEPP) 2020. An expansion of the 2018 Defence Production Policy, the DPEPP proposed overreaching reforms in asking for the corporatisation of the Ordnance Factory Board, promoting private participation and mandated indigenous production through negative lists (now called positive lists). By focusing on critical and future technologies and encouraging defence exports, the DPEPP, besides other aspects, aimed to warrant India became a safe and secure entity in the Defence Global Supply Chains.³⁸
- Increase in FDI. The initial FDI limits were capped at 26 % under Government Approval, then in 2014 it was increased to 49% under Government Approval which was later changed to Automatic Route in 2016, where no Government Approval was required. In 2020, it was increased to 74% under the automatic route, and under government approval, it was set at 100% for strategic projects where cutting-edge technology could be accessed.³⁹
- Corporatisation of Ordnance Factory Board (2021). The Ordnance Factory Board (OFB) had 41 factories till 2021 when the decision was taken to corporatise it into 07 different entities based on their functional specialisation.

From a loss of over Rs 2500 crores in FY 2019 – 2020; the OFB's, corporatisation changed it to the seven entities thereby making a profit of Rs 1625 crores in FY 2024 – 2025. These seven entities now also have export orders of over 3500 crores in FY 2024 – 25, mostly in ammunition and equipment.⁴⁰

- Munitions India Limited (MIL), for ammunition and explosives.
- Armoured Vehicles Nigam Limited (AVNL), for Combat vehicles.
- Advanced Weapons and Equipment India Limited (AWE India), for Weapons and equipment.
- Troop Comforts Limited (TCL), for uniforms and gear.
- Yantra India Limited (YIL), for engineering components.
- India Optel Limited (IOL), for optoelectronics.
- Gliders India Limited (GIL), for parachutes.

Indeginisation Efforts

- Defence Acquisition Procedure (DAP) 2020 and Buy (Indian-IDDM) Category. DAP 2020 was what came to replace the Defence Procurement Procedure DPP, specifically DPP 2016. It came with a fundamental continuity with the former document but brought structural changes, in that it focused more on promoting indeginisation and local manufacturing while making the procurement process simpler. It further brought out a process for leasing equipment without owning it, which had never been done before and an entire chapter on how to procure systems designed and developed by DRDO and PSUs. The category “Buy Indian-IDDM (Indigenously Designed, Developed and Manufactured)” became the most preferred one, with an increase in the Indigenous Content (IC) to 50% from the earlier 40% in DPP 2016, and an insistence on indigenous software.⁴¹
- Draft Defence Acquisition Procedure DAP (2026). While it is still in the draft phase, this amended procedure requires Indian content to increase to 60% from the earlier 50% in DAP 2020 for all manufacturing in India. In addition, even for Buy Global cases, there is now a requirement of 30% Indian content, showing that the primary focus has changed from Make in India (manufacturing) to

Owned by India (IP and design). For the first time, compensation to vendors for successful trials and a Low-Cost Capital Acquisition process to include the need of the times for faster procurements of low-cost, fast-evolving technology equipment like drones have also been included in the procedure.⁴²

- **Positive Indigenisation Lists.** There are two sets of these lists that have come out being the responsibility of two different departments. One came from the office of the Department of Military Affairs (DMA); the other came out from the Department of Defence Production (DDP). These are lists of defence items which have to be positively indigenised by a certain timeline, and beyond that timeline cannot be imported. The DMA lists 1 to 5, comprising 500 items, referring to entire platforms or assemblies such as the Future Infantry Combat Vehicle (FICV) or the Electro-Optic Fire Control System (EOFCS) for naval platform. The DDP lists 1 to 5, comprising over 5000 items, focussing on Line Replacement Units (LRUs), sub-systems, assemblies, and critical components required for larger platforms.⁴³
- **Srijan Portal.** In 2020 the Srijan Portal was launched; its aim was to connect Indian industry with the requirements of all DPSUs and the armed forces. It assists in helping the domestic vendors identify items that they can make which otherwise were being procured from foreign OEMs. Some 47,000 items have been identified, and of these, some 14,000 items have been indigenised. These items are often less complex and different than those identified through the positive indigenisation lists mentioned before.⁴⁴

Research and Development

The iDEX Scheme. The iDEX Scheme continues to be the mainstay for innovative research and modernising the armed forces. Funds for R&D increased from Rs 1.5 crore to Rs 10 crore for iDEX Prime and then to Rs 25 crore for Aditi Schemes launched in Mar 2024. DRDO-managed Technology Development Fund (TDF), on the other hand, can also provide suitable funds to startups and MSMEs to design and develop indigenous components. DRDO has also moved to 'Nil' ToT fee for its Production Partners and 'Nil' royalty for supply to Indian Armed Forces.⁴⁵ In addition to this, DRDO has 15 DRDO Industry Academia Centre of Excellence (DIA-CoE) for

carrying out R&D through the expertise of capable Academic Institutes and Universities.⁴⁶

Research, Development and Innovation (RDI) Scheme. In 2025 the government came out with the Research, Development and Innovation (RDI) Scheme with a One Lac Crore Corpus for six years to boost private sector led R&D for the various verticals of the sunrise sectors, the technologies which need to be indigenised for strategic reasons, economic security and self-reliance or “Atmanirbharta”, and the defence sector would be covered through the R&D on “Deep Technology’ including quantum computing, robotics, space, and artificial intelligence and other sectors with approval. By May 2026, companies in the space and drone sectors had been accepted for grants from the RDI schemes.⁴⁷

Electronics Sector Component Manufacturing Scheme (ECMS) 2025

Electronic Components do not figure as high-end technology; they however do form the backbone of all defence equipment. Large quantities of these, from basic components to sub-assemblies, are procured ex-import for the complete defence equipment. In addition to the foreign exchange used, in recent times, there have been cases where, through subterfuge, the supply chains of these have been compromised to cause physical harm to military equipment. Without a steady supply of these electronic components and with a surety of their being safe from malware, it may be difficult to sustain the manufacturing of safe defence products needing electronics. In Apr 2025 the Electronics Components Manufacturing Scheme (ECMS) was launched with an initial outlay of Rs 26,000, later enlarged to Rs 40,000, by the Ministry of Electronics and Information Technology (MEITY). The aim is to have an indigenous electronics manufacturing ecosystem, which caters to its own needs for a secure and malware-safe electronics supply chain. Further, this would also guarantee the country becomes part of the global electronics supply chain, catering to other nations.⁴⁸

Opening of Strategic Sectors to Private Industry

Without proficiency in contemporary and future technology, and the need to involve industry for massive investments and time bound results, the overall Defence Production would lag behind. Probably with this thought in mind, a series of strategic sectors, which otherwise would have continued in the Government’s domain were

unlocked for the Private Industries. Below is a chronological order of how this happened:

- 2020 - Space Sector for launch of satellites and launch services.⁴⁹
- 2022 - India Semiconductor Mission.⁵⁰
- 2023 - National Quantum Mission (mainly through startups).⁵¹
- 2024 - India AI Mission.⁵²
- 2025 - National Critical Mineral Mission.⁵³
- 2025 - Nuclear Energy (SHANTI Act 19 Dec 2025).⁵⁴

Result of the Reforms

The Indian defence production has risen considerably in the last few years, as did the exports to over 80 countries. It can be seen as a positive outcome of the push for indigenisation, opening up of the industry to private sector and the various changes that have been brought into the Defence Industrial Ecosystem. This has happened during the consolidating phase of the Reform Era; two charts based on data provided by the government through various press releases show a trend where the defence industry is now poised to take a leap and find its rightful place in the global market of defence products

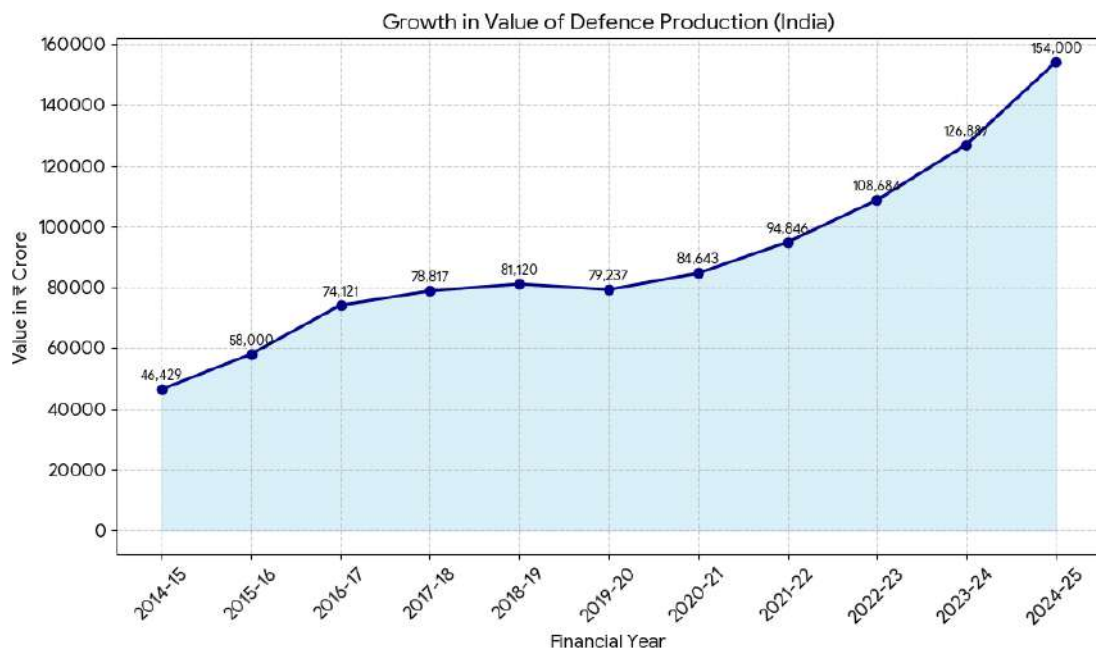


Figure 1: Growth in Value of Defence Production (India)

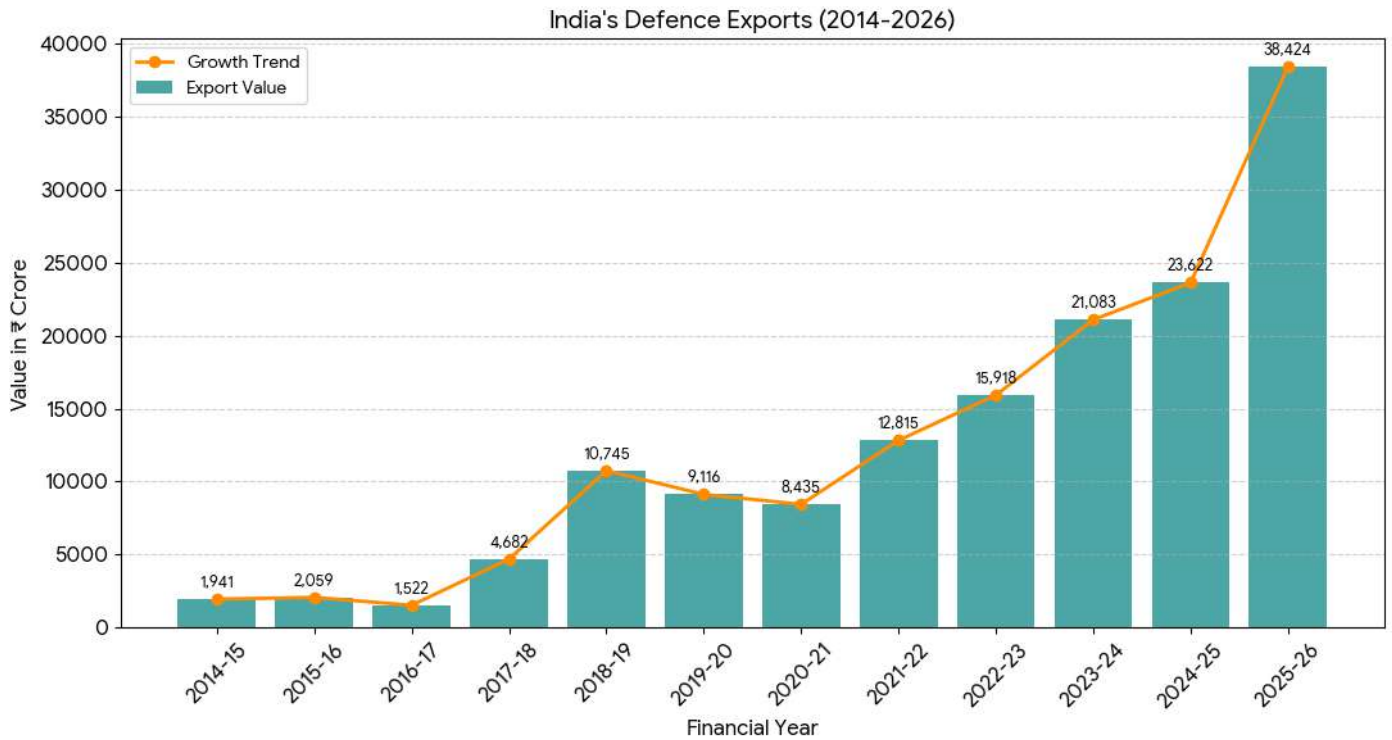


Figure 2: India's Defence Exports (2014-2026)

Conclusion

India's defence production shows a journey from ancient and medieval artisanal skill to contemporary industrial scale, shaped by history, disruptions and reforms. During the colonial era, through policies of Great Britain, these skills were lost, and very little technological advancement was allowed. This left India far behind in defence production compared to the leading powers of the time, while ordnance factories came into being, serving the colonial masters. World War II pushed India towards rapid capacity expansion, which provided the allied war effort requisite wherewithal to overthrow the Axis Powers, but this strong private industrial base was left to decline post-independence. Defence production was the domain of the PSUs, and defence research was given to the newly established DRDO in the late 50s, and the private industry, was kept out of defence production and R&D. It was the 1962 war which acted like a catalyst to bring the private sector in as ancillaries in support of the increasing PSUs. Indian defence production remained PSU oriented and largely

licenced manufacturing of foreign supplied platforms through the 70s to 90s. It was the Kargil war that forced a need for deep study and systemic changes, which ensured the entry of private industry into larger spheres of defence production. The PSUs still remained central in the entire defence production eco system into the new millennia. Only after the choking of supply chains during the covid years and later due to the Ukraine war has the private sector started reaping the benefits of an era of reforms. This has resulted in a revival of the Indian defence industry, positioning India to transform from a top importer to an international exporter of Indian platforms. The historical trajectory of defence production underscores that for India, the need to be self-reliant “Atmanirbhar”, is a strategic necessity for national security.

Declaration

I declare that this manuscript is being submitted exclusively to CENJOWS for publication consideration, is original, and has not been published or submitted elsewhere. I further certify that it contains no classified, restricted, or sensitive information and is based entirely on open-source material suitable for publication in the public domain.

ENDNOTES

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