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SEPTEMBER 2024
VOLUME 15 | ISSUE 12

INDIGENOUS DEFENCE INDUSTRIES AIMING GLOBAL EXPORTS

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The power of a King lies in his mighty arms...

Security of the citizens at peace time is very important because State is the only saviour of the men and women who get affected only because of the negligence of the State.

- Chanakya

INDIGENOUS DEFENCE INDUSTRIES AIMING GLOBAL EXPORTS

When India gained independence, there was hardly any big shot industry present, gradually a number of huge industries were established in various sectors of the economy, but unfortunately there was no defence industry as we were under the rule of Britishers. They had not introduced and did not establish any on purpose, therefore it was a challenge for the first government post-independence to visualise and establisha proper defence industry in the country.

But as India grew, in multi dimensions in concern to industrial development, the defence industry developed as well and thus the various milestones were established, and today the defence industry in India has taken a high leap with the support of the Defence establishments such as DRDO, ISRO, BARC and BRO and some Public Undertakings were also established in due course of time after the independence, like Hindustan aeronautics limited (HAL), Bharat Electronics Limited (BEL), Bharat Dynamics Limited (BDL), BemlLimited (BEML),and Mishra Dhatu Nigam Limited (Midhani) to name a few, which actually played a vital role in establishing the current status of the defence industry in India which is seen as the game changer in the defence sector.

With the beginning of establishing these organisations in India, the process of defence production was initiated. It is not only the preparedness of India's National Security, but also a great contribution in the self-reliance on the defence productions.

No one even thought that a time will come when our defence forces will be equipped with all the latest arms, ammunition and technologies. But gradually, the scenario changed and after the Kargil War with Pakistan in the year 1999, the then government decided to revamp our defence apparatus and thus new defence policy was introduced with a new vision and dimensions.

But unfortunately the then ruling party lost the elections and the whole process of revamping got a backseat and nothing much could be done for the next ten years, which I think was a dark era for our National Security as nothing of significance was done for strengthening the defence apparatus and the National Security.

But the golden era emerged in 2014 with the new government, which took the National Security as the Top Priority of the Government and thus in the first phase of a new program was introduced as the Make-in-India in Defence. This actually motivated various industrial houses to take the initiative to enter into defence production with few OEMs, which were followed up with innumerable startups who also joined hands under Make-in-India program.

Simultaneously, government of India revised the DPP which also supported the defence apparatus, as well as the defence industry. The current government has made a significant decision to ban the import of more than 200 defence products and technologies that were previously imported. With this decision the indigenous defence industry got a facelift and more and more industrial houses showed keen interest in entering the defence production market.

The best thing that happened under the leadership of the current government is that now the defence production was not meant only for India's requirements, but they were also produced as per the requirements of the offshore buyers.

Certain technologies, arms and ammunitions have also been exported to other countries which include Tejas, Brahmos Missiles, Assult Rifles, Chetak Helicopters and many more. I'm sure that the day is not far that the Indian defence industry will be one of the biggest exporters, which at a time was one of the biggest importers. India's defence exports surged from INR 2,000 crore (USD 250 million) in 2014-15, to INR 16,000 crore (USD 2 billion) in 2023-24, reflecting significant growth. Over a 100 export licenses are now issued annually, highlighting the expanding global presence of India's defence industry.

Aiming high on the global market is the ultimate goal of the defence industry and the government is whole heartedly supporting the same with financial support and policies to establish new industries in various sectors.

This edition is focused on the core issue of this recent development and we at DSA are supporting this endeavour of the Indian defence industry.

Happy reading!

Pawan Agrawal
Chief Executive Officer

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Volume 15 | Issue 12 | September 2024

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Defence and Security Alert is printed, published and owned by Pawan Agrawal and printed at SRG Traders Pvt. Ltd., B-41, Sector-67, Noida (U.P) and published at 4/19, Asaf Ali Road, New Delhi (India). Editor: Manvendra Singh

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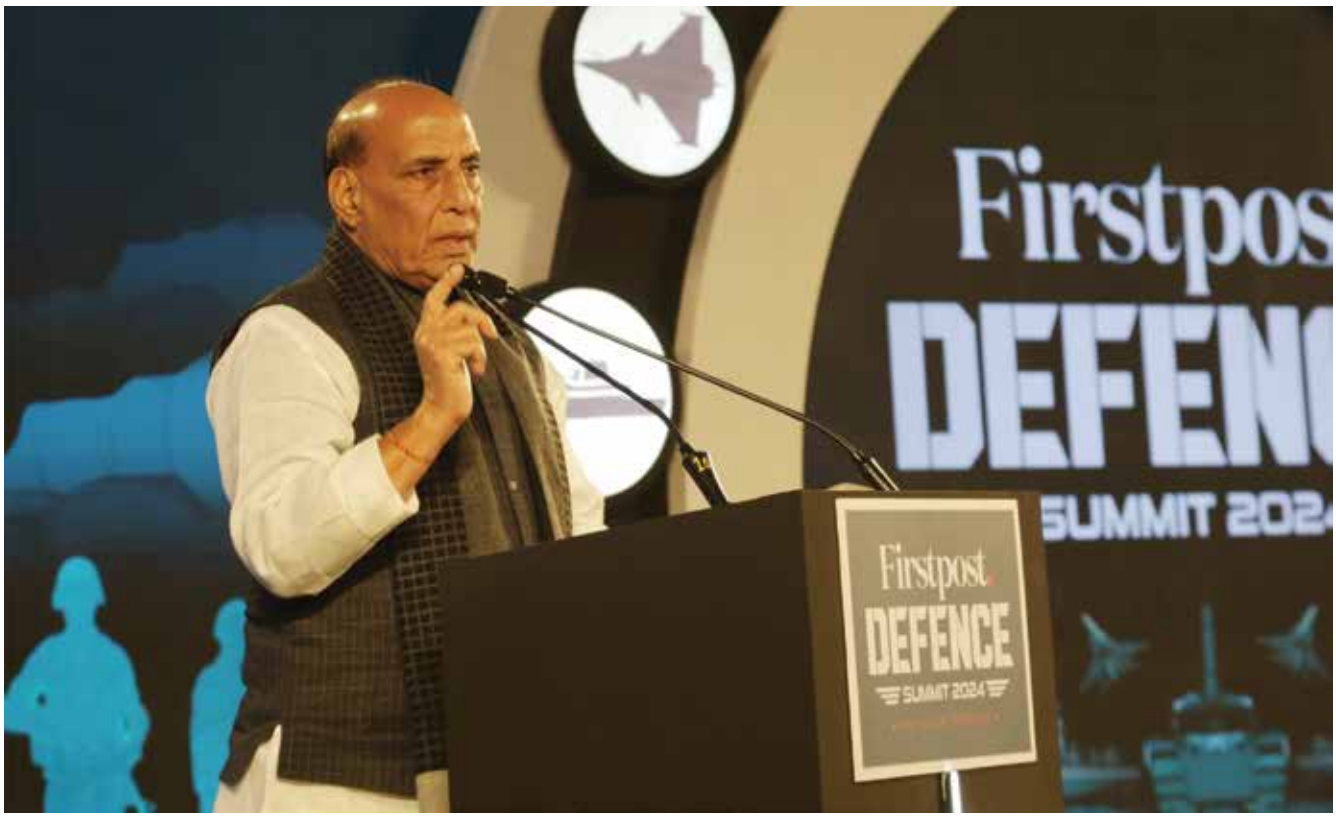
EXPORTS BY INDIAN DEFENCE INDUSTRIES

Exports generate employment, especially the demand for skilled resources. In addition, they help in developing a strong supply chain, technological advances, bond with engineering and metal research institutes, develop the cadre of defence experts for both hardware and software.

On 24 February 2024, Defence Minister Rajnath Singh announced that India had set an annual defence production target of Rs 3 lakh crore and defence exports worth Rs 50,000 crore by 2028-29. He said this is in line with the government's aim to develop India into a developed nation by 2047. He highlighted the significant progress India has made in defence exports, which has increased from under Rs 1,000 crore to Rs 16,000 crore.

Rajnath Singh said the Ministry of Defence (MoD) has been allocated Rs 6.2 lakh crore in the 2024-25 budget, the highest among all the ministries, and highlighted that capital acquisitions worth over Rs 4.3 lakh crore had been approved, reflecting the government's



Defence Minister Rajnath Singh addresses the Inaugural Session of 'Firstpost Defence Summit-2024', in New Delhi.

LT GEN PRAKASH KATOCH
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commitment to enhancing national security. He emphasised the importance of jointness among the Indian Army, Navy, and Air Force, noting improved coordination to address the challenges jointly.

Subsequently, on 05 July 2024, the defence minister announced that India recorded the highest-ever annual domestic defence production in 2023-24, reaching Rs 1.3 lakh crore in terms of value, which represents a 16.7 per cent growth over the previous fiscal. He said that the 'Make-in-India' program is crossing new milestones, year after year and the government has an unwavering resolve to develop the country as a leading global defence manufacturing hub.

The MoD issued a statement saying, the data shows that in terms of absolute value, both defence PSUs/ PSUs and the private sector have recorded a steady growth in defence production; of the total value of production in 2023-24, 79 per cent was contributed by defence PSUs and other PSUs manufacturing defence items, while around 21 per cent was by the private sector. The statement added that this has been achieved due to the policy reforms and initiatives, as well as the ease of doing business brought in the last 10

Raksha Mantri Rajnath Singh flags off 51st K9 VAJRA-T Gun from L&T Armoured System Complex in Gujarat.

years, with focus on attaining self-reliance, while indigenisation efforts have been pursued aggressively.

The MoD statement further stated that the increasing arms exports have also contributed to the overall growth in defence production; India's defence exports touched a high of Rs 21,083 crore in 2023-24, reflecting a growth of 32.5 per cent over the last fiscal when the figure was Rs 15,920 crore. Also, in the last five years (since 2019-20), the value of defence production has been increasing steadily, and grown by over 60 per cent.

There has been a sharp increase in the export value of defence products, in which, increased participation of the private defence companies has also played a significant role. Moreover, production costs in India are cheaper compared to foreign countries, as there are no pre-conditions as is the case with the US and other foreign countries. The policy of Atmanirbhar (self-sufficiency), liberalised industrial licensing, and certification policies for defence manufacturers have also helped.

The government is shedding its shyness of making procurements from indigenous defence industry, and the armed forces are interacting directly with indigenous private defence industry. The Defence Research and Development Organisation (DRDO) is also sanctioning new projects to industries under the Technology Development Fund scheme, aimed at fulfilling requirements of the armed forces, aerospace and other defence sectors.

India needs to find the **right equation** between **economy and security – defence exports** should come next

In October 2023, India released the 'Fifth Positive Indigenisation List' for which there would be an import ban beyond mentioned deadlines. Moreover, in FY 2023-24, a record 75 per cent of the defence capital procurement budget, amounting to Rs one lakh crore, was allocated to the domestic industry. In addition to sale of weapons, defence exports also include various goods and services in the defence sector. For example, Indian companies are becoming suppliers to the US defence firms;

The Indian Army and Defence Research and Development Organisation (DRDO) are engaged in a fast-track initiative to create new long-range rocket systems. These rockets, with potential ranges of 120 km (74 miles) and 300 km (186 miles), could undergo developmental trials as soon as 2025.

BrahMos missiles.

35 per cent of Indian defence exports are to the United States. The rise in defence exports has also improved India's relations with countries procuring Indian defence products.

Exports generate employment, especially the demand for skilled resources. In addition, they help in developing a strong supply chain, technological advances, bond with engineering and metal research institutes, develop the cadre of defence experts for both hardware and software. Also, research and development (R&D) focuses on composites, metals and navigation systems. Exports increase overall volumes, forces improvement in quality, reduces per unit cost and subsidises defence R&D.

Defence Items Exported By India

Export of BrahMos supersonic missiles to the Philippines under a US $375 million deal was a significant breakthrough. It does not matter that Ashley Tellis of Carnegie Endowment is criticizing that the Philippines lacks the C4ISR to operate the BrahMos. The recent media reports indicate that Vietnam is also looking to buy BrahMos missiles from India; a deal that could be worth $625 million.

The items of defence exports by India include BrahMos missiles, artillery guns, rockets, armoured vehicles, offshore patrol vessels, brake parachutes, personal protective gear, different radars, surveillance systems, ammunition, CBRN mini-UGV, combat free-fall system, computerised pilot selection system, controlled aerial delivery system, heavy drop system, flight simulators, HAPO chamber, crevasse crossing bridge, holographic sights, multi-span mobile bridging system, multi-purpose decontamination system, NBC suits, Pnaka ammunition support vehicle, submarine escape set, torpedo advanced light, among other items.

Some other firsts are also coming up in the media periodically. For example, for the first time, India has become an exporter of sniper rifles with the Bengaluru-based 'SSS Defence', bagging and fulfilling an export contract to a friendly foreign country, the supply of .338 Lapua Magnum sniper rifles having a range

Sukhoi Su-30MKI.

of 1,500 meters. Also, Brazil has confirmed importing 22 units of Ground Panoramic Night Vision Goggles (GPNVG) manufactured by Bharat Electronics Limited (BEL) at an approximate value of US $26,500. New innovations are also coming up, like under the 'Make-in-India' initiative, the Nagpur-based Solar Industries has developed 'SEBEX 2'; a non-nuclear bomb twice more powerful than TNT.

Indo-Russian Agreement On Exports

Russia's involvement in the Ukraine Conflict has indirectly helped Indian defence exports, although maintaining Russian-origin armament of Indian Armed Forces also required focus. During Prime Minister Narendra Modi's visit to Russia in July 2024, India and Russia agreed for joint production of advanced defence technology and systems, to include exporting these products to friendly foreign countries. It was also agreed to joint manufacturing in India of spare parts, components, aggregates and other products for maintenance of Russian origin arms and defence equipment under Make-in-India program, through transfer of technology (ToT).

Just before Modi's Russia visit, it was announced that Russia's 'Mango' missiles will be made in India for the T-72 and T-90 tanks. India and Russia are reportedly now in talks to jointly produce the Su-30 fighter jets for global export. This collaboration is part of a broader agreement between India and Russia for joint manufacturing and technology transfer. In fact, 'Make-in-India, Make for the World' has the potential to give a tremendous boost to India's defence exports.

India's Global Position

On 28 January 2024, Ajay Bhatt, then Union Minister of State (MoS) for Defence, announced that India is among the leading top 25 countries in defence export: This indeed was good, although we have since then slipped below the 25 top global exporters ranking; not because of reduced effort on our part, but because of the changing dynamics and fluctuating demand in global arms trade. But more important is to acknowledge, that even when we were among the top 25 exporters globally, India accounted for only 0.2 per cent of all global exports.

A thriving domestic industry can give a country the flexibility to use production lines to ramp up defence output when needed. Imagine, if we were to fight a prolonged war akin to the conflict in Ukraine? Are we really looking 25-35-50 years ahead

Armenia's recent purchase of the Swathi weapon locating radar from India.

A thriving **domestic industry** can give a **country the flexibility** to use production lines to ramp up **defence output** when needed

from the defence point of view? Certainly not, when we don't even have a national security strategy despite the NSA officially tasked to define it in 2019, and the CDS now saying we do not need a "written" national security strategy; height of yes-manship.

The equipping of our armed forces will continue to remain adhoc in the absence of a national security strategy. This is also the reason for the meager defence allocations and practically nil military modernisation. Some analysts praise our "geopolitics free" defence exports, which translates to export anywhere to make more money. But should we exercise some "discretion", considering the following:

- Designs of the indigenous 'Swathi' weapon locating radars exported to Armenia were leaked in that country (obviously to our adversaries). Is it enough to later say nothing to worry?

- Defence exports to Armenia amid a conflict, resulted in calls from Azerbaijan to send *jihadi* fighters to attack J&K. This may happen now, with the surge of terrorism in J&K. Visiting Pakistan in July 2024, Azerbaijan's President Ilham Ailyev said, "Azerbaijan always supports and will continue to support Pakistan on the issue of Kashmir."

- In the backdrop of the time-tested Indo-Russian relations, how did India-made artillery ammunition land up with the Ukrainian army? Isn't this blindly making money any way possible?

- India has strong defence relations with Israel, but also has good relations with Middle East-Gulf States and supports the two-state solution to the Gaza Conflict. Why then, could we not keep defence exports to Israel under wraps? Do we see the possible repercussions?

In backdrop of India's consistent position to resolve conflict through dialogue and negotiations, not war, Nicolas Blarel, author of The Evolution of India's Israel Policy, told media, "Reports that it (India) is supplying Israel with weapons could disrupt that narrative."

Defence production, on which defence exports are based, must keep the following in focus:

- Changing battlefield environments, for example, the preponderance of aerial and sea drones whose demand will keep increasing.
- Indian Armed Forces have considerable deficiencies and obsolete equipment. Filling up voids must be given equal focus, if not more than defence exports.
- The possibility of war being thrust upon us that too suddenly, cannot be discounted. We must have adequate reserves for prolonged war.
- Western arms industries thrive on the private industry, not governmental. Our DRDO is the biggest hindrance to Atmanirbharta. Kaveri engine "prototype" integration with aviation took 35 years. DRDO should concentrate on R&D of futuristic weapons and systems, not money-making.
- After thousands of crores worth faulty ammunition were dumped with the army by ordnance factories, Kalyani Strategic Systems has bagged artillery ammunition orders for the next three years; reiterating the merit of privatisation.
- The IAF has raised concerns with HAL of possible risks delay in induction of the Tejas MK-1A aircraft could pose to its combat effectiveness. Clearly the governmental defence industry is unable to cope with operational requirements; much load shedding to the private industry is warranted. The more delays in the Tejas program are likely, with Sanjay Sharma, a crucial member working on

Leading defence manufacturer Bharat Forge said its subsidiary Kalyani Strategic Systems Ltd has secured an export order worth US $155 million for a 155mm artillery platform.

Light Combat Aircraft Tejas (LCA Tejas).

the Integrated Flight Control System (IFSC) for the Tejas resigning, raising questions on HAL's HR policies.

We talk a lot about the ease in doing business, but according to Bloomberg, German companies operating in India, cite bureaucratic hurdles in doing business in 2024, more than in 2023. The 64 per cent listed bureaucratic hurdles, like protectionist measures and procurement rules act as the biggest drawbacks, up from 53 per cent in 2023. This is likely to feature in talks during the visit of German Chancellor Olof Scholz to India in October 2024.

After the Philippines, it should be possible for India to export Brahmos Missiles to Vietnam, Indonesia and other countries in the Asia-Pacific. Advanced Light helicopter (ALH), Light Combat helicopter (LCH) and Light Utility helicopter (LUH) also have considerable export potential. With continued focus and increased privation, potential also exists for export of tanks, tank parts, artillery guns, gun barrels, off-shore patrol vehicles, frigates, drones, 3D tactical control radars, Pinaka MBRLs, Tejas LCA and the like. For achieving the export target of Rs 50,000 by 2028-2029, the Line of Credit issued by the EXIM Bank may need to be increased to facilitate import of Indian defence products by multiple countries.

Finally, Defence Minister Rajnath Singh keeps repeating Prime Minister Modi's resolve of 'Viksit Bharat by 2047'. However, as the defence minister, he should be focused on what should be India's military power by 2047 to be recognised as a developed nation; towards which he shows little concern, not even demanding a national security strategy on which the military equipping and level of defence exports should be based – not exports only to make money. India needs to find the right equation between economy and security – defence exports should come next. The political rhetoric is, we are ready for any eventuality, but the Vice Chief of Air Staff has given a stark warning of the widening capability gap, vis-à-vis adversaries, saying Atmanirbharta shouldn't be at the cost of the nation's defence. DSA

INDIGENOUS DEFENCE INDUSTRIES AIMING GLOBAL EXPORTS

With National Security taking center stage in India's security landscape, more focus has been put on the indigenisation of the defence sector. This push, post-independence in the 1950s, towards indigenisation, has helped the industry take long and positive strides in becoming self-reliant. India has significantly, though not completely, reduced its dependence on other countries for procuring weapons and systems.

Recently, a 'Positive Indigenisation List' of strategically important systems and weapons was released, that will only be procured from state-run domestic manufacturers, after a ban on their imports. This was the 5th such list, which has given a strong boost to self-reliance or Atmanirbharta, setting up the base for the industry to focus on the next step.

With Government initiatives, like 'Make in India, Make for the World', Public-Private-Partnerships etc., the stage is now shifting towards the export sector. Manufacturers like Hindustan Aeronautics Limited (HAL), Bharat Electronic Limited

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(BEL), and other Defence Public Sector Undertakings (DPSUs), are now aiming towards a greater aim of creating a place for India in the global arena of defence exports.

India's Global Exports: Current Scenario

The Defence Export Strategy outlines the target of achieving $5 billion in defence exports by 2025.

In this direction, a major boost has been achieved, with a 23-fold jump in exports, between 2013-14 to 2022-23, touching nearly Rs 16,000 crore mark, according to the Ministry of Defence. These exports occur in almost 85 countries, including the Philippines, Armenia, Maldives, etc.

According to the Stockholm International Peace Research Institute (SIPRI), between 2000 and 2023, Myanmar remained the largest importer of Indian weapons (around 31 per cent). Sri Lanka, Mauritius, Nepal, Armenia, Vietnam, and Maldives were other major importers, as reported by India Today Group.

The exports primarily include missiles, radars, protection gears, artillery guns, etc. One of the largest PSUs, state-owned HAL, is a major player in this field. As per Deccan

Maharashtra MSME Defence Expo 2024.

Herald, it was in talks with countries like Nigeria, Argentina, and Egypt to sell its indigenous Tejas multirole combat jets. The Philippines, the US, Australia, and Indonesia have also expressed interest in Tejas LCA, a single-engine multi-role fighter jet.

The shipbuilding industry accounts for the largest share, accounting for nearly 61 per cent of total exports, followed by aircraft, sensors, armored vehicles, artillery, etc. These exports for the armed forces of other countries highlight the significance of our defence manufacturing and architecture, and the trust others have started showing in our industries.

As regional tensions in the world are flaring up, countries are exploring different options than their traditional ones, and India is emerging as an important choice for them. India exported BrahMos supersonic cruise missiles, developed jointly by India and Russia, to the Philippines under a bilateral pact, amid rising tensions related to China's increasing presence in the South China Sea. More countries, including Argentina, are now interested in acquiring BrahMos missiles from India.

Armenia is one of the top weapons importers of Akash Surface-to-Air Missile (SAM), which India started exporting to it in 2022, amid Armenia's conflict with Azerbaijan. India also signed a deal to export Pinaka Multi-Barrel Rocket Launchers (MBRL), Advanced Towed Artillery Gun Systems (ATAGS), Swathi Weapon Locating Radar, etc. to Armenia.

With **Government** initiatives, like 'Make in India, Make for the World', the **stage** is now shifting towards the **export sector**

India delivers BrahMos missiles to Philippines as part of $375 mn deal.

India strikes 'big deal' with Armenia; to export indigenous Pinaka missiles amid conflict with Azerbaijan.

Benefits Of A Growing Export Base

For a country like India, the growing defense manufacturing and exporting activity will have favorable advantages. Where most of the focus of the government is required in other priority areas of development, like healthcare, education, poverty reduction, etc., this export revenue will help to continue the defence and related expenditure, and also sponsor future developments in this sector, without causing a burden on the government.

Secondly, the export orders will serve as a major push to indigenous defence industries to push up their capabilities, and strive harder to match up with the competing global players, becoming a top global exporter in the defence industry. It will also help advance the existing technologies and further modernise the sector.

Lastly, strong domestic defence production and export capabilities will strengthen national security by shielding New Delhi from supply line disruptions during hostilities.

Accompanied Challenges

Though the exports are on a rise, various looming challenges need to be tackled. One of the major challenges is the persisting gap between the target set and the current value. Continuing to support the industry, while keeping a close eye on the export policies and actions is a critical challenge faced by the government of the day.

The global defence export market is highly competitive, dominated by traditionally established players like the USA, Russia, France, etc. Gaining a competitive advantage is a daunting task, to occupy a strong global position.

It can also be seen that many countries have implemented export controls and regulations that are detrimental to the international export market. Overcoming these is a major challenge, especially in today's sensitive geopolitical order.

Conclusion

The successful transformation from being a major importer, to becoming self-reliant, and now becoming a rising exporter, is the journey that India undertook, and continues to move forward. Although filled with challenges, with continued support from government policies, more technological advancement, and increasing public-private partnerships, India is set to occupy the central stage in the global market and achieve the 2025 vision of reaching $5 billion in defence exports. DSA

INDIAN CBRN INDUSTRY: NEED TO EMBRACE EMERGING TECHNOLOGIES

The Indian Nuclear Biological and Chemical (NBC) defence programme began in late eighties as a core training facility at College of Military Engineering (CME) Pune, in collaboration with the Defence Research and Development Organisation (DRDO). Today, there are ten laboratories of the DRDO engaged in developing various category of CBRN equipment based on current and emerging technologies.

Rapidly evolving technological advancements are adding new dimensions of threats to mankind. The horrors of the Bhopal gas tragedy (1984), the Covid19 pandemic, the Chernobyl and Fukushima nuclear disasters, countless industrial and logistic chemical accidents, and the tons of toxic wastes that abound in our cities are enough to raise public paranoia. A major Chemical, Biological, Radiological and Nuclear (CBRN) incident occurring in a populated area can wreak havoc and result in multitude of casualties. This is further compounded by the increasing spread of cutting-edge technologies, development of new materials and easy availability of toxic substances.

The underground three-flanged stainless steel tank (lower left foreground) at Union Carbide's Bhopal factory from which poison gas leaked.

Terrorist threats from use of such highly toxic, commonly used CBRN materials and technologies is on the rise. Industry needs to integrate and enhance developing new CBRN technologies and help empower Armed Forces and Law Enforcement agencies to be combat-ready to face such future threats.

CBRN Equipment And Emerging Technologies

CBRN equipment can be classified into sectors based on usage. Each sector has many new technologies which help enhance the efficiency and usage of these items. We shall deal with these as follows:

Detection, Surveillance And Reconnaissance Equipment

CBRN Detection is a much specialised sector. While there

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are elaborate detection and identification techniques and technologies for CBRN, we need to adapt these to future needs. CBRN detector desirables are, no false alarms, faster and reliable outputs, low energy/power requirements, light weight, and ease of use. New technologies are helping develop wearable/embedded detector systems, integrated and automated composite standalone detectors.

Chemical, Biological, Radiological & Nuclear defensive drills consisting contamination avoidance & weapons of mass destruction mitigation were carried out by Northern Command with an aim to react to challenges in operational spectrum.

Future CBRN Soldier.

Efforts are on to produce Integrated Automated CBRN Sentries and even deploying these as networked payloads on unmanned ground (UGV), and aerial (UAV) vehicles. Outputs from such remote detection systems would be seamlessly integrated into relevant common operational picture, with heads up data displays or delivered to remote CBRN centres hosting CBRN Situational Awareness and Decision Support Systems (CBRN SADSS).

Surveillance and Reconnaissance

Integration of advanced integrated detection systems on manned and autonomous reconnaissance and surveillance vehicles with real-time data feed (including video) to the CBRN SADSS, is another move to reduce exposure of precious human resource to toxic threats. Such vehicles are equipped with robotic sampling and comprehensive sample analysis equipment on board. Compact encrypted data communication with CBRN centres and the SADSS is also built in.

CBRN Protection

CBRN protection means are of two primary types – individual and collective.

- Individual Protection Equipment (IPE) is essential for troops fighting through contaminated environments and for first responders to CBRN incidents. Most present IPE is a heavy sealed overgarment and respirator mask. Emerging technologies like Nano Carbon and e-spinning, coupled with Chitosan based Ultra Hydrophobic Bioactive Textiles can help create light weight CBRN capable battle dress/ensembles with minimal physiological load. Suits with embedded detectors, self-decontaminating and wound identification capabilities are under development. Similarly, advancements in filter technologies and integrating these into CBRN helmet masks would assist in minimal respiratory load while providing enhanced clean air feed in CBRN environment.

- Collective Protection (ColPro) Collective protection systems range from fixed or deployed CBRN shelters, accommodating many personnel in clean air protected environments, thereby allowing them to function inside without IPE. Such shelters could be underground hardened concrete and steel structures, inflatable quick deploy ground shelters/ tents or mobile container based protective shelters. New filter technologies are helping reduce size and power requirements of the complex CBRN filtration systems needed for such shelters.

Terrorist **threats** from use of such highly **toxic**, commonly used **CBRN** materials and technologies is on the rise

With a history of serious chemical accidents and a population vulnerable to biological disasters, India has in the past few years implemented comprehensive reforms of its CBRN disaster management preparedness.

Decontamination

Decontamination (Decon) post a CBRN strike or incident, is of utmost importance. While Covid 19 did raise a lot of awareness on personal decon (sanitizers), not much is done for mass decon after toxic incidents. We never practice public mass decon drills. Many new methods are being researched like Hydrogen Peroxide decon, Plasma decon, bio degradation and some more; practical mass decon has remained water-based wash downs. Efforts to develop efficient, resource-friendly mass decon mechanisms and mobile decon stations (MDS) need to be explored. Degrading and making contaminants inactive while retaining environmental sanctity is essential.

CBRN Software and Control Systems

Many countries have developed advanced detector data receivers, hazard prediction software, mapping and warning dissemination systems integrated into one (CBRN SADSS). These are being constantly revised and are evolving fast with the help of AI and predicted response inputs to aid faster and directed response to a CBRN incident. Similarly, such systems integrated with GPS based Meteorological sensors can help in accurate hazard predictions and early warnings to possible affected areas. CBRN SADSS is also being developed to assist commanders and logisticians to monitor, plan and ensure optimal supply of CBRN equipment at the desired locations, in a timely manner. AI based systems are helping decision making in critical CBRN response. Virtual Reality is helping develop

CBRN Decon System.

training systems, practice modules and simulators for specialised CBRN training without the need for use of toxic simulants.

Falcon 4G Integrated CBRN Sentry.

Medical Management

Much work has been done in CBRN medical management. Covid 19 saw a surge in isolation chambers, field bio detectors, and special ambulances. However, there is a need to understand mass CBRN casualty management, especially the critical aspect of casualty decon, post triage and prior to treatment. Filtration assisted CBRN treatment and isolation pods, quick deploy CBRN emergency treatment shelters/aid posts, resuscitation equipment, more effective and faster acting antidotes and prophylaxis drugs are needed.

Testing Systems

All the above mentioned CBRN equipment are critical and lifesaving and thus, need stringent testing and proving. While such systems are established, robotics and AI is coming up in a big way to assist systematic testing procedures.

Emerging Technological Threats

In addition to use of technologies for protective and defensive purposes, we need to understand and guard against some emerging technological threats:

- **CBRN Darknet Trade –** clandestine trade in fissile material, bio agents and technologies.
- **Viruses and Malware –** system and control unit corruption leading to catastrophic outcomes.
- **Artificial Intelligence and Synthetic Chemistry -** to generate new and more toxic chemical weapon formulas.
- **Microreactors and Nanotechnologies -** to create toxic chemicals.

Covid 19 has **shocked** us all with the emergent need of **testing** and protective **equipment** in huge quantities

- **Gene Editing and Bio Tailored Weapons –** CRISPR
- **IND & RDD –** Improvised Nuclear Devices & Radiological Dispersal Devices (Dirty bombs) Suitcase bombs, crude gun type devices.
- Bio threats to Agricultural Products and livestock
- Additive Manufacturing or 3D printing of banned parts of items.
- **Robotics and Automation –** use of drones and remotely operated devices for CBRN weapon delivery.

Industries need to understand these emerging threats and work towards sound R&D and product development to meet these challenges.

Indian CBRN Industry

The Indian Nuclear Biological and Chemical (NBC) defence programme began in late eighties as a core training facility at College of Military Engineering (CME) Pune, in collaboration with the Defence Research and Development Organisation (DRDO). Today, there are 10 laboratories of the DRDO engaged in developing various category of CBRN equipment based on current and emerging technologies.

CBRN being a sensitive matter, most R&D has remained with the DRDO. The recent opening of the defence sector to private players and the 'Make in India' push by the Prime Minister has led to positive outlooks. Covid 19 pandemic gave a spurt to bio related technologies and systems. The technology transfers and sharing R&D with private players has led to emergence of state-of-the-art equipment within the Indian private sector.

Existing Indian CBRN Industry

There are a few Indian firms engaged in production of high quality CBRN equipment like suits, masks and respiratory devices, collective protection shelters, radiological sensors and medical equipment. A lot of expertise (and in a few cases even sound R&D) has been instituted and a stable base is well in place. Most of these industries also have a ToT (transfer of technology) agreement with the DRDO.

However, CBRN is a low demand (less probability of occurrence compared to other crisis situations), low technology, very high impact industry. Therefore, any private industry entering the CBRN market needs to have another sustainable business avenue for survival. This has been one of the major factors for limited private CBRN industry in India. The second main issue is that there has been minimal government support for R&D, or assurance of orders of approved and passed products. This also applies to critical hazardous material (Hazmat)

The Defence Research and Development Organisation (DRDO), in partnership with Mahindra Defence Systems Ltd (MDSL), has unveiled a formidable new player in the field of Nuclear, Biological, and Chemical (NBC) reconnaissance.

equipment in the civil arena, like PPE, masks, special detection and testing kits, analysers, mass sanitizers and decon equipment.

Not-withstanding the above, there are some start-ups and diversified industries that have developed excellent equipment and systems mostly with Armed Forces and Covid 19 in view. These industries need to be encouraged to expand their range of products for wider CBRN threat mitigation. Similarly, the global spurt in drone (UAV) usage has led to many Indian start-ups and industry majors looking to develop an array of drones of various capabilities and sizes.

DHRUV – The Integrated CBRNE Detection, Hazard Management & Protection Solution.

It is heartening to note that the IT sector is also in the CBRN fray, with engineering college students developing control systems, CBRN software and even virtual reality (VR) training goggles for CBRN training. Yet, much effort and interest by government and private agencies is needed to truly meet the emerging CBRN technological challenges.

IDEX, DISC and ADITI

Innovation for Defence Excellence (iDEX) is an initiative by the Ministry of Defence (MoD) that aims at creation of an ecosystem to foster innovation and technology development in Defence and Aerospace by engaging industries including MSMEs, start-ups, individual innovators, R&D institutes & academia.

Taking the iDEX initiative further, Defence India Startup Challenge (DISC) has been launched by the MoD in partnership with Atal Innovation Mission, aimed at supporting Startups/MSMEs/Innovators to create prototypes and/or commercialise products/solutions in the area of National Defence and Security.

ADITI is another endeavour of iDEX to support the development, and acceleration of innovation in critical and strategic deep-tech technologies, which are in the nascent stage of research & development in the country.

Taking advantage of these initiatives by the MoD, it is recommended that focussed R&D and production be undertaken in the following areas:

- **Detection Equipment.** India has a good radiological detection devices industry. There is an urgent need for reliable Indian manufacturers making state of the art chemical and biological detection equipment.
- **Integrated compact detectors for Drones or UGVs.** Develop small reliable sensors which can be integrated with drones and Unmanned Ground Vehicles (UGVs).
- **Automated CBRN Sentries.** These robust stand-alone fixed or robotic devices can be deployed in a grid to give real time CBRN threat inputs. These are ideal for civilian use (critical infrastructure, municipal or district hazard mapping) or military use in field locations.
- **Protection Equipment**
- **Individual Protection Equipment (IPE).** Suit technology is changing. CBRN proof and self-decontaminating fabrics with negligible physiological stress need to be developed using nanotech and bioactive fabrics. Lighter, sleek Masks and breathing apparatus with longer operational capabilities and advanced filter tech need to be developed.
- **Armoured Vehicle and Shipboard Protection.** Latest advancements and new technologies for enhancing armoured vehicle and ship board CBRN protection (especially filtration) need to be integrated.
- **Decon Systems.** Decon is an often-overlooked area. Most of the available equipment is outdated and of obsolete technology. Advancements in self-decontaminating paints, lighter and more effective decon systems and greater efficiency decon agents are required. Sadly, as of yet, there are no Indian firms engaged in decon equipment manufacture.
- **Medical Management.** This is a field where India has made good progress. DRDO and other agencies have developed excellent drugs, antidotes and casualty management apparatus. There is still a need for better drugs, vaccines, antidotes, advanced triage kits and casualty management equipment. Casualty isolation pods and CBRN/Isolation ambulances are areas of interest.
- **CBRN Software.** Hazard mapping, situational awareness and decision support are critical areas of CBRN incident management. Already the world is looking for the use of AI and robotics-based systems to aid these areas. India has great potential for developing such software systems. Already some private players are working on Integrated CBRN Control

Rapidly **evolving** technological advancements are adding new **dimensions** of **threats** to mankind

UAV based CBRN Detection and Surveillance.

The COVID-19 pandemic is already having a significant impact on terrorism in a variety of ways.

systems and software, which can be effectively integrated.

- **Research.** There is a lot of scope for growth of private R&D. This will help in developing state of the art equipment, enhance healthy competition and garner greater synergy between DRDO/CSIR and private vendors for enhanced technological advancement.

- **Training & Simulation.** Key areas of interest are automated training aids and simulators based on in-service equipment. VR training aids being developed are a good move.

- **Testing Facilities.** While testing facilities for various CBRN equipment exist with DRDO/CSIR, there is a dire need to upgrade these. Approved private testing facilities are few. Internationally acclaimed and accredited research laboratories, in partnership with Indian companies, can engage the DGQA and DRDO for setting up state of the art testing facilities.

- **The Emergency Management Market.** The Emergency Management market in India is huge and just beginning to show its head. CBRN Safety and Security in establishments is still neither correctly understood nor enforced, especially in critical infrastructures and Chemical, Pharma, Paint and similar industries. Foreign CBRN Industry (especially Europe, USA and Israel) have a lot to offer in these areas, and there is no dearth of Indian clients (government, quasi-government and private).

Conclusion

The need for robust Indian CBRN industry is already felt by government agencies and the armed forces. A major field of CBRN equipment usage is the civil Emergency Management apparatus. Covid 19 has shocked us all with the emergent need of testing and protective equipment in huge quantities. Rising terrorist incidents and frequent industrial accidents are already making the authorities think seriously of CBRN Incident Management. With two belligerent nuclear powers on our borders, the threat of CBRN is real. It is time India takes note and encourages CBRN industry growth within the country, in keeping with 'Atmanirbar Bharat', for optimal National security. DSA

FOREIGN DIRECT INVESTMENT IN INDIA'S DEFENCE

Since the early 2000s, India has gradually liberalised its defence FDI rules in order to attract global investment, while also encouraging domestic production. Initially, the industry was opened up in May 2001, enabling 26 per cent FDI via government approval procedure. Subsequent policy amendments in August 2014 and June 2016 increased the FDI ceiling to 49 per cent and 100 per cent, respectively.

Foreign Direct Investment (FDI), is an investment made by a company or individual in one nation, into economic interests in another country. Unlike Foreign Portfolio Investment, in which investors simply purchase equity shares in a firm, FDI entails creating a long-term stake and large degree of control over the management of the foreign enterprise. In terms of India's defence industry, FDI has played a critical role in increasing industrial capacity, pushing technical improvements, and increasing self-reliance in defence production.

FDI Policies In The Defence Sector

Since the early 2000s, India has gradually liberalised its defence FDI rules in order to attract global investment, while also encouraging domestic production. Initially, the industry was opened up in May 2001, enabling 26 per cent FDI via government approval procedure.

Subsequent policy amendments in August 2014 and June 2016 increased the FDI ceiling to 49 per cent and 100per cent, respectively, with the latter requiring government permission above 49 per cent. In 2020, the government liberated FDI requirements even more, allowing up to 74 per cent FDI through the automated route for businesses seeking new defence industrial licenses and up to 100 per cent through the government route if it is expected to result in access to contemporary technologies.

These policy changes eliminated the need for the single largest Indian shareholder to control 51per cent of the shares and the three-year lock-in period on equity transfers. The Department of Defence Production implemented many steps to encourage investment, including Offset Policy to increase the investment and technology transfer in defence production, regular consultations with foreign original equipment manufacturers to address investment concerns, establishment of defence corridors in Tamil Nadu and Uttar Pradesh providing tailored incentives and plug-and-play support

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Tamil Nadu Defence Industrial Corridor (TNDIC) will develop five nodes, including Chennai, Coimbatore, Hosur, Salem and Tiruchirappalli.

to investors, defence investor cell to respond to investment-related inquiries and provided critical information, webinars with friendly foreign countries, fostering connections between Indian military firms and potential international investors, and a negative imports list to reduce reliance on imports and promote domestic manufacturing by identifying weapons and equipment that can only be purchased domestically. Furthermore, the draft Defence Production and Export Promotion Policy 2020, includes measures to achieve a turnover of Rs 1.75 lakh crore, including exports of Rs 35,000 crore, by 2025 (Press Information Bureau, 2022).

Impact Of Policy Reforms

FDI in the military industry is critical for India, which relies on imports for more than 70 per cent of its defence needs. The country devotes around 3 per cent of its GDP and 25 per cent of its yearly budget to defence (International Institute of Business Studies, 2023). Despite these expenditures, India has always failed to attract major international investment in the industry. The liberalisation of FDI policies in India's defence sector has resulted in considerable advantages. As of February 2024, the sector had received Rs 5,077 crore in FDI (Press Information Bureau, 2024).

This infusion of cash has permitted the creation of production facilities by major multinational defence companies like, Airbus (France), BAE India Systems (UK), Lockheed Martin (USA), Boeing India (USA), and Israel Aerospace Industries (Israel). A prominent example is Sweden's Saab, which became the first foreign business to receive 100per cent FDI in India's defence programs by establishing a plant in Haryana to produce the Carl-Gustaf M4 systems (The Print, 2024). The trend of inward flow of FDI in India's defence sector has been shown in the table below.

Year	Amount (In INR)	Amount (In US $)
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	2.37	0.05
2007	0	0
2008	4.50	0.10
2009	0.00	0.00
2010	0.00	0.00
2011	174.40	3.66
2012	22.10	0.40
2013	44.72	0.82
2014	0.00	0.00
2015	4.80	0.08
2016	6.46	0.10
2017	0.29	0.00
2018	156.74	2.14
2019	107.35	1.56
2020	95.85	1.32
2021	174.85	2.36
2022	260.55	3.27
2023	49.68	0.60
2024	290.00	3.49

*Please note that the 2024 data is only for Q1.
**All the figures are in million
Table: Inward FDI in Defence from 2001-2024

Source: Authors calculations based on DPIIT data (Accessed on June 29, 2024)

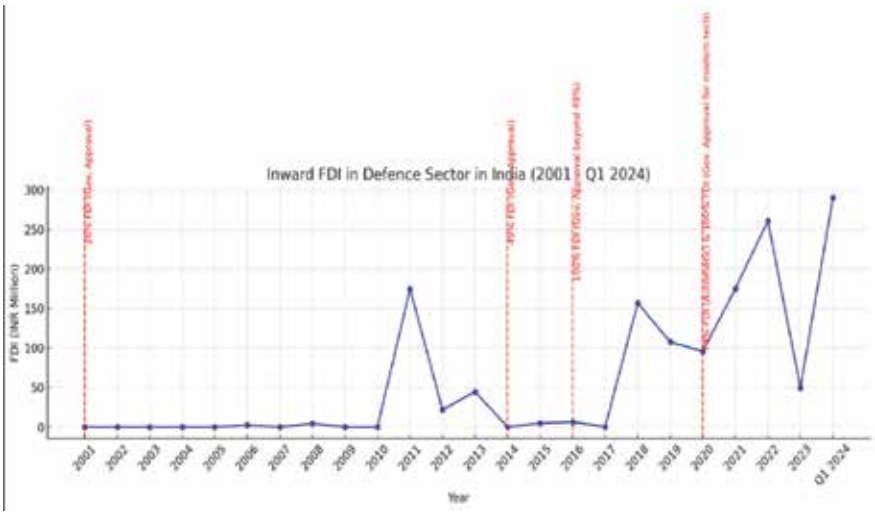

Figure: Inward FDI in Defence from 2001-2024
Source: Authors work based on DPIIT data

The graph above depicts inward FDI in India's military industry, from 2001 to the first quarter of 2024, as well as important policy developments that drove these investments.

Analysis With Policy Phases

Preliminary Phase (2001-2004)

- **Policy:** 26 per cent FDI allowed through government approval (since 2001).
- **Observation:** No FDI during these initial years, reflecting the conservative approach and high entry barriers for foreign investors. Historically, India had a conservative approach to foreign investments in defence due to security concerns and the strategic nature of the industry.

Initial Phase (2005-2010)

- **Policy:** Same as Preliminary Phase.

Saab officials & representatives of Swedish govt at facility in Haryana.

Foreign Direct Investment in India's **defence** sector has **significantly** transformed the **industry**

- **Observation:** The data shows almost negligible FDI in the defence sector during this period, with zero investments in 2005, 2007, 2009, and 2010, and only a small amount in 2006 (INR 2.37 million) and 2008 (INR 4.50 million). Minimal FDI, reflecting conservative policies, stringent regulatory environment, low investor confidence and limited openness to FDI in the defence sector.

Intermediate Phase (2011-2013)

- **Policy:** Same as Initial Phase.
- **Observation:** A significant spike in 2011 (INR 174.40 million), driven by significant investments in sectors like oil & gas from many big investors; but the FDI again experienced fluctuations post this due to unfavorable global economic conditions.

Growth Phase (2014-2019)

- **Policy Changes in 2014:** FDI cap increased to 49 per cent through government approval.
- **Policy Changes in 2016:** FDI allowed up to 100 per cent, with government approval beyond 49per cent.
- **Observation:** Noticeable increase in FDI post-2014, peaking in 2018 (INR 156.74 million), and 2019 (INR 107.35 million). This suggests improved investor confidence and increased foreign interest in the sector after Make-in-India campaign and policy changes.

Expansion Phase (2020 onwards)

- **Policy Changes in 2020:** FDI up to 74 per cent through automatic route and up to 100 per cent with government approval for access to modern technology.
- **Observation:** Sustained high levels of FDI from 2020, with a peak in 2022 (INR 260.55 million), and a significant surge in Q1 2024 (INR 290.00 million). These changes reflect the impact of liberalised FDI policies, making it easier for foreign investors to enter the market.

The examination of inbound FDI in the Indian military sector from 2001, to Q1 2024 demonstrates a transformational path shaped by legislative changes, strategic efforts, and global economic conditions. The initial low levels of FDI reflect the problems that international investors confront in the Indian military sector, which are related to tight FDI limitations, bureaucratic impediments, and security concerns. The surge in FDI after 2011 suggests regulatory improvements and a more favorable climate for international investment.

CEO of Lockheed Martin, Jim Taiclet met Prime Minister Narendra Modi. Lockheed Martin is a key partner in India-US Aerospace and Defence Industrial cooperation. We welcome it's commitment towards realising the vision of 'Make in India, Make for the World.'

Focusing on fostering strategic partnerships, India can **solidify** its position as a **global** defence **manufacturing** powerhouse

Policies such as the introduction of 49 per cent FDI through the automatic route, and 100 per cent through government approval, for situations involving access to current technology, which were introduced in recent years, have had a critical effect. The huge increase in recent years demonstrates the influence of legislative changes and the strategic relevance of foreign investment in strengthening India's defence capabilities. Future development will be dependent on continuous legislative support, smart alliances, and sustaining a favorable climate for international investment.

Advantages Of Increased FDI

Short-Term Impacts

- **Reviving the Economy:** New investment possibilities boost employment and economic growth, especially in the Micro, Small and Medium Enterprises sector.
- **Immediate Supply:** FDI addresses immediate defence demands and boosts military morale during times of geopolitical turmoil.
- **Boosting Investor Sentiment:** Improved FDI limitations increase investor confidence, attracting new local and foreign investors and promoting a good economic outlook.
- **Job Creation:** Increased FDI leads to creation of new jobs, both directly and indirectly.
- **Reduced Imports:** Increased investment boosts domestic output, decreasing reliance on imports and preserving foreign exchange reserves.
- **Encouraging Start-ups:** Eased FDI requirements encourage start-ups in defence production, leading to innovation and technical advancements.

Long-Term Impacts

- **Advancing Self-Reliance:** Policy measures such as 'Atma-Nirbhar Bharat' boost domestic production and minimise import reliance.
- **Technological Advancements:** Foreign investments in essential technologies, such as jet engines, enhance India's defence capabilities.
- **Boosting Exports:** India intends to increase defence exports to $5 billion by 2025, which can be made possible with liberated FDI policies.
- **Strategic Partnerships:** Fostering strategic ties through FDI strengthens India's position in the Indian Ocean region and promotes strategic partnerships.
- **Geopolitical Influence:** Foreign investment strengthens India's military sector, increasing its geopolitical power and strategic autonomy in regional and global affairs.

Limitations Of FDI In Defence

Despite these benefits, rising FDI in the defence sector presents a number of challenges:

- **Security Concerns:** FDI in critical defence industries increases security concerns and potential exploitation of indigenous resources.

BAE Systems wants to build 40 per cent of M777 in India.

- **Possible Monopolies:** Foreign investments and joint ventures may negatively impact native firms, resulting in increased competition or creation of monopolies.

- **Red-Tapism:** The FDI approval procedure, which requires several permissions from the Ministry of Home Affairs and Ministry of Defence, may be time-consuming.

- **High Investment and Rapid Obsolescence:** Defence investments demand large cash, extended gestation periods, and quick technical obsolescence.

- **Export Restrictions:** Governments restrict the export of critical technology, hindering international cooperation and acquisitions.

The Road Ahead

Foreign Direct Investment in India's defence sector has significantly transformed the industry, exemplified by the establishment of production facilities by global giants such as, Airbus, BAE India Systems, and Lockheed Martin. These investments have introduced cutting-edge technologies and operational improvements, enhancing India's defence capabilities. The liberalisation of FDI rules in India's military sector has greatly boosted production capacities, accelerated technical developments, and increased self-reliance. For instance, the establishment of Saab's facility in Haryana to produce the Carl-Gustaf M4 systems underscores the technological advancements facilitated by FDI. While policy reforms have drawn significant international investment and created a strong defence industrial environment, some obstacles persist. Foreign investors often navigate a complex regulatory landscape, marked by stringent approval processes and bureaucratic hurdles. Streamlining these processes could further bolster investor confidence and facilitate smoother operations. To reap the full benefits of FDI, the government must continue to expedite regulatory processes, create incentives for Research & Development, and maintain a competitive atmosphere. By integrating insights from policymakers, defence experts, and industry leaders, and focusing on fostering strategic partnerships, India can solidify its position as a global defence manufacturing powerhouse. With continued governmental backing and smart alliances, India can boost economic growth, advance technological innovations, and strengthen national security on the way. DSA

THE IMPACT OF MILITARY TECHNOLOGY ON SOCIETY

In this article, the author has only focused on India, a country which has a rich military history and a complex geopolitical environment leading to fast advancements in military technology, which in turn has various effects on the society.

Military technology has always been a significant factor which decides the power and status of a nation. From the use of ancient weapons in various historical battles, to advance missiles, nuclear technology and defence mechanism of a country today not only strengthen the security of a nation but also has a profound impact on the society of that nation.

Military technology in India plays a very important role in shaping political power, promoting economic growth, social structures as well as cultural identities. Gradually, as India is advancing in its military capabilities, it has

India Showcases QRSAM Anti-Aircraft Missile System at the exhibition at Army-2023 Expo.

ADITI JHA

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reinforced its national security and global standing. However, on the other hand, these advancements have seeped into society and have influenced government policies to the everyday of the common people.

This growth in military technology should also consider ethical values, environmental challenges like pollution and resource depletion, and other future problems like misuse of advanced technology.

In the early days, India was famous for its innovative war tactics like the use of elephants and chariots, as mentioned in Mahabharata. These tools were considered a symbol of power and strength at that time also. The different empires rose and fell, for instance, the Mughals, which in turn led to continued improvement in our military tactics and technologies. Next was the British colonial period which saw a major shift in Indian military technology. They introduced European weapons and military practices which drastically changed India's defence capability and the mechanism of it. Indian soldiers under the British command had access to modern rifles, cannons and other advanced weapons which were new to them. This period of the country not only transformed India's military forces

The Mahabharata, also called, The Kurukshetra War is a war described in our Hindu-epic, Mahabharata.

Gradually, as India is **advancing** in its military capabilities, it has **reinforced** its national security and **global standing**

Agni V, a long-range surface-to-surface Nuclear Capable Ballistic missile successfully launched from a canister on a road mobile launcher at the Dr. Abdul Kalam Island off the coast of Odisha.

but also started the modernisation of the defence systems of our country.

Post-independence India started to fulfill its goal of becoming self-reliant in the aspect of defence system. The process began by developing its own weapons and military technologies to move away from depending upon the imports. One important milestone was marked in 1998, when India developed its own nuclear weapons which helped India to gain status on the stage of global power, which was an important step towards attaining country's security and sovereignty. The evolution of military technology in India has been a compilation of external threats and the desire to be self-sufficient. In the contemporary word, India has built its own legacy while adapting to the challenges of modern warfare and global security needs.

The rapid growth of military technology in India has not only improved and strengthened the country's defence, while also on the other has affected many aspects of the society which includes political, economic, social and cultural dynamics.

Political Front

First and foremost are the effects on the political landscape of India due to the advancement of military technology. They have influenced both the domestic affairs as well as the international relations of our country. At the global level, India's advance missile technology, space capabilities and nuclear weapons have made it a key player in global geopolitics. These developments are crucial for India while keeping in mind its neighbors, particularly Pakistan and China, where military strength play a central role in maintaining the power balance. The deployment of advanced

Akash Missile System.

military technology such as Agni missile series, and the Brahmos Cruise missile has given India the opportunity to assert its strategic autonomy and pursue its national interest. In terms of the domestic aspect, military technology has led to militarisation of Indian politics, for instance, defence system shapes the electoral debates and majority of political parties use the topic of national security as an important issue to gain public support. Initiatives like "Make in India" in the defence sector show that they want to increase the domestic production and reduce foreign dependency, leading to strategy which will strengthen national security and economic reliance. Military technology also helps in maintaining law and order, protecting civilian populations and ensuring the stability of the state. As India continues to have both external and internal security threats, the political importance of military technology will always remain an important factor in shaping the country's future.

Economic Front

Defence technology has substantial impact on the economy of the country, industrial growth, innovation and job creation. The defence sector, which has a huge demand for military supplies and technological advancements, has led to its growth rapidly. Public sector industries like Hindustan Aeronautics Limited (HAL) and Bharat Electronics Limited (BEL) along with several private companies are engaged in producing a wide range of military equipment from basic arms to advanced fighter jets and missile systems. This increase in domestic manufacturing has led to a reduction in reliance on imports.

On the other hand, the economic impact is often accompanied by other challenges as well. Such as when a considerable amount of India's national budget is allocated to defence department, it raises concern about the opportunity cost involved. Critics often point out that the funds directed towards defence could be better invested in critical areas such as healthcare, education and social welfare programs. There is always an ongoing debate about how to balance military expenditure with investments in other sectors, showing how complex of a choice India faces to attain both security and development. However, the defence sector has also led to technological innovation, which in turn has a positive impact in civilian industries. For instance, research and development in military technology has led to advancements in space technology, telecommunications, and

Kalyani Group's wheeled, Enhanced Collaborative Autonomous Rover System (ECARS) during user trials.

cyber-security, among others.

While military technology is a significant contributor to India's economic development, it also tries to balance between national security needs and broader socio-economic priorities.

Social Structures And Cultural Dynamics

These areas are hugely influenced by the development of warfare technology. The Indian armed forces have a strict hierarchy and discipline, which they imitated from the broader social structures including traditional caste and gender roles. From the earlier times, certain groups have been more represented in the military and men mostly fill the combat roles. Although, there have been efforts to recruit people from diverse backgrounds and to include women in combat positions to change the long-standing patterns.

From the point of view of the cultural aspect, warfare is a great source of pride for India. Major milestones and achievements in defence or in military technologies are celebrated in popular media, including Bollywood movies and national parades. All this helps in showing how the public views the military, bringing about a strong sense of patriotism and national identity. This admiration for military strength influences how society views war, which most of the time only focuses on the glory of military success overlooking human costs involved.

Impact On Civilians

The impact of military technology goes beyond battlefield to the everyday life of the common people. common issues include privacy and civil liberties. For instance, the use of surveillance technology by the army with the help of law

The Indian Army uses a variety of indigenous sniper rifles for long-range engagements.

At the **global level** India's advance missile technology, **space capabilities** and nuclear weapons have made it a **key player** in global geopolitics

enforcement, leads to a debate about how to maintain a balance between nation's security and personal freedoms. The use of military level technology in civilian areas, particularly in counter terrorism, always raises a concern regarding the increasing presence of military methods in public life, which has an impact on the basic civil rights of the people.

The growth of defence advancements in India raises concerns about several ethical and moral questions. The most significant one is the development of nuclear weapons. However, India follows a "no first use" policy which simply means that it will not use nuclear weapons, unless attacked with them first. Even the existence of these weapons raises ethical dilemmas. The impact of military technology on human rights is particularly evident in conflict areas like Kashmir. The use of advanced weapons and surveillance during counter insurgency operations often results in civilian harm, displacement and long-term trauma. These incidents highlight the ethical challenges faced due to warfare technology, especially when it comes to protecting human rights amidst the conflict.

Environmental Impact

The advancement of military technology negatively affects the environment as well. Building and maintaining warfare weapons often leads to deforestation, destruction of natural habitats, and pollution. The use of heavy weapons and explosives can damage the land, contaminate the water sources and cause long

term harm to the environment. Managing nuclear waste and preventing accidents at nuclear facilities is a very critical challenge to ensure environmental safety, they produce lasting effects on the environment and the health of the nearby communities.

However, on the brighter side, there is growing awareness within India's defence sector about the need for more sustainable practices. There are initiatives which aim at reducing the military's carbon footprint by increasing the use of renewable energy, and minimising environmental damage during military exercises. There should be a balance between being prepared for defence and protecting the environment, which is a very complex and an ongoing challenge.

Stephen P. Cohen in his work has analysed how the role of Indian army in society has changed beyond just defending the country and handling the internal security. Historically, the Indian Army was mainly focused on these roles only, but Cohen introduces a "third role" where the army's influences extend in the civilian life through recruitment, training and its symbolic presence. Gradually, the focus of the army has shifted more towards external defence, and it has become more mobile and other forces mainly handle the internal security. Cohen mentions the problems when military's role is expanded for the societal development. One major concern is the weakening of civilian control. Expanding the military's non-military activities, like disaster relief, could increase its political power and decrease the

Military which are **isolated** from **social norms** may face issues like distrust and **internal friction**

Army, NDRF, police, fire and rescue staff carry out rescue operations after a landslide triggered by heavy monsoon rains, in Wayanad district.

Indian Army women recruits demonstrate their shooting skills as part of their training.

prestige of civilian politicians and administrative systems. This concern is quite important when considering the integration of advanced military technologies, enhancing the military's influence over society. He has also highlighted the political and social implications of military involvement in developments, when they are seen supporting a certain social or political group. This leads to the undermining of the democratic process. Lastly, Cohen suggests that with careful planning, proper budget and clear separation of roles, the military will be able to contribute to the society positively, without compromising its core functions.

Stephen Peter Rosen writes about the connection between the military and broader society, highlighting that military which are isolated from social norms may face issues like distrust and internal friction, which can reduce their effectiveness. Rosen critiques the neo-realist theory which believes that all the militaries of the great powers will become similar due to international pressures, by arguing that instead social structures play an important role in shaping military operations and performance. His analysis shows us the importance of understanding internal social dynamics to realise why different societies might exhibit varying levels of military effectiveness, extending beyond mere technological factors.

Conclusion

The author would like to believe that military technology has a big impact on Indian society, shaping everything from politics and economics, to social norms and culture. On the positive side, it strengthens national security. However, there are other challenges as well. Politically, too much focus on defence sometimes leads to sidelining other important areas like healthcare. Economically, heavy spending on the military is a major concern as well. Socially, there are traditional social structures, which are a problem. Although the increasing inclusion of women and diverse groups in the armed force shows a positive move towards equality. As India advances its military capabilities, it should also focus on balancing technological focus with democratic values. For the nation's long-term stability and prosperity, these advancements should align with principles of human rights, environment sustainability and global peace. DSA

INDIA'S JOURNEY: SELF-RELIANCE TO GLOBAL INFLUENCE

With the highest defence import from Russia and the highest export to the United States, India is maintaining a steady balance between the opposite ends of the pole. The defence manufacturing landscape of India has both seasoned enterprises and dynamic innovators.

Defence exports in India reached an all-time high of ₹6,915 crores in the first quarter of FY 2024-25, increasing by 78 per cent from the last year. The aspirations of India from being a predominantly import-dependent country, to becoming a global exporter in the defence sector are driven by the visionary policies and strategic initiatives of the Indian government. The evolution of India's defence sector has gone through three transformative phases: the launch of the "Make in India" initiative, the growth of self-reliance under "Aatmanirbhar Bharat," and the current push towards becoming a major exporter of defence equipment in the world.

Defence **exports** in India reached an **all-time** high of ₹6,915 crores in the **first** quarter of FY 2024-25

Hindustan Aeronautics Ltd in Sultanpur.

Since independence, India has relied heavily on imports to meet its defence needs, with a major portion of its budget being allocated to acquiring equipment from countries like Russia, the United States, France, and Israel. In the long run, this dependence has exposed India to vulnerabilities like, disruptions in the supply chain, fluctuating geopolitical relations and the high cost of importing advanced technologies. To overcome these challenges, the Government of India has put in great efforts to reduce the dependency on foreign suppliers by encouraging the growth of an advanced, and sustained indigenous defence industry. The Make-in-India initiative was launched in 2014 to lay the groundwork in this direction, marking the beginning of the strategic shift. This program was aimed at transforming India into a global manufacturing hub, with defence manufacturing as a key sector. It encouraged foreign companies to set up production facilities in India and incentivised

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Defence **exports** in India reached an **all-time high** of ₹6,915 crores in the **first** quarter of FY 2024-25

domestic companies to invest in research and development. This shift in policy was reinforced with the Aatmanirbhar Bharat campaign in 2020. However, this program was more or less a consequence of the lessons learned the hard way during the pandemic. These policies led to shrinking defence imports over three years (2018-21), from 46 per cent to 36 per cent. Meanwhile, the value of production by public and private sector defence companies increased from ₹79,071 crores to ₹84,643 crores.

Major Players In The Defence Sector

The defence manufacturing landscape of India has both seasoned enterprises and dynamic innovators. While it has been dominated by the public sector players historically, the liberalisation

Defence Minister Rajnath Singh and his American counterpart Lloyd Austin discussed "ongoing efforts to deepen the Major Defense Partnership between the United States and India in support of a free and open Indo-Pacific region", according to a statement from the US Department of Defence.

of the defence sector has invited the private sector entrants to play a prominent role in the industry, leading to an environment of competition and innovation. Public sector undertakings (PSUs) like Hindustan Aeronautics Limited, Bharat Electronics Limited, Bharat Dynamics Limited, and Mazagon Dock Shipbuilders Limited have been the backbone of India's defence manufacturing sector for decades. These companies have played a foundational role in the development and production of defence equipment in the country, ranging from fighter jets and helicopters, to missile systems and naval vessels. On the other hand, with favourable policies and environment from the government, private companies like MKU, Larsen & Toubro, Tata Advanced Systems, Mahindra Defence Systems, and Adani Defence & Aerospace have also made their inroads in the defence production and export sector, often in collaboration with global defence giants.

The defence manufacturing **landscape** of India has both **seasoned** enterprises and **dynamic** innovators

The Hindustan Aeronautics Limited (HAL) stands foremost in this field with its flagship projects such as the Light Combat Aircraft (LCA) Tejas, Advanced Light Helicopter (ALH) Dhruv, and the Light Combat Helicopter (LCH). These indigenously developed platforms have garnered international interest, with the Tejas LCA being pitched to countries in Southeast Asia, West Asia, and Latin America. When it comes to electronic warfare systems, radars, and communication systems, Bharat Electronics Limited (BEL) is causing stirs in the global defence markets with its Airborne Early Warning and Control (AEW&C)

Indian Army Dhruv Helicopter.

Mahindra Defence Systems is moving into offensive weapons development through a deal with US aircraft maker Boeing to produce F/A-18 Super Hornet fighters in India.

systems, Naval Sonar systems, and Electronic Warfare suites. The export of these high-tech defence technologies has further strengthened India's credibility in this domain. Simultaneously, Bharat Dynamics Limited (BDL) specialising in missile systems is a successful exporter of anti-tank guided missiles, surface-to-air missiles, and torpedoes to countries including Armenia and Egypt.

In the private sector, MKU is a leading name with its bulletproof jackets and helmets, exported to almost 100 countries in the world. Established in 1985 in Kanpur, this company has leveraged government policies, contributing significantly to this sector. Another emerging player, L&T, is actively seeking to export its naval platforms to countries in Southeast Asia and the Middle East. It has also developed and exported advanced missile systems, including surface-to-surface and surface-to-air missiles, contributing to India's growing reputation as a missile exporter. Moving to the aviation sector, Tata Advanced Systems has made great progress by manufacturing critical components for global aviation giants like Boeing and Lockheed Martin and is also involved in developing and exporting UAVs for surveillance and reconnaissance missions globally. One of the most important components of the manufacturing sector is defence vehicles. The two prime manufacturers of these vehicles are Ashok Leyland and Mahindra Defence Systems in India. While the former has been building its export business in 15 countries in Asia and Africa, in addition to serving the domestic defence business, the latter focuses on the production of armoured vehicles, including Mine-Resistant Ambush-Protected (MRAP) vehicles and armoured personnel carriers.

Including a vast range, from Tejas fighter jets to BrahMos missiles, India is ready to offer the global defence market some reliable and cost-effective alternatives.

Hot Markets And High Value Deals

With the highest defence import from Russia and the highest export to the United States, India is maintaining a steady balance between the opposite ends of the pole. The fact that the US is the largest destination for Indian defence exports signifies the strengthening of strategic partnership between the two countries. Beyond America, the export footprints of India extend to Southeast Asia, the Middle East, and Africa. Several strategic deals that have gained global recognition and are central to India's growing export profile include the export of Advanced Light Helicopter (ALH) Dhruv manufactured by HAL to

Defence Minister Rajnath Singh launches Indigenisation portal SRIJAN.

Ecuador, Mauritius, and Nepal. Similarly, the export potential of the BrahMos Cruise Missile, a joint venture between India and Russia is very high with countries like the Philippines and Vietnam, expressing strong interest in acquiring this cutting-edge missile system. Another key contributor to India's reputation as a defence supplier is the Akash Surface-to-Air Missile (SAM), developed by the Defence Research and Development Organisation (DRDO) and produced by BDL. It is designed to intercept and destroy aerial threats and has been exported to several countries in Southeast Asia and Africa. The naval equipment exports by L&T, to the South Asian countries are instrumental in establishing a strong impact on the Indian indigenous defence industry in the Indian Ocean Region.

These strategic exports highlight India's growing prowess and indicate towards a future with immense growth and opportunities.

Government Policies And Future Prospects

The policymakers within the government are well aware that building an indigenous defence industry is not a quick fix, but a long-term commitment that requires sustained effort and strategic vision. The establishment of defence industrial corridors in Tamil Nadu and Uttar Pradesh is a major step in this direction. These corridors are designed to attract investment, promote innovation, and create a supportive ecosystem for defence manufacturing. Ministry of Defence has also launched a SRIJAN portal to promote indigenisation by the industry. As of date, 19509 defence items, which were earlier imported, have been uploaded on the portal for indigenisation. Out of them, the Indian industry has shown interest in the indigenisation of 4006 defence items so far.

The budgetary allocations of the financial year 2024-25 also indicate the efforts of the Indian government to materialise these aspirations. A budget of ₹6, 21,940.85 crores (approx. US $75 billion) to the Ministry of Defence is a significant upgrade from the last year, increasing by 9.4 per cent. The government has set ambitious targets, aiming to reach ₹35,000 crores by 2025 and ₹50,000 crores by 2028-29 in defence exports. Looking at the structured and sustained growth, the targets seems achievable. However, the complexities of global defence markets, including stringent regulations, high entry barriers, and intense competition from established defence exporters, pose hurdles for Indian companies. There is certainly a long battle to fight for the indigenous industry in India to compete with the global defence giants. India has come far ahead on this journey, and the combination of strategic vision, industrial growth, and effective policy-making will remain essential in paving the way forward. DSA

FROM CONSUMERS TO PRODUCERS: INDIA'S CHANGING DEFENCE SCENARIO

India's journey towards self-sufficiency in the defence sector has become a key component of its broader economic and strategic ambitions. The country has gone from being a major importer of military equipment, to emerging as a significant player in the global arms export market. This transformation is driven by the government's concerted efforts to promote domestic defence production, reduce dependence on foreign suppliers, and establish India as a major global hub for defence production.

The Evolution Of India's Defence Industry

India has made significant progress in the defence sector in recent years, emerging as a major exporter of armaments and military technology. India's transformation from a net importer to a defence exporter reflects a long-term strategy aimed at enhancing self-sufficiency and consolidating the country's position as a global player in the defence sector.

Historically, India has been one of the world's largest arms importers, relying mainly on supplies from countries such as Russia, the United States, Israel and France. However, with the aim of reducing dependence on imports and thus vulnerability of various kinds, and especially with the intention of stimulating domestic industry, the Indian government has launched various initiatives to promote the export of Indian military equipment. Among these initiatives, the 'Make in India' programme has been particularly significant, encouraging local production of equipment and collaboration with foreign companies. In short, the programme aims to facilitate the inflow of foreign capital, and contribute to India's industrial prosperity, as well as the innovative strengthening of the national economy. By developing domestic technologies and systems, India aimed to reduce its dependence on imports and create a robust ecosystem for defence production.

Increasing domestic production would fill a very important strategic gap, adding an additional benefit: making India's arsenal, currently characterised by foreign weapon

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systems that are often incompatible, more coherent and integrated.

In fact, the defence industry has been at the heart of the 'Make in India' initiative promoted by Prime Minister Narendra Modi, as he emphasised recently at DefExpo, the biennial exhibition dedicated to weapons and military equipment held in Chennai.

Besides strengthening domestic capabilities, India has increasingly focused on expanding its presence in the global defence export market. This shift is part of a broader strategy to strengthen India's economic influence and strategic partnerships, while generating revenue to finance further advances in defence technology.

Despite this, India remains one of the world's largest arms importers, ranking fourth in 2018, with an expenditure of $1.53 billion. This increase has been facilitated by a set of favourable government policies, including tax incentives, simplification of licensing procedures and the creation of a more robust infrastructure for defence production. The main suppliers are Russia, the US, Israel and France. However, the country is gradually reducing imports: the 2018 figure represents a 47 per cent decrease from the previous year.

At the same time, India's defence exports have seen exponential growth, rising from around 2 billion rupees (around $25 million) in 2014-2015 to around 13 billion rupees (around $1.6 billion) in 2021-2022. This increase was facilitated by a set of some favourable government policies. The growth was 16.7 per cent from Rs 1,086.84 billion (about EUR 12 billion) in 2022-23 and is in continuity with the trend of the past five years. Industry contributed to about 79.2 per cent of the total value, while private industry contributed 20.8 per cent.

According to the Indian administration, 'Make in India' has exceeded expectations, ensuring increasingly favourable conditions for the industry.

The **defence** industry has been at the **heart** of the 'Make in India' initiative promoted by **Prime Minister**

Infusing the power of Atma-Nirbharta, Modi Ji has fortified India's defence.

Key Markets And Strategic Partnerships

Another important factor to focus on is India's clear desire to direct its defence exports primarily to the South East Asian region. South and South East Asia, Africa and Latin America have become the main export markets for the Indian defence industry. The countries such as Myanmar, Vietnam, the Philippines and Mauritius have purchased Indian defence products, and India has signed several memorandums of understanding (MoUs) to strengthen defence cooperation with these countries.

Secondly, Indian defence companies have increasingly focused on developing products that meet the needs of international markets. For instance, HAL's Tejas light

combat aircraft, BEL's radar systems and BDL's anti-tank guided missiles have attracted the interest of countries in Asia, Africa and Latin America. These products are often more affordable than their western counterparts, making them attractive options for countries with limited defence budgets.

Moreover, its ability to offer customised solutions that meet the specific needs of importing countries, has proved to be one of the key factors in India's success in these markets. For instance, India has supplied naval patrol vessels to Mauritius, radar systems to Myanmar and helicopters to Nepal. These exports not only strengthen India's defence ties with these countries, but also increase its geopolitical influence in strategically important regions.

> India has the **potential** to become a major **global** supplier of defence **solutions**

The exponential increase in exports has led to the growth of partnerships with other nations. These partnerships are important for the creation of joint military projects and the production of defence systems, technology exchange and research development with other countries. Among the main partners, it is interesting to mention the collaboration between

The Battlefield Surveillance Radar and Air Defence Fire Control Radar- Atulya from BEL.

Israel and India on various defence projects, including missile systems and unmanned aerial vehicles (UAVs); or with Russia, with whom India has a long-standing partnership in military production, with joint ventures such as the BrahMos missile system.

Challenges And The Path Ahead

Despite the great strides India has made in the global defence export market, there are still challenges to overcome to establish itself as one of the world's leading defence hubs. The effort made by the Indian government and the entire industrial apparatus must only be the beginning of a path that will bring more research and development to compete in the rapidly changing technological landscape.

Another point to be analysed is the intense competition in the global defence market. India competes with established arms exporters such as the US, Russia and China, which have well-established defence industries and extensive customer networks. India's goal should be to target niche markets, seeking to offer unique value propositions such as affordability, customisation and after-sales support.

This pre-supposes a market strategy that is not improvised and, above all, that is associated with relevant foreign defence objectives. The geopolitical landscape of the defence industry is a difficult terrain to explore, where one has to balance defence ties with major competitors and world powers.

Looking ahead, the Indian government aims to achieve a defence export volume of $5 billion by 2025. To achieve this, India will have to continue to develop advanced technologies, improve the quality of its products and establish strategic partnerships with countries that need reliable and cost-competitive military equipment. First, the government must continue to provide policy support and incentives to the defence industry. This includes further simplifying export procedures, offering tax concessions and creating export financing mechanisms. Secondly, Indian defence companies should prioritise innovation and technological advancement. By investing in cutting-edge technologies such as artificial intelligence, cyber-security and autonomous systems, India can position itself as a leader in next-generation defence solutions.

Third, India should continue to build and strengthen strategic partnerships with other nations.

DRDO showcases indigenously developed Mounted Gun System at MSME Defence Expo 2024.

India's first indigenous bomber UAV unveiled in Bengaluru. The FWD-200B is a medium-altitude, long-endurance (MALE) unmanned combat aerial vehicle designed and manufactured entirely in India.

Indian **defence companies** have increasingly focused on developing **products** that meet the needs of **international** markets

Collaborative projects, joint ventures and technology transfers can help India access new markets and improve its defence capabilities. Moreover, these partnerships can contribute to regional security and stability, aligning with India's broader strategic goals.

Conclusion

The Indian defence industry has made remarkable progress in recent years, transforming itself from a largely import-dependent sector to an emerging global arms exporter. Thanks to initiatives such as 'Make in India' and a focus on domestic capability development, India has emerged as a key player in the global defence market.

In conclusion, India's military export is set to grow, supported by strong government commitment and innovation by local companies. Although there are still challenges to overcome, India has the potential to become a major global supplier of defence solutions, strengthening its geopolitical position and self-sufficiency in the sector. The country's strategic approach to arms exports, coupled with continued innovation and strong international partnerships, positions it well for future growth.

By continuing to expand its presence in the global arms market, India will not only strengthen its economic and strategic influence, but also contribute to global security, by providing reliable and cost-effective defence solutions to countries around the world.

With the right policies and sustained efforts, India's defence industries have the potential to become a cornerstone of the country's economic and strategic landscape, driving growth and promoting international collaboration in the years to come. DSA

A TALE OF TWO WARS

"Wars maybe fought on the battlefield, but are decided on the negotiating table"

A surprising turning point in the 30-month long ongoing Russia-Ukraine War is the recent 10 kilometer deep incursion by Ukraine inside west-Russian territory of Kursk, bordering Ukraine. The tactical move has left experts surprised as it comes after Kyiv had lost significant territories to Moscow. In a similar striking move, the other war, between Israel and Hamas, which has gripped the world for the past 10-months, too has taken some compelling strides as the top Hamas leader, Ismail Haniyeh, was recently assassinated inside Tehran, thereby provoking Iran for an escalation.

Relatives of hostages held by Hamas in the Gaza Strip and their supporters protest in Tel Aviv, Israel, 15 August 2024.

The Russia-Ukraine War and the Israel-Hamas conflict are distinct in their origins, nature, and geopolitics, and therefore share more dissimilarities than similarities, but have had their respective geopolitical implications globally.

The Russia-Ukraine War is a large-scale conventional war involving land, air and naval forces, historically deep-rooted in national identities shaped by territorial disputes. The present war escalated in 2014, when Russia annexed Crimea, following which, in February 2022, Russian forces launched a full-fledged invasion of Ukraine. The civilian casualties, destruction of infrastructure, loss of equipment, displacement of citizens and economic meltdown are the fallouts of this conflict.

The Israel-Hamas conflict is not a conventional war, but a regional clash, dating back to more than a century over territorial claims involving aspirations of Jews and Palestinians. This conflict is asymmetrical, with Israel's state

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military facing-off against Hamas' militant and guerrilla tactics. The present-day conflict is a result of periodic escalations since Hamas-a proxy backed by Iran, took control of the Gaza Strip in 2007. The Hamas-led attack on 07 October 2023, on a musical event inside Israel, left thousands killed and wounded and more than 250 civilians were taken captive.

Weaponry

Russia-Ukraine

Ukraine backed and aided by the US-UK-led West has been fighting with NATO-standard arms like the highly advanced US F-16 fighter jets, AK-74, M4 riffles, machine guns like PKM, M240, Barrett M82, SVD Dragunov sniper rifles. Anti-tank weapons like the American fire-and-forget anti-tank guided missile (ATGM)- Javelin, Next-generation Light Anti-tank Weapon, provided by the UK. Ukrainian-made ATGM, Stugna-P, effective against Russian armor, along with Man-Portable Air Defence Systems (MANPADS), are the other powerful arms in this war. The US-made, Stinger missile, and Piorun, a Polish-made, shoulder-fired missile system, have been Kyiv's mainstay so far.

The American M777 Howitzers: 155mm artillery along with HIMARS (High Mobility Artillery Rocket System), the French-made CAESAR Self-Propelled Howitzers, are the highly mobile artillery for Ukrainian use.

Ukraine has been fighting with its Soviet-era T-72 and T-80 tanks, besides the American Bradley Fighting Vehicles, German-made, advanced main battle tanks Leopard 2, NASAMS- Norwegian Advanced Surface-to-Air Missile System, Soviet-era S-300, US-made, long-range air defence-Patriot Missile System, Bayraktar TB2 Turkish and American Switchblade drones, for enhanced support.

Ukrainian anti-ship missile, Neptune, used for sinking Russian vessels, French Storm Shadow/SCALP-EG: long-range cruise missiles are other systems being used by Ukraine.

Russia entered this war with its more sophisticated and advanced weaponry like the Armata T-14: advanced main battle tank, along with infantry weapons like AK-74 and AK-12, SVD Dragunov sniper rifle, PKM Machine Gun, T-72, T-80, and the T-90 main battle tanks, 2S19 Msta-S: 152mm self-propelled howitzer, BM-21 Grad Multiple rocket launcher system for high fire-power and Iskander-M: Short-range ballistic missile system for precision strikes, the S-400 long-range surface-to-air missile system, Kinzhal

The S-300 is a series of long-range surface-to-air missile systems developed by the former Soviet Union.

hypersonics, Pantsir-S1, Tor-M2, Su-35 fighters for air superiority and ground attacks, the Ka-52 "Alligator" attack helicopter, heavily used in ground operations, Tu-95 and Tu-160 bombers, Kalibr cruise missiles used for strikes on Ukrainian infrastructure, Kh-101 and Kh-55 missiles, and drones like Orlan-10 and Shahed-136 (Geran-2 Iranian-made kamikaze drones along with the Kilo-class submarines.

Indian Army's Lt-Gen Subrata Saha (retd) says, "We are witnessing a seesaw of technology - sometimes Russia has the edge, and on the other occasions Ukraine, with the help of technology-entrepreneurs from the western countries, manages to get the lead. For example: in the latest Kursk offencive, Ukraine appears to have got the better of Russia in the race between drones and jammers."

Israel-Hamas

The Israel-Hamas War has seen a wide array of weapons used by both sides. Hamas has been launching thousands of rockets and missiles towards Israeli cities, including Qassam rockets, homemade short-range rockets, Grad missiles-Soviet-era artillery rockets, the Fajr-5 missile-Iranian-supplied rockets with a range of up to 75 km, M-302 missiles, mortars, drones, AK-47 assault rifles, PKMs and other types of light machine guns, and Rocket-Propelled Grenades (RPGs). Hamas has also used ATGMs like the Kornet to target Israeli armored vehicles,

Israel, on the other hand, has conducted extensive airstrikes through its advanced fighters like F-16 and F-35, quipped with precision-guided munitions, and the American Apache attack helicopters. Iron Dome-the Israeli missile defence system used for intercepting incoming rockets and missiles, heavy artillery to target Hamas positions in Gaza, Merkava tanks and armoured vehicles, drones, naval ships and submarines, are other systems being utilised by the Israeli Defence Forces (IDF).

It may be noted that in the Israel-Hamas conflict, gaps and inadequacies of high-tech defence capabilities are being exploited by commercially available simple but effective technology and techniques; for example, the offencives launched from the shadow of border-surveillance systems and overwhelming the Iron Dome.

Artificial Intelligence, Cyber And Electronic Warfare

The use of artificial intelligence (AI) in the Israel-Hamas and Russia-Ukraine Wars demonstrates the evolving nature of modern-day warfare. Both conflicts have seen the deployment of AI technologies, but the scale, applications, and impacts differ.

Russia-Ukraine

Both Russia and Ukraine have utilised AI-powered reconnaissance drones for gathering intelligence and conducting surveillance on the battlefield.

AI has been crucial in cyber warfare tactics employed by both Russia and Ukraine, as AI algorithms detect anomalies and respond to cyber threats in real-time. Russian forces have also used electronic warfare (EW) systems to jam Ukrainian communications.

Israel-Hamas

This was the first-time AI had been used in a frontline conflict, when Israel successfully used robots inside Gaza to locate tunnels in the initial days of the conflict.

Israel has also extensively used AI-powered drones for surveillance and reconnaissance. These drones can identify, track, and neutralise threats with high precision. AI-driven facial recognition systems are used at checkpoints and border crossings.

The Israeli Iron Dome missile defence system leverages AI to detect, track, and intercept incoming rockets and missiles.

In the Israel-Hamas conflict, the use of AI is more localised and focused on defence systems, surveillance, and cybersecurity. While the Russia-Ukraine War has seen broader and more diverse applications of AI, including autonomous systems, cyber warfare, and strategic analytics.

AI's role in both the Israel-Hamas and Russia-Ukraine conflicts highlights its transformative impact on modern-day warfare.

Israeli soldiers in the Gaza Strip, January 2024.

Tactical Military Strategies

Russia-Ukraine

Russia initially attempted a blitzkrieg-style invasion, aimed at quickly capturing key cities, including Kyiv, Kharkiv, and Mariupol, involving combined arms operations, by engaging mechanised infantry, tanks, and air support. Russia deployed airborne units to seize strategic locations near Kyiv, to facilitate the rapid movement of troops and supplies.

Encirclement and siege tactics to isolate Ukrainian cities, heavy artillery barrages, with cities like Mariupol, Severodonetsk, and Bakhmut experiencing relentless shelling, attrition warfare, prolonged engagements, utilisation of mercenaries of Wagner Group and Chechen fighters, hypersonics and fortifications have largely been the Russian approach.

Ukraine, on the other hand, has mainly resorted to asymmetric warfare and Guerrilla tactics, employing ambush and hit-and-run, prior to the recent counter-offensive undertaken by Kyiv inside Kursk.

Fortifications, use of civilians and militia, counter-offensives and recapture operations, combined arms operations with precise intelligence to punch through Russian defences and exploit weaknesses, has been Kyiv's strength.

The Russia-Ukraine War has seen both conventional and unconventional tactics, with Ukraine leveraging asymmetric strategies with Western support to resist and reclaim territory, while Russia has relied on its larger military and resources, but faced significant challenges in achieving its objectives.

Israel-Hamas

Hamas applied the ancient military strategy of –"surprise attack", by launching a massive, coordinated surprise attack into Israel on 07 October 2023. The attack was timed to catch Israeli forces off-guard, exploiting a holiday period in Israel.

A Ukrainian serviceman guards his position in Mariupol, Ukraine.

Hamas has used a network of underground tunnels for infiltration, movement of fighters, and launching surprise attacks. Thousands of rockets and missiles have been launched in large salvos to maximise the chance of hitting targets and overwhelming Israeli defences. Making use of urban warfare, Hamas has embedded its fighters and infrastructure within densely populated civilian areas in Gaza.

The IDF depends mostly on a large-scale ground offensive, extensive precision airstrikes targeting Hamas leadership, weapons storage facilities, rocket launch sites, and destroying tunnel networks. It has continued its practice of warning civilians in Gaza before strikes.

The IDF has employed combined arms tactics, integrating infantry, armor, and engineering units with close air support to penetrate deep into Hamas-controlled areas. Drones, the Iron Dome and leveraging its extensive intelligence-gathering capabilities, are other important tools employed by the IDF.

Geopolitical Implications

In both the wars, both sides have been accused of violating international law, including targeting civilians and committing war crimes. There are ongoing investigations by international bodies, such as the International Criminal Court (ICC). Peppered with sabotage operations, assassination attempts, banned chemical usage, etc., both the wars are nowhere nearing an end, and also lack clarity in what a victory might look like.

Lt-Gen Saha (retd) adds, "Strategic, Operational and Tactical are three levels of warfare. Typically, tactical manoeuvres are woven together through deft operational art to achieve strategic goals. When wars prolong, both the political objectives and military strategy must be questioned." DSA

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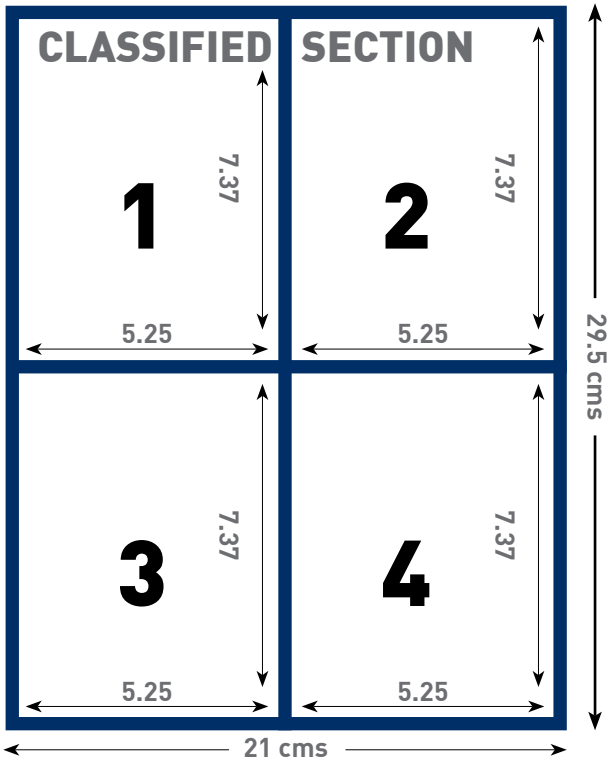

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