

Defence Technology Ecosphere for Viksit Bharat

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The Government of India is pursuing the goal of ‘Viksit Bharat’ by 2047 through the route of *atmanirbharta* self-reliance. It is in fitness of things that the roadmap to ‘Viksit Bharat’ is made, goals for each sector are defined and ecosystem is developed to achieve the goals in mission mode. These will require concerted teamwork by various stakeholders, a holistic approach and dynamic cause–effect decision-making (dynamic programming technique) based on sound logics, technological capabilities (existing and to be developed), cooperation, collaboration and coordination. The execution will require visionary leaders at each level, that is, leaders who have foresight, are willing and are able to analyse their own performance, debate alternate strategies and are aspirational leaders to their teams. With the Ministry of Defence (MoD) having large tangible and intangible effects on capital expenditure, technology readiness level, and sense of security for business and employment, the need for such leadership and supporting holistic ecosystem does not need greater emphasis.

To be fair to the political leadership, the government has been publicly announcing its intent of turning the country from a net weapons importer to a net exporter: US\$ 25 billion turnover of defence production and US\$ 5 billion export per year by 2025—and now, US\$ 8 billion export per

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year by 2028; and major armoury of Indian defence forces to be made in India. Against these goals set by the political leadership, the Indian defence technology ecosystem, in the recent times, has been able to produce military goods worth US\$ 9–12 billion, with exports amounting to US\$ 2–2.24 billion approximately.^{1,2} Curiously, while exports have grown in value (matching with the planned target for 2023–24, although far behind the goal for 2025), overall production has seen a fall. Further, the country has remained the top importer of weaponry in the world.³ Obviously, something has not gone as well in ecosystem as envisaged. It is, therefore, worth analysing the adequacy of set goals and sufficiency of steps taken. This analysis should lead us to the requirement for further structural changes or reforms 2.0 in the defence sector.

THE GOALS

As mentioned earlier, the Government of India set the goal of US\$ 25 billion of defence production and US\$ 5 billion export per year by 2025.⁴ Military goods production worth US\$ 10.4 billion and export worth US\$ 1.5 billion in 2018–19 were the baselines while setting the goals.⁵ Thus, the aspiration was to, more or less, treble production and exports in six years. Even though the country has achieved record production and exports during the current financial year, it is clear that the ecosystem has not delivered as per expectations.

Recently, the Defence Minister set the target of Rs 3 lakh crore production and Rs 50,000 crore exports by financial year 2028–29 (approximately US\$ 35 billion and US\$ 6 billion, respectively, at the current rupee-dollar exchange rate).⁶ Hopefully, these goals must have been set after due analysis of the ecosystem and requirements, with an overall outlay in contribution to Viksit Bharat by 2047.

Sector-wise analysis of economic data of countries indicates that developed economies are also significant defence exporters. Keeping in view the size of the country, the likelihood of India becoming a US\$ 35–45 trillion economy by 2047 (although pessimists peg this figure at US\$ 25–26 trillion) and the percentage of contribution of defence sector in developed countries, it may not be out of place to expect defence sector manufacturing in India to scale up to at least US\$ 300 billion and exports up to US\$ 35–45 billion per year.⁷ Thus, our ecosystem, policies and decisions should endeavour for about 35-fold production and 20-fold export values in the remaining 23 years.

However, these numbers do not tell the whole story. Which systems need to be produced, and how many, and which technologies need to be pursued to realise the numbers depend on the military vision for the country. For example, should our navy control the Indian Ocean or should we be satisfied in dominating only the Bay of Bengal and the Arabian Sea? Should we have the capability to conduct operations on demand, including in hotly contested regions, like the South China Sea and the Taiwan Strait? Should we be satisfied with defending our territories on western and eastern fronts, or should we develop capability to capture back the lost territories and/or conduct operations and hold on to enemy territories anywhere in the world? Should our perception of enemy and friendly countries remain restricted to our neighbourhood or should it get expanded to potential threats anywhere in the world? Should we take advantage of the geo-security scenario to boost our exports or should we remain non-aligned? While many of these and similar questions may never be answered, at least in public, the integrated capability development framework being developed by Integrated Defence Staff (IDS) must answer these questions through a technology-cum-product induction roadmap of the services.

Thus, technology capability aspirations of the services, procurement roadmaps, global market with the 'Indian-User-First policy', etc., should drive the required revamping of the existing ecosystem, including investment, to achieve quantitative targets.

THE BOTTLENECKS

It may be worth pondering over the limitations of the existing ecosystem to understand the rationale of recommendations in the later part of this commentary.

The MoD has been making structural changes in procedures, policies and establishments over the past years, based on recommendations of various high-profile committees. These changes, however, are organisation/department specific, bereft of holistic vision for the country. Conversion of Defence Procurement Procedure (DPP) to Defence Acquisition Procedure (DAP) has not made significant difference in the way the business is being conducted. Spiral development and acquisition policy, even though the topic has been in discussion for several decades, is yet to find firm root in the system. Major technology/weapon system/platform development project approvals take several years with India-specific, final requirement-meeting product in mind. Trials take endless times, while GS evaluations last up to eternity.

Acquisition volumes and timelines are still vague. Profit is still a bad word, leaving the entrepreneurs with little money to spend on spiral development and next-generation technologies. The pricing mechanisms, despite policy in place, still favour the lowest bid, as against the technically highest capability bid. Enabling trial mechanisms for non-QR products are absent.

A stronger handholding of industry by the government for export, apart from policy framework, needs to be in place. 'Make in India, Make for the World' programme needs to support Indian intellectual property (IP); and it must not be allowed to become a backdoor entry gate for foreign technologies. The IP policies are still tilted in favour of the government, leaving very little manoeuvring capability to the start-ups against venture capitalists/angel funders. There is also a sense of 'us and them' in the minds of government functionaries when it comes to the private sector. The funding and procurement agencies have the feeling of masters rather than being public servants. There are hardly any long-term research partnerships between the government and academic institutions. There is also a tendency of one-upmanship among various stakeholders, resulting in a rush to carry out someone else's job rather than concentrating on one's core activities and targeting of low-hanging fruits. There are several such systemic issues.

Similarly, availability of resilient global supply chains, acceptance of tier structure of Indian industry (system integrators, system/sub-system suppliers and component/assembly suppliers), the readiness of Indian industry to Industry 4.0 or 5.0 standards and beyond, integration of quality assurance (QA) agencies, limited resources in certification agencies, etc., demand serious attention among technical and technological issues.

Then, there are administrative/procedural issues. Even a casual discussion with any competent financial authority is good enough to convince that the financial process in the MoD needs a serious review.

SUGGESTIONS

A quick look at 'Trends in International Arms Transfer 2023' indicates that Indian defence exports, despite a ten-fold increase in 10 years, still account for less than 0.2 per cent of the world market.⁸ A large number of suggestions to improve defence technology ecosystem have already been published, such as^{7, 9-14} enhancing ease of doing business with the government; proper optics for indigenous technologies; policies for moonshots; defence technology diplomacy; optimisation of resources for maintenance, repair and operations; widening of whole-of-India approach; showcasing indigenous weapons

during exercises; Defence Export Promotion Agency (DEPA); export revenue to fund Defence Public Sector Undertakings (DPSUs)/research and development (R&D); attractive pricing mechanism; long-term procurement commitments; necessity of Indian IP for systems; exploring export possibilities of ships and submarines; investment in high-end technologies and human power; improving industry standards; removing mandatory link between development projects and QR; dedicated wings for testing and certification of products; internationalisation of defence R&D; and defence technology-specific degree and skill development courses. However, the time has come to make further structural changes in the ecosystem. Some of them are discussed next.

Civil–Civil Fusion

There are several aspects that need attention in the MoD, both within the government and outside in the civil sector. Some of the indicative issues are discussed next. However, these need to be brainstormed among the players and an acceptable way forward needs to be worked out.

Fusion within the MoD

First and foremost, an atmosphere of trust needs to be created among dominant players in the defence technology sector. Single-point responsibilities need to be fixed and duplication of efforts needs to be avoided within the MoD itself. All departments, organisations and appointments should own product life-cycle from womb to tomb. Inter-departmental transfers should become norm, rather than exception, to bring integration in public services. Towards this, the point of service officers being appointed in the positions of authority in the DRDO, the DPSUs, QA agencies, etc., has been over-emphasised beyond proportion, without realising the importance of their training in relevant disciplines required by these organisations. Inter-departmental transfers will solve this issue. Likewise, deputation of DPSU engineers, DRDO scientists and QA executives into service establishments has hardly got any traction in reforms, thus depriving the benefits to both sides.

It is equally important that services must trust indigenous systems and not take them as decisions thrust on them. This will enable technically oriented service personnel to get into details of technology, identify limitations and propose innovations, innovate on usage of current technological capabilities and gather relevant data in the field to plan for next generation of equipment. Reliable Indian data are vital for integration of new-age technologies like artificial intelligence (AI), autonomous systems and man–unmanned

teaming, into legacy systems. Sadly, the data are either not available or not accessible to the developers.

Clear-cut, unambiguous rules need to be promulgated for financing defence R&D. There needs to be a separate budget for R&D department of defence in the MoD, as against a certain apportionment of military budget currently. The R&D budget should be in proportion to national ambitions and aspirations. The procedure to allocate/sanction R&D funds to research service providers should be reasonably fast and time-bound. Endless consultation processes in departments, clarifications and negotiations exhaust the research service provider/investigator/project team before the project even starts. In many cases, the time to sanction from initiation may be of the same order as the time to conduct R&D. It may be a good idea to conduct research on these aspects for, say, the last five years and formulate a policy to curb delays wherever they are occurring. Delays in approval processes should be curtailed, made time-bound and owned by everyone, including defence finance. Defence finance and audit should not be allowed to remain aloof from the implementation of government directives and capability development, or lack of it, as most delays/objections happen in finance and audit. The policy framework must encourage outcome-driven processes rather than word-by-word compliance of manuals.

The R&D, being a business to create new knowledge, product or process, will have more partial successes (failures, as called in the Indian audit system). A fixed time schedule cannot be estimated accurately for an R&D activity as it depends on the availability of latest and state-of-the-art resources. The overall ecosystem of the country, including the expertise in academia, laboratory and industry; capability to integrate diverse requirements and scattered resources; adequacy of funds to explore alternative processes simultaneously; business potential of the resultant product; geopolitical/geo-security situation to tap global supply chains and trusted partners; and so on, are all important factors which determine full/partial success and timely/delayed completion of projects. The country needs to have policies and processes to absorb expenditure on these partial findings and/or delays in project completions and immunise fund-sanctioning authorities from incarceration by audit.

Fusion outside the MoD

Currently, there is no process, except a mechanism of sub-project, to harness countrywide expertise, both in public and private, for developmental projects. Perhaps, it may be worthwhile to look at the model of pooling expertise in the Intelligence Bureau (IB). The IB assembles the best brains

available in the country on a tenure basis. It is the diverse knowledge pool of such officers that delivers the kind of intelligence required for the security of the country. It may be worth exploring the possibility of assembling required brains from all over the country for R&D on a project on tenure basis. This will not only bring the expertise of R&D personnel together but also the resources and test facilities. The government may like to explore an all-India service, like Indian Science Service, towards integrating scientific institutions of the country. In addition, scientists must be allowed sabbaticals to work in private industry, as also engineers in private sector may be allowed tenure posting in government laboratories.

The industry cannot be expected to invest in R&D, whether funds, manpower or facilities, without clear future business prospects and profit margins. Thus, internal consumption with their timelines and support in exports should be outlined as policy. Academia too needs the visibility of sustained funding and research handholding over long term. Research and innovation in academia are primarily done by students—PhD and MTech scholars. To enhance technology readiness level, state-of-the-art research facilities and test equipment are needed by academic institutions. Academia hosts students and researchers from all walks of society, such as R&D labs, industry and general students. This makes academic centres fertile laboratories to cross-breed ideas, technologies and products. Funding agencies should invest liberally in setting up facilities in academic institutions across the country, and not just in the Indian Institutes of Technology (IITs) and the Indian Institute of Science (IISc). They should also make attractive offers to faculty and students in timely manner to harness young talent.

Trust-building among various stakeholders is quite important. The direct and indirect (through sponsored articles/briefing in media by retired officers) public criticism of players needs to be stopped. One must understand the difference between criticism and analysis: analysis presents the shortcomings and recommends the way forward based on a large data set; and criticisms are generally based on individual experiences bereft of suggestions to improve. Further, the government/MoD should ensure enough positive publicity of achievements of not only government departments but also of the related academia and industry partners.

Civil–Military Fusion

Once the MoD departments become adept in integrated approach, further civil–military fusion should be aimed for. Tenure deputations of government officials in academic institutions and industry (public and private), and vice

versa, should be facilitated. The Centres of Excellence established by various wings of the MoD in academic institutions must be expanded to collaborate with industry to solve technology issues of not only the MoD but also the industry. Mechanisms for integrating specialised expertise and facilities scattered around the country should be explored. Specialised technology clusters, which cater from processes and components to systems and sub-systems in a specific technology for both civil and defence sectors, should be developed. Spin-in and spin-off of technologies should be pursued in letter and spirit. There are many technologies that can be benefitted by this approach, like communication, robotics, AI, biology and climate control.

Investment for Major Platforms and Technologies

The government's budget announcement of 2022–23 regarding 25 per cent R&D budget for private sector should have been accompanied by corresponding increase in budgetary support to the R&D department of defence. The current R&D budget is not able to support a large number of visible and horizon technologies.^{7, 10} A quick analysis of 'Trends in International Arms Transfer 2023'⁸ indicates that out of the top 10 military hardware exporters, all 10 are exporting armoured vehicles (other than tanks); eight are exporting combat aircraft (combat/trainer aircraft and anti-submarine warfare aircraft) and major warships (aircraft carriers, corvettes, destroyers, frigates and submarines); seven are exporting artillery guns, surface-to-air missile systems and tanks; and three are exporting combat helicopters. The budget announcement should have been used as a golden opportunity to accelerate development of these and other futuristic systems,^{7, 10, 11} through public–private partnership, enhancement of defence R&D budget and conducive policies for private investment in R&D, including amendments in General Financial Rules of the government etc.^{9, 11}

Mil-tech Think Tank

There are many think tanks in the Indian defence sector. These operate in various specialised realms of the defence sphere. In current times, there is a need to take a holistic look at the geo-security scenario, military tactics, foreign policy framework, industrial and production technologies, technology evolution, capacity and capability gaps, possible collaborating institutions, military markets, finances and enabling policies. There is, thus, a need to have a think tank to continuously track these parameters and advise the government on necessary measures. This think tank, manned by experienced personnel in required disciplines, hired on tenure basis, should also be tasked

with tracking the progress of aspirations of the country and the evolution of a dynamic roadmap. A baseline framework for comparison of investments, skills and performance of various countries is also available publicly.¹² India-specific metric may be evolved and utilised continuously to monitor the performance and advise the policy-makers.

Further Liberalisation

The MoD should seriously look at further liberalising the regulatory framework to promote generation and protection of IP; empower individuals and organisations for international collaborations; enhance indices on ease of doing business, skills and innovation, and so on. Policies should provide for deemed licences for the mil-tech industry and export of listed military hardware to identified countries, possibly with prior/concurrent information to the government. The DPSUs may have professional boards with the same degree of autonomy that a private company enjoys. The culture of DPSUs taking direction from a joint secretary in the MoD, while providing protection, also becomes a stumbling block in growth. This must be dispensed with as soon as possible. The government must have equal influence on the DPSUs and private industry. Only then can a level-playing field be ensured.

Make in India, Make for the World

The 'Make in India' theme has to be pursued with the aim of not only generating employment, meeting domestic consumption and exports goals, but also with the aim of wealth generation and IP creation for the country for long-term sustainability. A modified strategic independence index,¹³ catering for indigenous IP, should be continuously tracked and facilitated through policy interventions.¹⁴

CONCLUSION

There is a requirement to agree wholeheartedly that there is a need to change, Reforms 2.0. A large number of articles have already been written and published regarding this. The suggestions therein can provide a baseline document for brainstorming. The government may like to give the responsibility of working on the framework of Reforms 2.0 to a non-governmental think tank. The think tank should propose the framework after wide-ranging consultations with all the stakeholders in government, industry, academia and thought leaders of the country. It must analyse various models practiced in other countries and propose an India-specific model.

Viksit Bharat by 2047, that is, Indian economy measuring at least 18 per cent of the world, is too sacred a goal to be missed. Defence sector has to play its role by realising the capability and capacity of design, development, production and export of military goods in line with norms elsewhere in the developed countries. One hopes that there will be measures in place for dynamic planning, setting of aspirational final and intermediate milestones, monitoring and reviewing mechanisms, policy interventions, collaborations, cooperations and coordinated actions to see that the dreams become reality, sooner than later.

NOTES

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