

SYNERGY

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CENTRE FOR JOINT WARFARE STUDIES



CENJOWS

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FOREWORD

Air Marshal PP Reddy, VSM, ADC

CISC & Chairman CENJOWS

Over the past few years, India has become the world's largest arms importer with more than 40% of our defence equipment being procured from abroad.

With a view to streamline the acquisition process, the Defence Procurement Procedure (DPP) was put in place in 2002. After seven major reviews during the last 13 years, an expert committee under Shri Dhirendra Singh was set up to recommend game changing measures to rejuvenate the DPP. The recommendations of the Committee can be grouped under four sub-heads: conceptual ladder for 'Make in India' mission; amendments to DPP 2013; integration of the private sector including MSMEs; and lastly, some supplementary issues which otherwise fall outside the purview of the DPP.

Defence industries are fundamentally the same as any other industry. They are all affected in the same manner by government policies, business opportunities, and lack of infrastructure or resources. The basic laws of economics do not discriminate between industrial sectors in any manner. Therefore, any effort to acquire military technology must be grounded in the business realities.

Compressing development timelines and ensuring faster induction of the developed platform into the User Service in large numbers is crucial in building confidence between the Services, the development and the production agencies. The only prescription for overcoming these ills is sustained efforts with a concerted push from the country's political and military leadership.

An increase in FDI, new policies in manufacturing and export, a new DPP document, are initiatives in the right direction, to encourage indigenous defence production.

A handwritten signature in black ink, appearing to read 'PP Reddy', with a long horizontal stroke extending to the right.

(PP Reddy)

Air Marshal

CISC & Chairman CENJOWS

Director's Remarks

The visionary initiative “Make in India”, focuses on 25 sectors ranging from Automobile to Biotechnology to Defence Manufacturing to Electronic Systems. It is aimed at increasing the share of manufacturing sector in India's economy from a little over 16% in 2014-15 to 25% of the GDP by 2022 which is expected to create an additional 100 million jobs. Defence Make in India programme is largely fashioned by the defence procurement policy.

Indigenization is essential considering long-term benefits of assured supplies and prompt maintenance support. There is no alternative to building domestic capacities and capabilities in critical materials and technologies like titanium, aero engines, composites; nanotechnology and MEMs-based sensors etc. Though international arms suppliers are keen to supply complete systems, spares and set up maintenance repair and overhaul (MRO) facilities; they are generally reluctant to engage in transfer of technology.

Thrust on R&D investment would also be needed for developing advanced technology indigenous products. For 2014, the R&D investment as percentage of GDP for India is 0.9%. This is compared to 2.8% by the United States, 2.0% by China, 3.4% by Japan, 1.5% by Russia and 4.2% by Israel. In order to enhance indigenous development, Indian spending on R&D should increase and sustain to the global average of 1.8% of GDP.

Strategic Partners concept in the private sector is another way forward. Shree Dhirender Singh Committee has identified sectors to implement the Strategic Partners concept in the private sector. These sectors include aircraft, warships and submarines, armoured fighting vehicles, missile systems, C4ISR systems and Critical materials.

India has forever possessed the basic framework needed for “Make in India” in Defence sector. All stakeholders have to be brought together to operate synergistically. Increasing the FDI limit, updating the DPP and implementing

the strategic partnership concept is likely to overcome many weaknesses in defence industrialization. Encouraging proper utilization of offset obligations should also get high priority.

In this issue of the Synergy journal excellent articles by seven domain experts have been included for an all round exploration of this vital subject theme.

A handwritten signature in black ink, appearing to read 'KB Kapoor', with a large, sweeping initial 'K'.

(KB Kapoor)
Maj Gen (Retd)
Director

Make in India – Much More Facilitation Required

Lt Gen PC Katoch, PVSM, UYSM, AVSM, SC (Retd)*

That no country can be militarily strong without a strong military-industrial base is an established fact. India has had its DRDO since 1958, operating presently through a network of 52 laboratories, nine DPSUs and 42 Ordnance Factories and other establishments located nationwide, employing an overall manpower of 1,80,044 employees including some 16,000 scientists and technical persons. The country's defence R&D allocation goes all to DRDO, not to private industry dealing in defence. DRDO's annual budget is considerable, rising consistently; DRDO's annual budget in 2014-2015 rose to US\$ 41.66 billion from US\$ 24.78 billion in 2009-2010. The irony is that despite all this, India is importing 70% of its defence needs and consequently can hardly be militarily strong. Despite a Review Committee in 1995, headed by Dr Abdul Kalam, directing that India must meet 70 percent of its defence needs by 2014, we did not move an inch forwarded, as was discovered 19 years later in 2014. Yet, no heads rolled. The CAG and CGDA audit reports point to extreme corruption in the governmental defence-industrial complex. The Ministry of Science and Technology acknowledges that 50 percent of defence equipment held by our military is "obsolete". To cap this, CAG states that balance 30% of defence items produced indigenously are "sub-standard".

The irony is that above remains the dismal state despite Joint Secretaries of the MoD on all Boards of the DRDO-DPSUs-OF. Then there is also the issue of service with DRDO not being binding. The numbers of researchers in

* *Lt Gen PC Katoch is a Special Forces Veteran.*

DRDO have been shrinking over the years. In January 2011, media reported that 20 top scientists of the DRDO quit their jobs in the preceding six months since the economy and the IT sector had started to look up in a big way. India has consistently failed, to create a sizable domestic manufacturing industry for weapons or even basic military goods. A major reason for this is that the public sector remains inefficient and unaccountable, while the private sector is by and large kept away from arms production. According to Commodore Uday Bhaskar, “More than 60 years after becoming a republic and 50 years after the debacle with China, the opaque Indian defense production establishment does not produce high quality clothing and personal inventory items like boots, let alone a suitable rifle for a one million army, or tanks and aircraft.”

Make in India

Prime Minister Narendra Modi gave a call for ‘Make in India, Sell Anywhere’ from ramparts of the Red Fort on 15th August 2014. This is vital for defence since we can hardly afford to continue relying on 70% defence imports. Indigenization is essential considering long-term benefits of: assured supplies and prompt maintenance support; cheaper compared to imports; allowing creation of strong indigenous defence manufacturing ecosystem; balanced growth of R&D both in public and private sectors leading to strong technology innovation ecosystem; dual use technologies benefiting sectors like automotives, engineering, robotics, inland and maritime security, medical diagnostics, healthcare; and, potential for increasing defence exports. Significantly, the current cycle including acquisitions drafted under the long-term integrated perspective plan (LTIPP), is expected to include procurements worth US\$ 100 billion by 2022. So the picture will remain is pathetic unless Make in India takes of systematically in sustained fashion. Interestingly, as per a survey undertaken by CII Defence Division members conducted by KPMG, approximately 62% of the companies believe that the Indian market is an attractive proposition for foreign defence companies owing to India’s large procurement plans. This is hardly surprising though the overall picture is hardly rosy. In fact, the surprise should be why only 62% and not more number of companies want to invest in the defence sector in India? However, this notwithstanding the point to note is that these 62% companies are interested on the basis of India’s ‘large procurement plans’. We have a glut in technology including critical voids, for which FDI and joint ventures (JVs) are must.

Our media reported last year that the US had offered us technologies in some 10 fields. Logically, one cannot expect state-of-the-art technologies from any country including the US but then possibilities fluctuate with the rapidly changing geopolitical scene. Heading the US side during the launch of the US-India Defence Technology and Trade Initiative (DTTI) at New Delhi in September 2013, the US Deputy Secretary of Defense Ashton B Carter (now replaced by Frank Kendall) had said that US technology and exports control areas were being looked at so that India has the same status as the ‘closest allies’ of US, for the US system to operate on a timescale consistent with the needs for the Indian side to make decisions, aim being to take the Indo-US defence relationship to the next level and help India raise the indigenization of its defence systems. We also have strategic partnership with many other countries as well. The bottom-line is that even in the event we do not get the top of the line technology, we still can get the next best. Therefore a joint venture (JV) with transfer of technology (ToT) is the route to indigenization. Of course countries like China and her two nuclear talons (Pakistan and North Korea) excel in reverse engineering and exploit dual use technology in order to leapfrog technology without inhibitions of intellectual property rights and global norms.

Why in the present context ‘Make in India’ in the defence sector has not taken off despite all the noise is primarily because of two reasons over and above the red tape: we have not yet facilitated the right level of FDI; and we have not streamlined the defence procurement procedure (DPP) including for it to absorb foreign technology. These issues need to be addressed on priority.

FDI in Defence

On 10 November 2015, government announced a slew of measures for “ease business” along with FDI reforms in 15 sectors including defence, stating that FDI bids worth up to 49% of equity will now progress through the “automatic route”. Media quoting informed sources said this effectively meant that foreign companies will now be able to bypass the government’s Foreign Investment Promotion Board (FIPB) in finalizing defence investment deals. However, it is significant to note that FDI in defence had already been raised from 26% to 49% (even beyond 49% involving state-of-the-art technology and ToT on case-to-case basis) in 2014 and this was done because in the previous 14 years we could attract less than US\$ 5 million as FDI in defence. Yet despite having

raised the FDI limit to 49%, the defence industry has only managed to bring in a miniscule US\$ 0.08 million (Rs 48 lakh) of FDI leaving it virtually deprived of foreign investors. More significantly, despite having promoted defence as one of the prime sectors under the 'Make in India' initiative, the defence sector has contributed zero per cent of the total FDI inflow in the country. Obviously, while raising the FDI in defence from 26% to 49% we did not incisively analyzed what should be the level of FDI that would make the defence sector lucrative to foreign companies? More importantly, day after the 49% FDI in defence was announced during the budget session of 2014, the visiting President of Federation of German Industries, Ulrich Grillo, met our Defence Minister and later told reporters that German Industries would not like to invest in India since with 49% FDI they would not have control over selling the products. Ironically, defence equipment currently held by our military is 50% obsolete, the proportion of state-of-the-art equipment also needs to grow from its current level of 15% to at least double. According to the Financial Times of UK, in the January-June period of this year, India surpassed US and China as the biggest FDI destination with US \$31 billion investments compared with US\$28 billion in China and US\$27 billion in the US. In the first half of 2014, India had received \$12 billion worth FDIs, thus more than doubling the kitty in this year first half. So, when India has become such a lucrative FDI destination, why can't we attract FDI in defence? Clearly the fault lies within, the red tape being one reason which may be by default or design. Why to talk of FDI, we are obviously not letting our private industry contribute equally in defence, despite the capability. Take the case of the TCS, where development of the prototype by the Larsen & Toubro, Tata Power SED, and HCL Ltd Consortium is stuck past several months without MoD addressing issues of equivalent tax incentives provided to BEL and control over IPR raised by them. Past several years, the Department of Industrial Policy and Promotion (DIPP) of the Ministry of Commerce and Industry has been recommending 74% FDI in case of ToT and 100% FDI in case of making available state of the art technology. Now take the case of the Tejas, which despite having scores of imported assemblies and parts, IAF is likely to buy number of squadrons but HAL will unlikely be able to meet total requirements of the IAF since the number of their operational squadrons are declining rapidly. So this is one area (aerospace) where more production lines for Tejas could be established through JVs. Same goes for helicopters, transport aircraft, weapon platforms and other defence equipment. We must acknowledge we have glut in technology and the military

has major voids which we need to make up through FDI. We need state-of-the-art technology which we can get exploiting our strategic partnerships. We therefore need to revisit the FDI in defence and make the defence sector unambiguously lucrative for FDI. Just facilitating foreign companies to bypass the government and the FIPB in finalizing defence investment deals is unlikely to suffice. The issue of IPR and the number and guarantee of what would be absorbed in India too need to be addressed. It is also noteworthy how China despite being under sanctions has managed massive JVs with foreign collaboration in dual use civil-military technology.

DPP

While the Prime Minister called for Make in India on 15 August 2014, the Defence Minister speaking on the sidelines of Aero India in February 2015 categorically stated that our DPP is not conducive for Make in India in defence sector. The existing DPP 2013 categorizes defence acquisitions into four sub-categories: 'Buy Indian/Global', meaning outright purchase from Indian/foreign manufacturers; 'Buy and Make' and 'Buy and Make (Indian)', meaning buying from foreign/Indian vendor followed by Transfer of Technology and production in India; and 'Make (Indian)', meaning development of the product in India from scratch. DPP 2013 for the first time listed buying from within the country as priority. It mandates that for any contract above Rs 300 crore in the 'Buy' and 'Buy and Make' categories, offsets corresponding to 30% of the value of the contract are compulsory, implying the vendor has to invest 30% (of the cost of the contract) in Indian industry so as to have indigenous content in the product. This has not yielded great results over the past decade, given that the Indian defence industry is still in a nascent state and has been unable to absorb state-of-the-art technology that defence offsets require. Foreign vendors have been discharging offsets that do not build the capability of Indian industry, thus killing their very objective. The offset policy is under revision; the government is of the view that they should be measured as percentage of technology gained, instead of in terms of money. Moreover, the current DPP does not fit the 'Make in India' idea as no clause facilitates this in terms that the government has been advocating, even though it does give preference to buying Indian products over global.

The draft of the new DPP, first one to be issued by the present government,

has been circulated with the industry and Services, draft policy having been prepared by a committee appointed by the government that was to submit its report on 31 July 2015, their task being to draft an easy-to-comprehend and industry-friendly procedure that would cut down chronic delays in defence procurements. The private industry's apprehensions are genuine since year after year MoD has come out with DPPs with much fanfare but only with cosmetic changes retaining stranglehold of the DRDO headed official defence-industrial complex. Authorizing defence agents, revision of blacklisting policy and simplifying policy are supposedly main highlights of the new DPP. But are these all the changes we need? The DPP in any case only provides "guidelines" and unless administrative reforms are conducted, nothing much may change. Strangely, a draft offset policy was put into limited circulation by MoD in end April for comments of industry associations; which ones – details not known. But it is well known that offsets are incidental to the procurement and import of weapon systems and defence equipment. With massive equipment voids in our military, plenty imports will be required for many years in addition to Make in India. The latter too will require imports if the quantum of imported components of Tejas are any indication. To this end, the offset policy is important and must be an intrinsic part of the DPP. So what comments were expected on the offset policy in absence of the new DPP? Did the committee release the draft offset policy earlier by default or was it on purpose? If the new DPP is what the committee was tasked to draft, why not ask for comments of the draft offset policy together with the draft DPP? The question also arises do actually need a separate offset policy and why can it not be part of the DPP itself because any mismatch would have obvious implications unless that is precisely intended. One wonders whether disjointed actions like these are on purpose.

What should the new DPP aim at? Sensibly it should cater for: *one*, meeting the requirement of the armed forces; *two*, providing level playing field for both the official defence-industrial complex and the defence industry with emphasis more on R&D with respect to the former and focused commercialization by latter – encompassing both defence production and procurement; *three*, define clear division between the public and private industry; *four*, lay down how much in advance and in sufficient detail what products and technologies are required in what future time-frame by the military in order to provide sufficient and competitive time to undertake R&D and development; *five*, include the offset

policy as intrinsic part of DPP; six, define structures and organizations outside the MoD to implement the defence production and procurement policies. On balance, the need of the hour is to have not just a DPP but a DPPP – a composite Defence Production and Procurement Policy.

Defence-Industrial Complex

In his first address to the DRDO in 2014, the Prime Minister gave a subtle admonishing while stressing on the need for scientists to complete work in time, and stay ahead of technological innovations by saying, “I see that the big challenge is how we complete our work before time. If the world will finish something in 2020, can we do it by 2018?” The report by the Standing Committee on Defence to Parliament on December 22, 2014 has been highly critical of DRDO’s chronic inefficiency as well. A news item of 23 November 2014 titled ‘DRDO’s Rath Yatra’ reported DRDO crafting one silver chariot costing of more than Rs 5 crores and donating it to a temple without sanction. The senior scientist, who filed a complaint with the CVC against this venture was stripped him off his ongoing projects and transferred out. Our defence-industrial complex has remained in pathetic state, obviously because of rampant corruption, this being the very reason why the military is being kept away from MoD and the official defence-industrial complex. Not without reason a former diplomat who started as an IAS officer in MoD says his first briefing was always look for what are the defence acquisitions in the pipeline and how much money could be made.

The expansion of the DRDO with its seven technical clusters and host of new appointments with enlarged manpower indicates that this stranglehold of the DRDO-DPSUs-OFP may well get tightened further despite the fact that countries producing modern defence systems have done so through private industry, not through DRDO-like set ups. The bifurcation of posts of the DRDO chief and SA to RM is good as a concept but appointing both incumbents with DRDO background negates the advantage sought. Any worthwhile change cannot be expected unless the MoD is inducted with military professionals – a move that has yet to be made by the present government in harness since May 2014. In fact, just like the Niti Ayog replacing the Planning Commission, the government needs to replace the MoD with a Department of Defence (DoD) headed by the Defence Minister and manned by military professionals. Otherwise we can also expect erratic decisions like shifting the Defexpo from Delhi to Goa. The government

proposal to appoint a Permanent Chairman COSC without any operational powers instead of a CDS with full operational powers again indicates that the bureaucratic control by MoD remains intact particularly in terms of defence procurements, without any contribution towards defence of India.

Requirement

The above mentioned KPMG study recommended that greater private sector participation in defence would be in favour of Indian companies with 55% of offset contracts taken by the private sector, and that the Indian Aerospace Defence industry was emerging as outsourcing hub for many services like CAD, CAM and CAE, manufacturing and design engineering, testing and integration, and technical publications. Some 18 defence offset JVs are already underway or on the anvil in India. Reorganization of the defence-industrial sector in India needs to be taken up on multiple fronts: first, the name 'defence-industrial' itself is misnomer for the reason that the users (military) are not part and parcel of the DRDO and DPSUs whereas military officers (serving and veterans) should be posted at various levels including the design, management and decision making levels. Perhaps it should be termed military-industrial complex rather than defence-industrial complex which creates impression of an exclusive DRDO-DPSUs domain; two, civil-military industrial zones need to be planned at national level (like what is happening in Gujarat) incorporating private industry including even Micro Small and Medium Enterprises (MSMEs); three, DRDO should focus on R&D and given a focused road map for futuristic technologies; four, the military-industrial complex including the DPSUs, OF and private industry should be 'affiliated' not 'under' the DRDO; five, a policy and road map is needed for leapfrogging technology – as being done by countries like China and Pakistan, and; six, JVs and ToT must be encouraged and the defence sector made unambiguously attractive especially to our strategic partners. From a global innovativeness ranking of 24 in 2004, China jumped to the sixth position in 2009, and targets to be the fifth by 2020 and by 2040-50, attain technological parity with the US. We need the corrective against the paradox reaching the Mars but not being able to produce a state-of-the-art assault rifle, being called an IT Superpower but importing hardware, not having own operating systems, and glut in electronics – namesake indigenous chips manufacture, and don't even make a pen drive.

Self Reliance in Defence Production – Can India achieve it?

Air Marshal Dhiraj Kukreja *

Introduction

The long years of colonial rule, saw India unable to take advantage of the Industrial Revolution, the effects of which can be seen even today. To sustain a large nation as India, with hostile neighbours, it is imperative for the country to have a strong and well-equipped military, ever ready to foil any ill intentions. After gaining independence, India did attempt to gain what had been lost during the colonial days, and did achieve success in many fields, but reached a plateau in gaining self-reliance in defence production, the reasons for which are many.

Indigenised defence production is a significant factor that provides strategic independence to a nation, thereby adding exponentially to national security through 24x7 defence preparedness. Given the specialised and highly controlled nature of the defence industry, the world over, military supplies are obviously high-value goods. Indigenisation provides security flexibility to a nation, by reducing continued reliance on external sources and frees a nation from peripheral pulls and pressures, be they political or otherwise.

The vibrant defence industrial base of DPSUs, OFs, and R&D, that existed earlier, exists even today, but does not produce the wanted results. Can India usher in an era of transformation and self-reliance in defence production with the Prime Minister's call for 'Make in India', supported by the introduction of new policies, thus leading to a shift in focus from being import-dependent to a

* *Air Marshal Dhiraj Kukreja is a former AOC-in-C Training Command, IAF.*

global exporter in its own right? The answers to this, and other questions, can be found only if one examines all facets of the problem; the author would make an attempt though the emphasis may flow on to the aerospace sector, having been a 'man in blue'. Notwithstanding the partiality, the story is the same with the entire defence industry and the lack of interest and prioritisation equally affects not just the three arms of the military, but the para-military and police forces as well.

The Aerospace Industry in India

Production in the aerospace industry has a long gestation period and is technologically intensive, involving many other industries of the nation. Hindustan Aeronautics Limited (HAL), the Goliath of aviation industry in India, is synonymous with aerospace industry in the country; it has a turnover of about Rs 15000 Cr, and a R&D corpus that comprises of 10 per cent of its profits, has 14 types under license production and 15 types of aircraft through in-house R&D, to its credit. As per Dr RK Tyagi, the former Chairman, HAL (speaking at the Seminar on 'Energising Indian Aerospace Industry' in 2014), the company has around 34000 workers on its employment rolls, and is a 'Navratna' company since 2010; it has a vendor base of about 2400 and has more than 2000 designers on its payroll. It also claims to have a more than 60 per cent indigenous content in the much-delayed Light Combat Aircraft (LCA), has collaborated with about 20 academic institutions, and about 150 industries for its production, of which about 80 are in the private sector. However, even with such impressive figures, has it been able to satisfy the modernisation needs of the IAF? The answer is obvious, or else why would the Air Force and other Services, be taking their shopping-list outside the country!

HAL also has the reputation of being the largest of aerospace companies in Asia, but with hardly any customers outside the country; the IAF, and other sister Services, are its 'captured' customers. Rather than move ahead by holding hands of the Armed Forces, the continuous storm of controversies with all the three Services refuses to abate. The IAF is not happy with the LCA; the Indian Navy is not satisfied with the sea-going version of the Advanced Light Helicopters; the Indian Army wishes to purchase the Light Utility Helicopters (LUH) from outside the country, either due to the long delays by HAL of poor product quality. In spite of its turnover and size, the HAL has not very much to show, though the former Chairman may have had different statistics to present.

No aerospace company in the world today, worth its reputation, attempts to cover all aspects of aerospace activity, as HAL does; it is engaged in an endless list of activities ranging from design, development, manufacture, repair/overhaul, and upgrade of aircraft, helicopters, engines, accessories, avionics, structures for aerospace launch vehicles, integrated systems for satellites and industrial/marine gas turbine engines. Technologies in the aerospace industry are so spread over a broad spectrum, that it is almost impossible for any single company to be self-contained, irrespective of its size; it is essential to have cross-linkages to be vibrant, proficient, and economical. Yet, HAL attempts to do just the opposite! Why is this sorry state of affairs been permitted to exist?

India's march to progress after independence was bolstered through major contributions in the fields of science and technology by organisations, such as the CSIR, DRDO, and ISRO. Notwithstanding their contributions, the Indian Armed Forces continued to depend on imports to meet their needs for military hardware. Even as India is in the seventh decade of independence, there is no major change in the situation. The Indian Army is short of the basic boots and gloves for its soldiers in the Siachen, not to mention the replacements for war fighting equipment, such as a combat rifle. The Air Force is looking to augment its operational and strategic capability with the purchase of aircraft from abroad. These scary situations are not because of shortage of funds or the lack of capability to produce, but because of the delays involved due to misplaced priorities, and the technology used.

Challenges Facing the Aerospace Industry

The technologies used in defence production, and more so in the aerospace industry, are very complex and expensive to develop and integrate, normally being at the high end of the spectrum; a fact not well comprehended by many who have to take the final decision on the files. The word 'technology' is often loosely used, without an understanding that it comprises of a number of hard and soft elements, which have to be figured out together to gather an all-inclusive picture. The hard elements include materials to be used, design documents, manufacturing and assembly infrastructure – available and required - and more such issues; these, however, do not complete 'technology' on their own. The soft elements too are numerous and include the likes of human skills, attitude and aptitude to absorb knowledge and new practices, teamwork, potential and

skill to handle new equipment, leadership, and application of new management processes. This package of the hard and soft elements is a part of 'technology', whenever one talks of technology expansion or technology absorption.

The deficiency of a technologically advanced and an internationally competitive industry has greatly impacted India's efforts in the aerospace sector. Whatever little the aerospace industry has designed and produced in the past is reminiscent of the Fiats and Ambassadors, which monopolised the automotive segment in the country for a very long time after independence. A rapid modernisation of the Indian industry in general has taken place in the last twenty years or so, but the aerospace sector has lacked the requisite momentum and enthusiasm, so essential to service domestic force-modernisation requirements. Just as the DPSU-bureaucratic combine (one wishes to use the word 'nexus') has flourished over the years, the ever-increasing demand and consequent dependence on foreign supplies has continued too; indigenous defence equipment production caters to only 30 per cent of the demand!

While the call for indigenisation has been getting stronger over the years, the Indian aerospace industry has been stuck in the comfort zone of 'licence production', with support from the bureaucracy, which has almost always insisted of including a clause of 'Transfer of Technology' (ToT) in contracts. Little does the bureaucracy realise that a ToT gets the country only modern production techniques, but does not help in getting new state-of-the-art technology to assist in design and development, the need of the hour; the Intellectual Property Rights (IPR) would continue to remain with the original manufacturer. It is only now that the call of "Make in India" has shaken all concerned – bureaucrats, DPSUs, and the private sector - out of the Rip van Winkle sleep and projects with state-of-the-art technology are on the anvil through joint ventures (JVs).

Inadequate privatisation is another important cause for the present 'vegetative state' of the aerospace industry. The conglomerate of the Ordnance Factories and other DPSUs may take the credit of having encouraged medium and small entrepreneurs, but only as tier-3 and tier-4 suppliers. There are not many, or any, tier-1 or tier-2 suppliers. Successive governments have been hesitant to implement policy changes announced earlier. For an answer, one needs to go back into history, to the rationale that existed when laying down the First Industrial Policy of 1948. This Policy was given the importance of a

statutory legislation by the Industries (Development and Regulation) Act of 1951, and a decision to keep the industry under government control was taken, recognizing the critical importance of the defence industry to national security, and the country's need to be self-reliant in this sector. Accordingly, the Gol invested heavily in setting up the massive empire of DPSUs and DRDO, the capacities of which match the biggest, and in some instances, even the best of the world, but the output is nowhere near world standards.

Focus on Government Policies

The Prime Minister is quite sure in his mind that India needs to upgrade its security preparedness, considering its not-too-friendly neighbourhood and the menace of insurgency within the country. The “Make in India” plan conforms to his vision and affirms his reputation of being a pro-growth leader. There is no disagreement that the manufacturing sector needs an impetus, for the economy to surge ahead. Studies have indicated that even a small 20 per cent reduction in imports, would create an additional 100,000-plus high-skill jobs in India. If the present domestic procurement were to be increased from 40 per cent to 70 per cent, in the next five years or so, the output of the defence industry would be doubled. A strong industrial infrastructure can boost investment, expand manufacturing, support Micro-Small-and-Medium Enterprises (MSMEs), raise the technology levels, and hence, contribute towards the overall economic growth of the nation. Some essential steps were needed to be taken to ensure success in this field; mere words, either by the Prime Minister, or by the RM, would not steer the industry.

On November 10, 2015, an announcement unveiled a new framework of regulations for Foreign Direct Investment (FDI) in as many as 15 sectors of the industry in India, defence manufacturing included. In addition, there has also been an effort to improve the system to enhance the ease of doing business in the country. Prior to announcing these latest measures, the Government had already initiated certain steps last year. *First*, a list of items requiring an industrial licence was published in June 2014. *Second*, also in the same month, a security manual for licensed defence industries was notified. The *third* step was two months later, when the limit for FDI was increased to 49 per cent from the then 26 per cent, with a proviso that should there be access available to state-of-the-art technology, then a higher limit of FDI could be permitted. The

last policy was amended on November 10, to include FDI of up to 49 percent under the automatic route, with no riders; any further higher investment would still, however, have to be cleared by the Foreign Investment Promotion Board (FIPB).

The defence procurements policy constitutes an integral and essential part of the defence and security policy of any country. The Acquisition Wing of the Ministry of Defence (MoD) manages the policy in India. The Procurement Policy concerns not only the requirement relative to the Indian Armed Forces, but also R&D, and in general, the national defence industry and production capabilities, through which, self-reliance in the field of operational requirements, procurement, standardisation, and industrial rationalisation, is to be achieved.

With a view to streamline the acquisition process, the Defence Procurement Procedure (DPP) was put in place in 2002; it has, thereafter, been subjected to seven major reviews during the last 13 years! Even before all the players understood an amendment, it was already under re-examination, thus causing extended delays in an already long and tiring process. It is now once again under re-evaluation. An expert committee under Shri Dhirendra Singh has submitted its recommendations, which are under examination and the acceptance or otherwise, likely to be announced by the end of 2015. The recommendations of the Committee can be grouped under four sub-heads: conceptual ladder for 'Make in India' mission; amendments to DPP 2013; integration of the private sector; and lastly, some supplementary issues which otherwise fall outside the purview of the DPP.

While it goes to the credit of the Ministry of Defence (MoD) to have made the recommendations public, going by experience, it will accept only those recommendations that suit it, so as not lose its stranglehold on the acquisitions process.

Effects of Delays

Future conflicts will not necessarily be symmetric; on the contrary, the conflicts will be asymmetric, or even dissymmetric, though the potential for a full-blown conflict will continue to exist. The adversaries can be either state or non-state actors, but with a common factor – both will have access to high technology. The IAF is on a steep growth trajectory, as are the other Services. The dilly-

dallying, the ‘hurdles’ in the acquisition process, the indecisions, however, are proving costly, not just for the IAF, but for the other Services too. The operational squadron strength of the IAF has had a steady southward trend. The Army has been crying itself hoarse for tanks, armoured vehicles, helicopters, assault rifles, and even for small, but important items, such as bulletproof jackets, gloves, and ballistic helmets, while the Navy is short of submarines, helicopters, and armament to protect its fleets on the high seas.

The delays and indecisions are a phenomenon unique to the Government of India (GoI), irrespective whether the decision concerns national security, has the requisite funds available, and a Committee of the GoI itself recommends the item for purchase. A decision, if a new layer of indecision can stall it, then it will be stalled! How long does it take for a government to procure bullet-proof jackets for its soldiers, an item that is easily available off-the-shelf? A few weeks perhaps, but in the case of India, it seems that even a decade is too less! Similarly, the case for procurement of the Medium Multi Role Combat Aircraft (MMRCA) has been languishing in the files for almost 10 years since it was first asked for by the IAF; even today, the aircraft contract is nowhere near finalisation, despite the Prime Minister himself ordering 36 aircraft during his bilateral visit to France. So is the case with the Navy and its Scorpene submarines. It has reached a stage that some Commanding Officers of the Army have begun purchasing items like bulletproof jackets and helmets through the welfare funds available at their disposal!

Can India Do It?

Are the Indian Armed Forces asking for the moon on their path of modernisation and enhancing their operational potential, or are they justified in their demands? If this question was asked to a professional, or even a nonprofessional, the answer would be in favour of the Armed Forces. Heart of hearts, all the Services would like to go the indigenous way to decrease dependence on a foreign nation, which can stop or delay delivery of critical items at a crucial time, but it is just not happening.

The new policies promulgated in the recent past are supposed to provide the necessary impetus to India’s quest for self-reliance. The new production policy has clauses in it to support indigenisation and upgrading of technology.

Nonetheless, has this not been the thrust for the last sixty-eight years, ever since independence? Sadly, implementation of earlier policies in letter and spirit has been found wanting; public-private partnerships (PPP) in defence production have been recommended by the many committees that have been formed thus far, but to no avail.

The way ahead is to place accountability for every rupee spent of public money, not just to make a noise in Parliament, but to ensure that national security requirements are met in totality.

- There needs to be clarity of vision and mission statement. The clearances for new Light Utility Helicopters (LUH) and the replacement for Avro aircraft have been changing with sickening regularity in the past few months.
- In all indigenous projects, be they in the manufacturing or in the R&D sector, there has to be accountability for every month of time overruns and demand of cost overruns. There has to be a clear realisation plan, as to which organisation is to do what, timelines for approvals, and detailed project reports.
- The potential of the private sector needs to be harnessed through synergy with the public sector and the users.
- The DPSUs/DRDO must shed their mindset of considering the private sector as competitors, and rather see them as partners.
- The private sector has to be given the necessary encouragement by providing it a level playing field by removing protective policies favouring the DPSUs and OFs. The taxes are 41 per cent higher if made in India! The private sector should be at par with DPSUs and foreign suppliers.
- Support innovative skills in the defence production sector by encouraging Micro-Small and Medium enterprises (MSMEs).
- Exploitation of offsets due for the huge shopping list, should be a bargaining tool to gain economic benefits for the country.

- Improve R&D and skill levels with constant interaction with the academia and allocation of extra funds for research.
- All acquisitions should be through an unambiguous policy and a single agency, rather than having multiple documents and multiple agencies.

If India is to attract foreign investors in defence production, it has to portray itself as an attractive business destination, giving confident vibes to the investors. For that, it must fine-tune its policies to provide freedom of action to the joint ventures (JVs) that have now begun to form, to respond as per market dynamics. It is, therefore, prudent for the policy makers and those who have to implement those policies, to peep into the minds of investors to appreciate where their motivation lies to invest large sums of money in a foreign nation and the associated risks. The investor would like to have adequate control over the use of his funds, sufficient freedom of action to increase/decrease production capacity, and have access to markets to ensure commercial viability, through economies of scale. Towards this end, India needs to have a relook at its defence exports policy.

India's defence exports have been terribly low over the years; defence exports during 2010-2012 were just \$183 million, which the former defence minister, Shri AK Antony, had himself termed as "woefully meagre". There has been a major policy decision taken by the present Government, wherein it has notified a new strategy for export of defence products. Not only is the sale of military equipment to foreign nations to be given a boost, but a structure has also been proposed, for India to finance purchase of Indian arms by countries, which may need financial assistance. The '*Strategy for Defence Exports*', issued by the MoD, contains a new set of rules for obtaining clearances for export of military stores by both private and public sector enterprises. Amplifying the new strategy, for both commercial and military diplomatic gains, the document specifies for the establishment of a new Defence Export Steering Committee (DESC), along with a National Defence Export facilitation body. It, however, needs to be seen whether the Policy is faithfully implemented for economic, military, and diplomatic gains, as it envisages, or would the old mindset of questioning every deal through the lens of suspicion, would continue.

Conclusion

The world over, nations have a system in place that respects priorities and processes that deliver accountability to hasten decisions, especially in matters relating to national security. India has just witnessed an example of rapid decision-making after the 13/11 attacks in Paris. Do we have it in us, or is it the best India can do, to promulgate new policies, amend some old ones, and live with a system that sleeps over decisions that concern operational preparedness of the Armed Forces?

One hopes, there will be some circumspection in this regard. The myopic view of those who inhabit the corridors of power should not hamper the growth and modernisation plans that concern national security. Processes have been initiated, and more are in the pipeline, but the medicine must be administered in the right doses, with due care. Just facilitating JVs with foreign partners, bypassing the FIPB, to increase investment is not likely to prove successful; process of what technology comes into India, and how would it be absorbed, also needs to be looked into.

An increase in FDI, new policies in manufacturing and export, a new DPP document, are initiatives in the right direction, to encourage indigenous defence production. The creation of a favourable environment, the change in the thinking, shaking off the lethargy in various government organisations, are some of the other processes that need to be accelerated, if the slogan of 'Make in India' is not to remain a mere slogan.

The Government needs to act on these issues with a sense of urgency. The world is waiting for some results!

Road Ahead for Make in India

Dr SK Palhan*

Defence preparedness of a country depends on the defence machinery and the men behind the machine. India has excellent record of the men behind the machine. The defence machinery is an outcome of technology and the production capability. We have a reasonably good capability in production also. As far as technology for defence equipment is concerned we have been lagging behind since independence. This is confirmed by the heavy dependence on import of defence equipment. A rough estimate indicates that 70% of our defence equipment is of imported origin. It is implied that the import was done since we did not have the technology/capacity to make it indigenously. The market for defence equipment is very peculiar; the state of the art equipment is rarely sold and kept for the use of the country of origin. Technology transfer in defence equipment manufacture is invariably when the new version has been developed by the donor. Even with the best bargaining through diplomatic ties, the equipment which a country imports is of second class only. Building modern defence equipment requires technology, design capability, strategic raw materials and mother machine tools to manufacture the equipment. India was put under embargo for import of defence related technology, as well as equipment till 1994.

The defence equipment of cutting edge technology is very difficult to manufacture indigenously without any previous experience. The products developed indigenously for the first time are usually technically inferior in specification and users are not willing to induct them, this result in import to meet the strategic requirements. In this process the indigenous product does not gets the opportunity for production beyond the prototypes. The technology

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is improved only when the product is manufactured, used and the feedback is used to upgrade the product. It has been noted that sometimes the restricted technologies are exported at easy terms to thwart the indigenous development of technology. This phenomenon happened in carbon fibre industry also. In such cases the indigenous effort for technology development requires lot of hands holding to promote a product which is below the desired specification. When the import is resorted to then the indigenous effort suffers further; the indigenous manufacturers do not get the experience to make the product and lose the opportunity to improve the product further. This builds up the vicious circle in which the indigenous development is lagging behind all the time simply because it did not get the opportunity to manufacture it when the gap between the imported equipment and the indigenous equipment was small. Unless the indigenous manufacturer gets an opportunity to manufacture an item, and get the feed-back for further improvements it will not be able to bridge the technology gap. This is precisely what happened to development of LCA in India. After 2 decades 4 Tejas have been built and 2 prototypes have been approved for induction. The production facility is yet to become operational. Such problems may be solved when the defence procurement becomes a subset of the defence production policy .

Efforts have been made to indigenize the production of defence equipment under phased manufacturing programmes. In most of the case CKD imports continued and the absorption of technology was limited to assembly in which critical/ high tech components were imported and mostly routine items were made indigenously. Technology absorption does not happen by itself unless it is built in the technology transfer agreement and adequate manpower is earmarked for facilitating technology absorption (in design as well as production capability)

India has made progress in export of some defence related products to developed as well as developing countries. Export of defence equipment/ components has picked up significantly; it was Rs 686.27 crores during 2013-14 was (almost 50% increase over 2012-13). Some of the major export destinations for defence products have been Italy, Israel, Ecuador, Russia, USA, UAE, Namibia, Srilanka, Malaysia, Romania, UK, Indonesia, Mauritius, Netherlands, Kenya, Nepal, Botswana, Tajikistan, Oman, Belgium, Singapore, Bangladesh, Vietnam, Ireland, Myanmar, Switzerland and Czech. The defence items exported were Test

Equipment for Radar, ULSP etc. for radar, High Speed Patrol Vessels, Turret upgrade, Light Engineering Parts, Components for Acoustic head of heavy weight Torpedo, Battery proof vest, Helmet, Fuze Harness, Stallion 4X4, Naval Safe & Arm Device(Modified), Turbo Charger, Vehicle Mounted Launching Bride & Offshore Patrol Vessels.(MOD Annual report 2014-15)

The environment and the strategic requirements of the users preferred imported equipment and this is supported by the fact that more than 70 % of the equipment is imported. Though the country wanted indigenous production but the policies were not conducive. The policy regarding indigenous manufacture of defence equipment was not explicit; the policy was summed up in few lines in the policy for Industrial licensing under the IDR Act. In contrast to this Defence Procurement Policy (DPP) has evolved into a large document. Many studies on the subject were critical of heavy dependence on import of defence equipment .The Kelkar committee report in 2005 , Ram Rao committee and the Standing committee on Defence 2006-7 and CENJOW'S study on Defence Industrial Base 2025 in 2010 highlighted the need for indigenous development and production of strategic defence equipment in the country.

It took India almost 62 years after independence to enunciate an explicit Defence Production Policy which was announced on 1-1-2011. This is a big landmark. This policy has opened avenues for building capabilities in the private sector in addition to the public sector. Defence R&D, Ordnance factories, Defence PSU to provide our armed forces with weapons, ammunition/equipment/platforms and systems that they need for the defence of the country. It acknowledged the dynamism of Indian industry along with capabilities available in academia as well as research and development institutions. The implementation of DPP-2011 has been rather slow so far but with the recent emphasis on "Make in India" it would have definite impact on defence preparedness of the country. The roadmap for development of indigenous defence industrial base has been fairly well defined in DPP-2011. Some of the factors which could make large impact are:

- **Planning and management of projects** .The development of a complex platform has number of interrelated activities which require proper planning. Planning and implementation of large projects require the application of modern techniques of project management. In the Indian

scenario most of the defence projects could not be completed within the budget and time frame. India has the capability of excellent project management e.g. The project of Delhi Metro is an example where a state of art project could be completed in India within the time frame and budgeted cost. It was possible through the use of modern project management technique in the Indian environment. There has been lack of planning of projects .The culture of project planning has been almost missing in defence projects. Only very junior persons in the team had undergone proper education/ training in project management. The culture of professional project planning is to be imparted to the whole team including the top management.

- India has done well in spite of technology denial regime in space, nuclear and IT.
 - Space –Indian space programme started in 1962 and it was upgraded to ISRO IN 1969 has achieved a lot .It includes Aryabhata the first Indian designed and fabricated satellite launched in space with Soviet help. The capability to make in India was further demonstrated by Bhaskara, Rohini series of satellites, INSAT series, GSVL and launching of Chandrayanin 2008. India is among the top 5 countries in the world as far as space technology is concerned. This shows that India has the capability to compete internationally in space technology. The military space programme is however on low key. The global leaders in missile technology are USA, Russia, UK, and France. The second tier in this area is dominated by China, Korea, Brazil and Israel which imported technology and have developed it further. India has produced Prithvi, Akash, Trishul, Naag indigenously and Brahmos in collaboration with Russia. The technology gap is still very large and we have a long way towards make in India in this field.
 - Nuclear power is another area in which India has demonstrated its capability for production of nuclear power for military as well as civil applications.
 - India has developed an excellent base in the area of IT and it is a major foreign exchange in the service sector.

The defence industrial base cannot grow without research and development in the country and its utilization in production of modern defence equipment. The dominant role in terms of infrastructure and expenditure has been played by DRDO. Large infrastructure of defence labs have been established but the utilization of its output has been very poor. The efforts put up by the defence PSU has also not resulted in development of new equipment. In most of the developed nations the upgradation of the products is invariably done by the production units with in-house capability. In the Indian scenario, upgradation has been done in few area like Mark-2 in MBT Vijyanta tank and Pinaka-2. The biggest player of defence equipment is the Ordnance Factory Board which has 39 production facilities (2 more are under implementation). They produce defence equipment valued around Rs7,138 crores (2014-15). Most of the Ordnance factories are mainly production units without any design or Research and Development facilities. They do not have the infrastructure to absorb the technology and develop next model of the items being produced by them. This inherently leads to products which are outdated in design and technology. The DPP announced in 2011 clearly recognized that development of complex systems is generally a stage process with incremental changes progressing from Mk-1 and Mk-2 and so on. The Ordnance factories are well equipped with production equipment which have been modernized from time to time. The modernization plans have dealt with equipment and technology; but design and Research and Development areas have been neglected. The restructuring of the ordnance factories with suitable infrastructure for technology absorption and developing improved version of the products is very important for developing products with an edge over the adversaries.

The DPP-2011 has opened the doors for entry of private sector in defence production. Letter of intent have been issued for 240 defence products to 144 companies but only 49 companies have started production till date. Their production data is not reflected in the annual report of the Min of Defence. There is scope for further growth in this since the procedures are being simplified further under Make in India programme .

The existing policy permits 49% FDI in defence production. The actual inflow during 2000 to 2014 has been only Rs 24.36 crores which is negligible. The steps taken for promoting make in India should lead to quantum jump in FDI and production in the private sector. Building the confidence of the foreign

investors is very important for transfer of technology in high tech areas .The FDI would increase after the ease of doing business is improved further and the concerns regarding the intellectual property rights are taken care.

Conclusion

India has high potential for the success of Make in India campaign. We have the policy frame work as well as the capability to develop and manufacture state of the art equipment and to be a leader in few areas in which we have inherent advantage e.g. cyber warfare and space technology. For higher impact on our defence preparedness, the defence industrial base could to be strengthened further through the following actions:

- Proactive encouragement of the Indian private sector in design, development and manufacture of defence equipment in the country so that they are not disqualified for development order due to lack of previous track record of production.
- Strengthen technology acquisition, Absorption of imported technology; design , manufacturing and upgradation capability in production system.
- Develop own technology through leveraging our R&D strength in selected areas for world leadership through.
 - Encouraging innovative and Basic research in labs and technical institutions.
 - Sponsoring of basic research projects in IITs and other academic institutions.
 - Encouraging In-house R&D in PSU, Ordnance factories and private sector for technology absorption and upgradation and building capability to produce next higher models of their existing products.
- Improve ease of doing business in India to attract FDI and technology transfer in high tech areas through suitable intellectual property rights.
- Inculcate modern techniques in planning , implementation and monitoring of major projects.
- Encourage formation of consortia for handling large R&D projects.

Indigenisation of Defence Procurement: Impact on Operational Preparedness

Brig Gurmeet Kanwal (Retd)*

Government's Push for 'Make in India' Policy

No country that is not substantially self-reliant in defence production can aspire to become a dominant military power in its region and, in due course, on the world stage. Prime Minister Narendra Modi has selected 'make in India' as a key feature of his policy for economic development. While addressing investors during his visit to the United Kingdom in November 2015, he once again invited them to come and make in India. The aim of indigenisation of defence manufacture should be to make India a design, development, manufacture, export and servicing hub for weapons and defence equipment by 2025.

During the UPA-II regime, the Defence Minister, Mr A K Antony, had repeatedly exhorted the armed forces to procure their weapons and equipment from indigenous sources. However, it was not well appreciated by the Ministry of Defence (MoD) bureaucracy that the government needed to drastically reorient its own procurement and production policies for indigenisation, or else the import content of defence acquisitions would continue to remain over 80 per cent.

It is axiomatic that the country's procurement of weapons platforms and other equipment as part of its plans for defence modernisation, must simultaneously lead to a transformative enhancement in the defence technology base and manufacturing prowess. In case the measures required to upgrade

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the defence technology base are not instituted, defence procurement will remain mired in disadvantageous buyer-seller, patron-client relationships like that with the erstwhile Soviet Union and now Russia. While India manufactured Russian fighter aircraft, tanks and other equipment under license, the Russians never actually transferred technology to India. Whatever India procures now must be procured with a transfer of technology (ToT) clause being built into the contract, even if it means having to pay a higher price.

Though it seeks to publicly encourage public-private partnerships, privately the government continues to retain its monopoly on research and development and defence production through the DRDO, the ordnance factories and the defence PSUs (DPSUs). The Defence Procurement Procedure (DPP), which was first formulated in 2006 and is now in its sixth edition, was amended in April 2013 to reflect the new thinking on 'buying Indian'. However, the changes were not far reaching and, in effect, the process still favours the defence PSUs over the private sector. Defence MNCs are allowed to bring in only up to 49 per cent FDI as against 74 per cent for non-defence sector joint ventures. Though the procurement of weapons and equipment worth more than Rs 300 crore from MNCs has been linked with 30-50 per cent offsets, it is doubtful whether the economy is ready to absorb such high levels of offsets.

On May 1, 2015, the Defence Minister, Mr Manohar Parrikar, appointed a 10-member committee headed by former Home Secretary Dhirendra Singh, to review the defence procurement policies and procedures and to recommend fresh guidelines with a view to implementing Prime Minister Narendra Modi's exhortation to 'make in India'. The review was utilised to learn from the experience gained in the implementation of the current version of the DPP and many pragmatic recommendations were made by the committee. The Defence Minister has begun to implement its recommendations in earnest. For example, the policy on offsets has been reviewed and several pragmatic amendments have been made. Approval of necessity (AON) has been accorded to defence acquisition projects worth approximately Rs 100,000 crore, mostly for make in India projects. However, many important issues remain to be resolved. Among others, the DPP document is still too long and must be cut down to not more than 12 to 15 pages.

Acquisition of Defence Technology: Policy Recommendations

As has been noted, the Soviet Union and Russia did not transfer any weapons technology to India. For that matter, no technology has been transferred by US companies either despite US\$ 10-12 billion worth of weapons acquisitions in the recent past. However, in the purchases made from the ToT was not part of the contract as India had not insisted on it. Defence technology is proprietary; the selling company's government must be willing to allow the transfer and the buyer must be prepared to pay for it.

The essence of all efforts to achieve self-reliance lies in acquiring state-of-the-art defence technology through original research or by gaining access to it through ToT. No country will give India strategic technologies, such as nuclear warhead and ballistic missile technologies, know-how on building nuclear-powered submarines and ballistic missile defence technology (BMD), among others. It is the responsibility of the DRDO to conduct original R&D into strategic technologies and this must continue.

For the development of hi-tech weapons platforms like fighter-bomber aircraft and sophisticated defence equipment like over-the-horizon (OTH) radars, there should be no need to reinvent the wheel. These should be developed jointly in conjunction with India's strategic partners. The route adopted should be to form joint venture (JV) companies between Indian defence PSUs (DPSUs) and defence MNCs or private sector companies and MNCs. In these cases, the role of the DRDO and the Services HQ should be mainly supervisory and to act as facilitators.

The design and development of low-tech items should be outsourced completely to the private sector, with the DRDO monitoring progress of the projects. In fact, some R&D projects should be outsourced to universities and IITs to involve the institutions of higher learning in this important national endeavour. Also, DRDO should invite and put in place a system for the evaluation of project proposals from individual entrepreneurs.

Services HQ should establish their own Design Bureaus to inculcate a technology development culture. The armed forces should be given funding support to undertake research geared towards the improvement of in-service equipment with a view to enhancing operational performance and for the purpose

of product improvement during the life-cycle of weapons systems and defence equipment. They should initiate R&D projects in their training institutions. At present very little innovation is taking place within the Services, perhaps with the singular exception of the navy.

Since its inception in 1958, the DRDO has achieved some spectacular successes like the missile development programme, but also has many failures to its name. Programmes like the Light Combat Aircraft (LCA) and the Main Battle Tank (MBT) Arjun have suffered inordinate delays and time and cost overruns. However, to its credit, the DRDO worked under extremely restrictive technology denial regimes and with a rather low indigenous technology base. At present there are far too many DRDO laboratories. There is a need to rationalise the justification for these and close down those whose work can be outsourced to the private sector. The DRDO must scrupulously stay out of production. In 11 years, the DRDO budget has increased from Rs 3,443 to Rs 14,354 crore for FY 2015-16, that is six per cent of the defence budget. This level of funding for R&D must reflect in the results achieved.

A few years ago, the P Rama Rao committee had gone into the functioning of the DRDO. The committee had asked the DRDO to identify eight to 10 critical areas that best fit its existing human resource pool, technological threshold and established capacity to take up new projects. Its recommendations must be expeditiously implemented after scrutiny by the Defence Technology Board headed by the Defence Minister. The inputs of the Services HQ must be taken into account. This multi-faceted approach will help to raise India's technological threshold over the next two decades by an order of magnitude.

Additional Policy Issues

At the policy level, many contentious issues remain to be resolved. The starting point for the acquisition of new weapons systems and other defence equipment are General Staff Qualitative Requirements (GSQRs – army term). It is often alleged that the Services ask for the moon when they formulate GSQRs. The services, naturally, strive to acquire the best. The MoD should ensure that representatives of the DRDO are made available to the Services' teams assembled to formulate GSQRs. If there is still a disagreement between the desirable and the achievable, the DTB should act as the final arbiter. However,

in order to avoid a situation where no bidder qualifies during trials, the Chiefs of Staff should be empowered to approve deviations from the GSQRs for single-Service acquisitions and the Chairman, CoSC, for tri-Service acquisitions.

The privatisation of most of the ordnance factories and some of the defence PSUs should be considered on priority. Publicly owned manufacturing facilities are always inefficient and seldom meet the laid down production targets. They also lack dynamism and normally develop a risk-averse professional culture. Today it is well accepted that it is not the business of the government to be in business. The private sector has shown its readiness and technological proficiency to take up the production of weapons and equipment designed and developed by the DRDO and must be trusted to deliver.

Though FDI in defence manufacture has been increased from 26 to 49 per cent, this is still not attractive enough for the MNCs to invest in India. Given the time and effort that goes into locating a joint venture partner, the risks involved and the fact that they are expected to bring in proprietary technology, the MNCs prefer to have a controlling stake. This policy should be reviewed by the government, but adequate regulatory measures should be built in to guard against the pitfalls of permitting majority stake. While exports of defence equipment have been permitted, the procedures for according the approvals that are necessary and the regulatory framework need to be streamlined.

The offsets policy has not worked to India's advantage. The defence industry's ability to absorb hi-tech offsets is still limited. Absorbing 50 or even 30 per cent offsets is extremely difficult at present. It may be more prudent to consider offsets only in cases where the benefits expected to accrue will outweigh the additional costs and Indian JV partners can absorb the technology that is brought in. In November 2015, the government restored 'services' as eligible offsets for defence contracts, opening up a business potential of over \$3 billion in immediate projects. The government also added the development of software and engineering design to the list of eligible offsets, but limited it to 20 per cent of the project cost. This will bring some relief to the maintenance, repair and overhaul (MRO) and software industries, as also companies involved in the upgradation of military systems and life extension projects of defence equipment.

Streamlining Production

The inability to speedily conclude major defence contracts to enhance national security preparedness in the face of growing threats and challenges, exemplifies the government's challenges in grappling with systemic flaws in the procurement procedures and processes. Despite having promulgated the Defence Procurement Procedure (DPP) and the Defence Production Policy (DPrP), the government has been unable to reduce bureaucratic red tape and speed up acquisitions.

From the submission of a Statement of Case for a new acquisition to according approval in principle (Acceptance of Necessity – AON) takes six months to one year. Then the case goes into RFI (request for information) and RFP (request for proposals) stages and prolonged negotiations with the selected bidder. The actual conclusion of the contract takes up to three years. The inconclusive negotiations for the Rafale fighter aircraft are an example. The delivery of the contracted item begins two to three years later. Even according to the current DPP, this is excessive and must be cut down to less than one-third. The DPB should decide on a cut-off date for the conclusion of the acquisition contract and ensure accountability.

There is a need for pre-RfP consultations to avoid incidents of 'no bid'. The policy of conducting trials on 'no cost-no commitment' (NCNC) basis, in which the prospective bidder has to bear the entire expense of transporting the equipment to the trials locations in India, providing crews and ammunition and organising logistics support for the crew, has put off many bidders. Like elsewhere in the world, the MoD should bear the cost of trials.

At present, the services find quality control to be grossly unsatisfactory. The Directorate of Quality Assurance (DGQA), the organisation responsible, comes under the Defence Secretary. The DGQA must be transferred to HQ Integrated Defence Staff so that it is directly answerable to the Chairman, CoSC. Quality assurance during production also needs to improve. Close supervision during manufacture would help to avoid time and cost overruns. As the Services are the main stakeholders, armed forces officers should be positioned in manufacturing facilities for supervision.

The government should examine the feasibility of establishing Defence Economic Zones (DEZs) to provide incentives for indigenous defence manufacture. There is an inescapable need to establish an Institute of Defence Acquisition under the CoSC. The US has a Defence Acquisition University where all officers nominated for posts dealing with defence procurement are trained. As an example it would be pertinent to mention that the 'life cycle concept' of evaluating defence equipment for acquisition was completely alien to the armed forces till very recently. In fact, an exchange programme should be instituted with defence acquisition universities and institutions in countries from which India acquires the bulk of its defence equipment.

Impact on Defence Preparedness

The procurement of defence equipment is an extremely important facet of preparedness for future conflict. Defence preparedness is a function of the training and morale of the combatants, the suitability of the force structure, the efficacy of the weapons with which the force is armed, the adequacy of the supporting equipment, the availability of the right quantities of ammunition and explosives, and the serviceability state of the war machinery. Due to critical deficiencies in several of these elements, the present state of defence preparedness – particularly that of the army – leaves a lot to be desired.

More than anything else, the former Army Chief, Gen V K Singh's leaked letter to the Prime Minister and the CAG's reports of 2012 and 2015, revealed that the state of defence preparedness is a cause for serious concern. Parliament's Standing Committee on Defence has noted these developments with alarm. Attributing the deficiencies to 'hollowness' in the defence procurement system, Gen V K Singh reportedly wrote in his letter to the PM, "The state of the major (fighting) arms i.e. Mechanised Forces, Artillery, Air Defence, Infantry and Special Forces, as well as the Engineers and Signals, is indeed alarming."

The major issues raised by the former COAS include the following: the army's entire tank fleet is 'devoid of critical ammunition to defeat enemy tanks,' the air defence equipment is '97% obsolete and it doesn't give the deemed confidence to protect...from the air,' the infantry is crippled with 'deficiencies of crew served weapon' and lacks 'night fighting' capabilities, the elite Special Forces are 'woefully short of 'essential weapons,' and there are 'large-scale voids' in critical surveillance.

Military modernisation has two major facets: the replacement of obsolete and obsolescent weapons and equipment with modern ones, which results in increasing combat effectiveness; and, the qualitative upgradation of combat capabilities through the acquisition and induction of force multipliers. As the defence budget is invariably much smaller than the requirement, military planners face a major dilemma: how to improve operational preparedness while simultaneously making concerted efforts to modernise. Logically, operational preparedness must take precedence over modernisation. The art of leadership lies in finding an optimum balance so that all efforts that are made to enhance operational preparedness also contribute substantively to modernisation.

Hence, while implementing the policy to make in India, it is necessary to first take up projects that contribute directly to enhancing defence preparedness by making up critical deficiencies in weapons, ammunition and equipment. When the funds are limited, the acquisition of long-term force multipliers must take lower priority over the short-term needs of defence preparedness. However, those projects that have a long gestation period can be given some funds for the early stages of the project where the costs are low; e.g. setting up a production line and putting in place the logistics chain for sourcing raw materials.

India cannot leap-frog to a higher defence technology trajectory virtually overnight. Transforming a low technology base to a higher plane will need time, patience and large-scale capital investment. It will also need strong support across the political spectrum. In the interim period, inevitably, there will be a further dip in defence preparedness. This short-term weakness in capacity building will need to be carefully weighed against long-term gains that will be strategic in nature. The risk involved will require fine political judgement backed by sound military advice.

Concluding Observations

The defence procurement process must provide a level playing field between defence PSUs and private Indian companies forming joint ventures with MNCs where necessary. The amount of FDI that MNCs can bring in must be raised to 49 per cent immediately and to 74 per cent in due course to make it attractive for MNCs. However, no MNC that is unable to provide transfer of technology – either due to the home country's restrictive laws or due to proprietary considerations – should be considered for future defence acquisitions.

As the largest importer of arms and equipment in the world, India has the advantage of buyers' clout. This clout must be exploited fully to further India's quest for self-sufficiency in the indigenous production of weapons and equipment. The immediate requirement is to think big in keeping with the country's growing economic clout and to plan for the future with a level of confidence that policy planners have not dared to exhibit before. In 10 to 15 years India must begin to acquire most of its defence equipment needs from Indian companies—with or without a joint venture with an MNC. There is an urgent need to cut red tape, improve time-lines for the conclusion of contracts, ensure better quality control, involve armed forces officers more effectively at every stage of the acquisition and introduce greater transparency in the acquisition process. Only then will the era of self-reliance in defence acquisition truly dawn on the country. It will be a difficult quest, but not one that a great nation cannot realise.

To enable the armed forces to fight and win the nation's future wars in an era of strategic uncertainty, the government must give a major boost to their modernisation drive. The modernisation plans of the armed forces require substantially higher budgetary support than what has been forthcoming over the last decade, the speeding up of the weapons and equipment acquisition process and the simultaneous upgradation of recruitment standards and, consequently, personnel skills so as to be able to absorb high-tech weapon systems. Doctrine, organisation and training standards will need to keep pace with technological modernisation to make the Indian armed forces a force to be reckoned with in the 21st century.

Make in India and How to Make it Happen

Air Marshal V K Verma, PVSM, AVSM, VM, VSM (Retd.)*

It is painfully evident to all that India has missed the “manufacturing bus” in its growth trajectory and hence is not able to fulfill the potential it possesses. This deficiency in manufacturing is most pronounced in the sector of defence. India’s ambitions on the world stage, its defence needs, its inimical neighbourhood all demand that Indian military muscle be strong. This has forced India to become one of the biggest arms importers in the world. A country whose military is dependent on imports and foreign suppliers for its basic armament can only produce the short lived fizz of a carbonated drink. A longer stay on the top can only germinate from a strong military-industrial base and indigenous military muscle. This truth has been recognized all along by our leadership since independence. This article shall trace the history of ‘Make in India’ in defence, its shortcomings, failures, my personal journey enroute wherein I attempted to provide a vital link to the chain, the current status position and possible remedies that can ‘Make in India’ happen.

Make in India: Ver 1.0

The post independence vision for the Indian Defence Industry resulted in a creation of a “Self Reliant’ model that hinged on the Defence Research and Development Organisation (DRDO) for R & D and the Defence Public Sector Undertakings (DPSUs) and Ordnance Factories (OFs) for manufacturing and delivering the fighting wherewithal. In its nascent years with post independent India under an idealistic spell under the leadership of Nehru, this theoretical

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model promised a lot but produced very little. For such a model to succeed technological base and good scientific human resource is essential. These components being absent, the output was a dud. There were myriad other problems besetting this triad. The Defence Industry was designated a core sector and was controlled by the central government. Bureaucratic control with little accountability and minimal peripheral participation by the private sector created a non-competitive environment with obvious end result of forcing the country to import most of its defence needs.

Make in India: Ver 2.0 (TOT Route)

The next “Make in India” wave rested on the shoulders of “Transfer of Technology” (TOT). Theoretically this was progress on the ladder of indigenization. Practically this version hardly saw any real transfer of technology. A certain percentage of the equipment would be imported outright and the balance manufactured in India with very meager indigenization. The fact that the bulk of production took place on the Indian soil produced a mirage of homegrown progress. The practitioners of the craft however knew the truth. The global scenario wherein India was primarily dependent on Soviet Union for its defence supplies and had access to it without interruption on easy payment terms also led to an acceptance of a poor performer in the form of local defence industry. Collapse of Soviet Union and poor arms support thereafter changed the scenario.

With partial globalisation and liberalization of the Indian economy in the nineties, the GDP and the overall growth rates began to edge higher as did the successive defence budgets. Our leaders also realized that to transform the nation into a global player, the country could not afford to depend continuously on imports for its defence needs. It became clear that the reliance on the public sector in defence needed to be modified and private industry made a bigger player in this game. All this set in motion the process of progressive change in policies. In 2001, the Government decided to allow 100% private sector participation and foreign direct investment (FDI) up to 26 percent in the defence industry. Unfortunately this did not succeed as the private sector was wary of investing huge capital that is needed in the defence production due to apprehensions of not having assured supply orders. The Defence Procurement Procedure (DPP) also did not take into consideration the factor that if a specific product is made by private industry for defence – there are no other buyers, hence “competition” and

“L1 or the lowest bidder” cannot be overriding consideration. To make matters worse Arms Export Policy also continued to exhibit a “moralistic holier than thou” attitude with restrictions in export of armament, thus shutting this possible outlet.

Poor response prompted the Government in 2004 to appoint Kelkar Committee to review the methodologies and produce a framework that would encourage the entry of the private sector into defence and revitalize the defence public sector. By this time there were 52 labs of DRDO, 9 DPSUs and 39 Ordnance factories under Government control. One of the key recommendations of Kelkar Committee (2004) was to create Raksha Udyog Ratna (RUR). About a dozen private players were identified in 2006 by the Prabir Sengupta Committee for being nominated as RURs. However, trade unions of public sector defence companies played spoilsport and the concept never took off. Unfortunately, a lot of important recommendations have remained confined to the pages of the report.

Make in India: Ver 3.0 (Offset Policy)

With enhancement of FDI to 26% and 100% private sector participation in defence not bringing necessary rewards, Government in 2005 embarked on its offset policy. Recognising the international success and its adoption in 130 countries, India too adopted Offset Policy by which the supplier would have to reinvest 30% of his earnings in contracts valued above Rs 3 billion under “buy” and “buy and make” categories. It was hoped that through the offset route, private sector would get the necessary impetus, technological backing and bring the defence industry to a level where it could compete internationally. Most of these hopes were belied as the implementation of the “off set policy” lacked clarity, is continuously being revised and upgraded and is a work in progress. The experience world over is that offset mechanism is full of complexities and the satisfaction level it provides differs from country to country. There will always be an economic cost to offsets that the supplier will include at the very beginning of the deal. Hence the feeling of a free lunch is at best a mirage. All doubts notwithstanding, in the long run offsets will help forward movement in developing our own indigenous military industrial base only if this is coupled with an increase in the FDI limit.

Indian Space Success Story in Make in India

Our space scientists offer us a good lesson. There are a lot of similarities between the Defence and Space sectors. Both have limited users of the items produced and both belong to the Government. Yet they follow different procurement procedures. Model followed by ISRO is to involve a private firm as a co-partner in developing a project or equipment. Once equipment is ready for production, the co-partner is given the contract for production. This model does not resort to the “lowest bidder” procedures that are prevalent in the defence sector. The model also gives ISRO the flexibility to choose the public/private sector as co-partners. Surely we can derive learning values from the success of ISRO and apply these to defence deals. Such a modification in the DPP will bring solace to a lot of private players who are developed as vendors by DRDO and DPSUs. The signal of assured orders will encourage entry of private players into this sector.

Lead Times in Defence Industry and Linkages between User, Developer and Producer – A Personal Journey

There is always a large time gap between the enunciation of the need of a product/capability to its manufacture and ultimate delivery to the user. For various reasons such time gaps are large in the defence sector. The user has to forecast his need and pass it on to the developer or the producer of the product. Many times this may involve two separate entities – the developer and the manufacturer. Indian model with its DRDO labs, its DPSUs/OFs and the Armed Forces clearly belong to this model. Communications and regular interaction between them should be the norm if any success is to be achieved. My attempts to synergise these linkages between the user, developer and producers are given in succeeding paras.

As I grew up in service, whatever little interaction I had with the DRDO labs and DPSUs, one thing became clear. There was practically “Nil” mechanism for interchange of information and ideas between the triad described above. Each organization was working in its own silo. One of the factors for creating HQ Integrated Defence Staff (HQ IDS) was precisely to bridge the gap between the three services and harness commonalities and jointness in equipment, technologies and operations to achieve better economy, effort and effect. HQ

IDS at least brought the three services on a platform. However DRDO & DPSUs/OF, also needed to be brought on board the same platform. In 2004, I became the Asst Chief at HQ IDS in the PPF (Policy Planning and Force Development) Branch. Major task of this branch is to integrate the individual plans of each service and produce an integrated single Long Term Procurement Plan for the Armed Forces. I was heading the division that looked at commonality of weapon systems and interoperability issues. I visited the DRDO headquarters and discovered that they too had realized that they needed to look ahead and forecast and had formed a core Group named G-FAST – Group for Forecasting of Systems and Technologies. In addition this Group was to be the link between all the DRDO labs.

My team identified 8 specific areas that affected all the three services. The areas identified were Radars and Surveillance, SAR, Precision Guidance/Strike, Communications, Networking Datalinks, Camouflage and Concealment, Lasers, Microwave/High Energy Weapons, Simulation and Modeling. SA to RM connected our team with G-FAST. G Fast then gave us a list of 12 labs that dealt with these subjects. These were :-

- DEAL - Defence Electronics Application Lab, Dehradun
- IRDE - Instrument Research & Development Establishment, Dehradun
- LRDE - Electronics & Radar Development Establishment, Bangalore
- ADE - Aeronautical Development Establishment, Bangalore
- ADA - Aeronautical Development Agency, Bangalore
- DLJ - Defence Laboratory, Jodhpur
- DMSRDE - Defence Materials & Stores Research & Development Establishment, Kanpur
- LASTEC – Laser Science & Technology Centre, Delhi
- ARDE – Armament Research & Development Agency, Pune
- HEMRL – High Energy Materials Research Lab, Pune

- DLRL – Defence Electronics Research Lab, Hyderabad
- ISSA – Institute of Systems Study & Analysis, Delhi

A Team was created with reps of HQ IDS, reps of Army HQ, Naval HQ and Air HQ of Plans & Procurement branches dealing with the specific area and members of G FAST. Each of these labs was visited by the team in a span of six months (Jul-Dec '04). On reaching each lab, a presentation was given by the visiting team of what the services requirements existed in the core competency of that particular lab. The lab would then give a presentation on its facilities, its capabilities and the projects it was working on. This would be followed by a familiarisation round to each section of the lab. Some of the labs had never heard of any procurement plans of the services. Scientists at some of the labs had not seen a person in military uniform visit them for years. The lack of co-ordination and follow up that are needed for development projects was obvious. Here the fault was at both ends. DRDO was working in isolation without accountability. Services were not even aware of what projects were on and whether they were relevant to their needs or not. A week after the visit, a report was sent to each service HQ, DRDO and the lab.

At the end of the programmed visits by Dec 04, our team prepared a document “Technology Needs for Joint Warfighting”. The document defined the capabilities needed by the three services in these joint arenas. Aircraft, Ships, Tanks and Artillery Guns were not included. The areas covered were :-

- Information superiority
- Electronic warfare
- Area Missile Defence
- Combat Identification
- Precision Force
- Military operations in Built up areas
- Combating Terrorism
- Nuclear Chemical & Biological warfare (Defence and Protection)
- Logistics Support

Care was taken not to identify the product needed – only the capability was defined. A very basic example would explain this. Till then each service had been spelling out the details of equipment they needed and the qualities it must have (QRs) and forwarding it to MoD for acquisition. There was no scope for original and indigenous solution. Thus the demands of services were a mirror image of what the developed countries had already produced. Instead this document spelt out the capability needed and left it to the developer/producer to visualize its solution, invent/develop it and provide it. Infantry needs to kill the enemy at a stated distance. Normally Army would define the exact specification of a weapon that would do it. This document left it to the Defence R &D/Industry to suggest solutions. This document was circulated to each service HQs and also presented to DRDO. A joint working group was set up in each area by 2006 so that these capabilities could be pursued. All the labs associated with these capabilities were asked to give presentation to HQ IDS on their plans and projects to an audience of decision makers from service HQs in the latter half of 2006. These efforts built bridges and networks. Suspicions began to be replaced with mutual understanding and trust between the organizations. A sense of realism about our capabilities to meet/not meet the demands of modern military also began to dawn.

Research, Academia and the Military

It is generalized that each scientist engaged in research is likely to produce just one item of any significance in his life time that too before he hits 40 years of age. Having visited 12 labs of DRDO it became clear that with youth practically absent, chances of any path breaking research in these labs was fairly low. The atmosphere in the labs lacked enthusiasm and instead gave a very bureaucratic feel – hardly conducive for research work. An alternative had to be found. For most of the twentieth century it is the military-industrial complex which has been at the cutting edge of the technology. Civilian sector has enjoyed the spin offs from defence research. Slowly things are changing. Civilian sector now appears to be ahead and leading. Time lines between the conception of the idea and delivery of the product have been shortened. Presence of youth at the Academia has always generated ideas for technological advancements. The Academia in the developed world is well established and so is their lead in research. In India there are just the five IITs (Indian Institute of Technology) and the lone IISc (Indian Institute of Science) who have the wherewithal and the

inclination to progress R & D. All they need is funding. With a seed capital of Rs 20 Crores in 2005, my team began interaction with the five IITs and IISc on the same contour as was done for DRDO labs. Document “Technology Needs for Joint Warfighting” was supplied to them and a joint team from HQ IDS and Service HQs visited each of these institutions. Areas of common interest were located and over a period of time research projects identified for each of the IITs. It is another matter that when approval for higher funding was sought the three Chiefs in the Chiefs of Staff committee refused to get involved in research. Their contention was that armed forces need deliverables and cannot spend time and effort in chasing research. Thus, this effort to rope in Academia to conduct research in areas of interest for Defence came a cropper. That was 2005. Today the entire scenario has changed and a similar attempt may have better chances of success. A caveat here, this must be coupled with an increased amount of funding for research. The budgeted 100 Cr as Technology Development Fund is too meagre and needs to be enhanced. More importantly, institutional linkages need to be created and kept alive.

Linkages with Private Industry

CII, FICCI and ASSOCHAM are three organizations that bring in private business/industry under their umbrella to help propagate their businesses through mutual networking. Each of these organizations also has a segment that deals with the defence. Many meetings were conducted with these organizations and businessmen to understand, to remove hurdles, to help them gain footage in defence acquisitions. They were provided the document “Technology needs and Joint Warfighting” so that they could visualize the capabilities needed by the armed forces. Their concerns of limited vendor base, low production rate, rapid military obsolescence and high technology content were forwarded to the Ministry of Defence and many tweaks to the DPP had their bases in these meetings. The industry was also very thankful that at last somebody was telling them what the military needed and a forum become available where mutuality could be beneficially advanced.

Make in India: Ver 4.0 and the Dhirendra Singh Committee Report

Once again “Make in India” – its fourth avatar is on the anvil. Government set up a committee under the Chairmanship of Dhirendra Singh to evolve a

framework for facilitating “Make in India” and streamline the existing procurement process. The Committee was set up in May 2015 and its recommendations are in public domain since September 2015.

Kelkar Committee had recommended forming Raksha Udyog Ratnas (RURs) from amongst big private players in specific areas. In a similar vein Dhirendra Singh Committee has identified “Strategic Partnership” as one of the models to be adopted. It suggests that one or two private players should be identified for each of the following six segments :-

- Aircraft, helicopters and their systems
- Warships, submarines and their systems
- AFVs and their systems
- Weapon systems
- C4ISR
- Critical materials

The challenge before the Government now is selection of the strategic Partner and acceptance of it by the industry.

Strategic Acquisitions – A Faster Route

Look at “Mahindra and Mahindra”. They are able to produce and market military vehicles to a country like Israel – one of the biggest sellers of defence equipment to India. Their product somehow does not find favour in India. Take a look at the way the steel giant Mittal Group operates. The group buys steel factories that are not performing efficiently, pumps in capital, infuses newer management techniques and churns the stagnant factory into a world class one. Can we not replicate these methods? What I am suggesting is “Strategic Acquisition”- strategic acquisition by the private industry through strategic sale/disinvestment by the Government. L & T is already into producing components for missiles. Offer them a strategic sale of the DRDO lab and the DPSU that is involved in producing missiles. Mahindra & Mahindra, Tatas, Ambanis are all very keen to get into the defence industry. Ask them to choose an area of their interest. Disinvest/sell a lab and its associated DPSU in that area to the big business

house. Such a strategic marriage will produce a win-win for all. The private player will acquire a readymade R & D facility complete with its scientists and a manufacturing hub that is already involved in defence production. All that the player needs to do is to provide the expert management, infuse technology and capital into the scheme, use its superior marketing skills and we have the successful Mittal formula replicated. Increasing the FDI limit above 51% from the present level of 49% is likely to produce even better results as that will also attract the big defence players of the world.

Acquiring land is the biggest obstacle today and the above methodology overcomes this issue as all these organizations already have huge pools of land with them. This method will also cut down on time and leap frog the whole process of inducting the private industry into defence.

Offsets and the Human Resource Development

One of the very prominent recommendations of the Dhirendra Singh Committee Report is to enable skill development through the offset route. Offset obligations are in billions of dollars. This will be the fastest and the easiest route to enable discharging a portion of the offset obligations. As the basic cost of setting up skill development institutes is low, a very large number of training institutions/Academia, etc can be set up. This will provide a fillip to the development of a defence sector specific skill force and lay the foundation for future growth. This is by far the most important and far reaching element as the country is beset with availability of large manpower with a very poor/low skill set.

Conclusion

India has forever possessed the basic framework needed for “Make in India” in Defence. What was lacking was the recognition that all stakeholders have to be brought on the stage together and made to operate synergistically. The pillars have all been erected and most of them even joined for the common cause. HQ IDS is ideally positioned to play a major role in connecting all stakeholders. Increasing the FDI limit, tweaking the DPP and strategic acquisitions of a DRDO lab along with associated DPSU/OF by a big business house will leap frog the entry of private players in defence industrialization. Encouraging utilization of offset obligations for setting up skill development of our unemployed youth

should get very high priority. These are some of the measures to revamp the defence sector. Please note that none of the measures are earth shattering and all are very doable. But they do need a central directing force or a project management approach. Once these measures are installed, Make in India for defence will “happen” and only then can India hope to be respected and counted at the global stage.

Indian Defence Research and Development (R&D): Transitioning from “Make in India” to “Made in India”

Arun Vishwanathan*

Abstract

Currently about 60% of India’s defence equipment is procured from abroad. There are imminent risks of such a situation to India’s national security as seen during the 1965, 1971 Indo-Pak Wars and 1999 Kargil conflict. The success of the “Make in India” programme is critical to increase the share of defence equipment produced within the country. International arms suppliers are however unlikely to undertake complete transfer of technology especially in critical materials and technologies. The article argues that in the long term, there is no alternative to strengthening domestic defence research and development (R&D) if the larger objective of increasing self-reliance in defence has to be met. The article flags three bottlenecks which need to be done away with in order to strengthen India’s domestic R&D efforts. These include adequate long-term funding for research & development; augmentation of national capacity and capability to support R&D efforts; and compressing development timelines and ensuring quicker induction of the platform into the Services in large numbers.

Introduction

The Indian government led by Prime Minister Narendra Modi launched the “Make in India” programme in September 2014. The visionary initiative is aimed

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at increasing the share of manufacturing sector in India's economy from a little over 16% in 2014-15 to 25% of the GDP by 2022 which is expected to create an additional 100 million jobs. The programme focuses on 25 sectors ranging from Automobile to Biotechnology to Defence Manufacturing to Electronic Systems.¹

In the area of defence manufacturing, the "Make in India" initiative - with a focus on increasing domestic manufacturing of defence equipment by the public and the private sector - becomes all the more significant. Given that the government in the form of the military and security forces is the only consumer for defence equipment, the 'Make in India' programme is largely fashioned by the defence procurement policy.²

Importance of Self Reliance in Defence

India has the third largest standing military in the globe and is situated between two inimical neighbours - in Pakistan and China - with whom India continues to have unresolved border disputes. India's bilateral relationship with India and China is unlikely to change in the short term. This in turn necessitates a military which is modern, well equipped and fighting fit. Though the Indian political and military leadership have been working towards inducting modern equipment into the Indian military forces; a large percentage of such procurements have come from abroad.

Over the past few years, India has become the world's largest arms importer with an estimated 60% of our defence equipment being procured from abroad.³ This situation is not a new phenomenon. A March 2014 report by the Stockholm International Peace Research Institute (SIRPI) had stated that the volume of Indian weapons imports had risen by 111 percent between 2004-08 and 2009-13.⁴ More recently, in March 2015 the SIPRI reported that India continued to occupy the position of the world's largest importer of major weapons between 2010 and 2014 followed by Saudi Arabia and China with a 15% share of international arms imports during the same period.⁵ It is also important to remember that apart from direct imports/capital acquisitions an equally vast sum of money is spent every year for the purchase of parts, components, and consumables from foreign sources by the Services and various state-owned enterprises or Defence Public Sector Undertakings (DPSUs).

It is quite apparent that the current situation is fraught with obvious risks. In

addition to being a drain on the country’s financial and foreign exchange reserves; the continuance of the situation poses a direct national security risk. In a recent interview with *Times of India*, former Chief of Army Staff (CoAS), General V.P. Malik stated that dependence on foreign partners for critical defence equipment and spares resulted in a serious crisis during the 1999 Kargil conflict. During the Kargil conflict, the Indian military was running short of spares for critical Bofors artillery guns and naval helicopters which hampered the optimum utilisation of these platforms. As a result of the sanctions which had been imposed on India following the May 1998 nuclear tests, many countries refused selling much needed equipment and spares during the Kargil conflict.⁶

It is important to recall that Kargil was not the first instance of using supply of essential military spares and equipment to exercise their influence in the region especially during conflict situations. During the 1965 Indo-Pak War, the United States and the United Kingdom had stopped supply of all military equipment to India and Pakistan in order to force both parties to end the conflict.⁷ During the 1971 Indo-Pak War, the American administration under President Nixon tilted completely in favour of Pakistan. In addition to diplomatic support at the global stage, the US directly and indirectly supplied Pakistan with much needed military equipment. Despite the embargo on military supplies to Pakistan imposed by the US Congress, the Nixon administration supplied Pakistan with F-5 and F-104 fighter aircraft via Iran and Jordan.⁸ Recent US declassified documents bring out the fact that American Secretary of State, Henry Kissinger in a meeting with the then Chinese Ambassador acquiesced to China providing Pakistan with military supplies at a meeting in Paris.⁹

It is therefore very much possible that in future crisis or conflict situations, foreign countries supplying weapons and spares to India could either delay or deny essential weapons for purely commercial, political or other simply in pursuit of their strategic interests. Therefore reduction of dependence on foreign suppliers for defence equipment is an important national goal. It is in this context that the Indian government’s ‘Make in India’ programme and the push for greater production of defence equipment in India by public and private sector becomes so critical.

Transition from “Make in India” to “Made in India”

It is imperative that the Indian political and military establishment should

seek a 'golden mean' which lies somewhere in between the current situation of over-reliance on imports for meeting our defence needs and a situation where the country strives for complete indigenisation. The latter situation might neither be achievable nor desirable. However, to give a concerted push to our domestic defence industry, it is critical to make investments into defence research and development (R&D) and that too over a sustained period of time. Though producing a larger share of defence equipment in India under the Make in India programme is desirable, it should go hand in hand with an increased focus on R&D efforts. Only domestic R&D efforts will enable the country to transition from 'Make in India' to 'Made in India'. It is imperative that such efforts receive adequate funding and human resources even if initial efforts face setbacks and do not garner immediate results. Such support is vital given the fact that defence R&D projects by definition involve overcoming complex technological challenges and have long gestation timescales.

The hard truth is that there is no alternative to building domestic capacities and capabilities in critical materials and technologies like titanium casting, forging and machining; aero engines; single crystal turbine blades; composites; gyroscopes; Nanotechnology and MEMs-based sensors; miniaturised Synthetic Aperture Radars (SAR) and ISAR; fiber laser technology etc. Though international arms suppliers are glad to sell complete systems, spares and set up maintenance, repair and overhaul (MRO) facilities; they have historically been reluctant to share their technological expertise and engage in transfer of technology.

This fact is brought out by the fact that despite increase in Foreign Direct Investment (FDI) limit into the defence sector, the country has seen an influx of only Rs 56 lakh into Defence industries between October 2014 and September 2015. The figures for the current financial year (March 2015 to September 2015) amounts to a measly Rs 8 lakh.¹⁰ As Jayant Sriram argues in *The Hindu*, the slow trickle in foreign investment is largely the result of the foreign companies' anxiety over control of technology and unwillingness to transfer high-end technology if the FDI cap is not raised over 50 percent.¹¹

The situation thus cannot be remedied by simply relying on foreign companies to invest in the defence manufacturing in the country either individually or by way of joint ventures with Indian public and private defence companies

as envisioned in the Make in India programme. A larger share of indigenisation in defence equipment is only possible only when enough financial and human resources are pushed into domestic R&D with a long term perspective in mind. This is very important because of the multiplier effect that investment into R&D can bring about in the socio-economic situation. When compared to the global situation, Indian investment into overall R&D and in particular into defence R&D has largely been below par.

As per the latest figures released by Battelle in its 2014 R&D Global R&D Funding Forecast states that GERD in India has increased from PPP\$ 40 billion to PPP\$44 billion between 2012 to 2014. This is compared to the global GERD expenditure which has gone up from PPP\$1,517billion to PPP\$1,618 billion in the same period.¹² Figure 1 below shows the gross expenditure in R&D (GERD) of select countries between 2012 and 2014. In India, as per estimates put out by the NSTMIS, Department of Science and Technology, the government sector ploughs in close to 55% (55.4%) of national expenditure into R&D with the private sector spending close to 29%.¹³

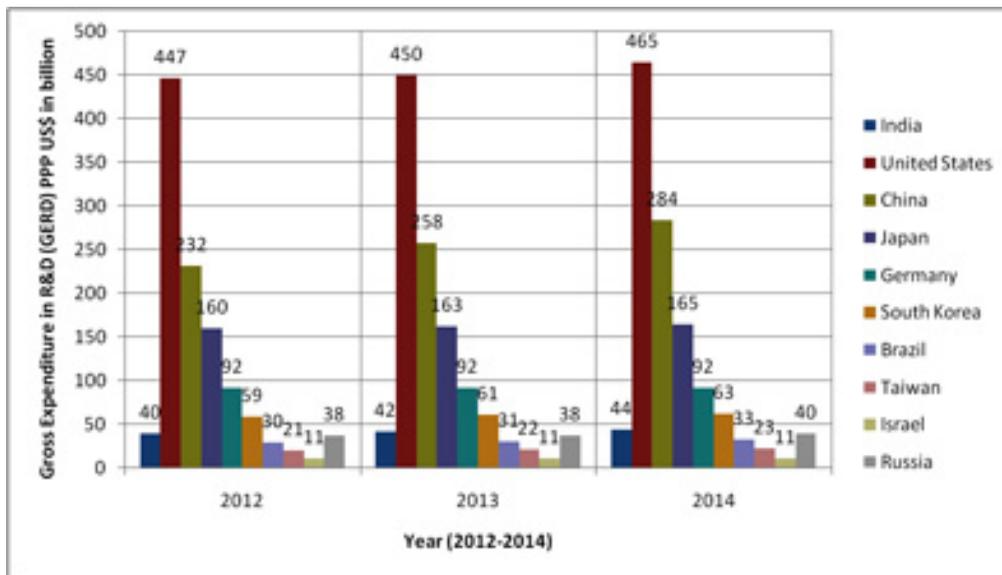


Figure 1: Gross Expenditure in R&D (GERD) in Select Countries (PPP US\$ billions)

The need for greater investment into R&D becomes more starkly when one compares R&D investment as percentage of GDP in India and other select countries. During the Eleventh Five Year Plan period, India allocated about 0.88% of its GDP into R&D. For 2014, the R&D investment as percentage of GDP for India is 0.9%. This is compared to 2.8% by the United States, 2.0% by China, 3.4% by Japan, 1.5% by Russia, 1.3% by Brazil, 2.4% by Taiwan and 4.2% by Israel. In order to catch up with the global leaders, Indian spending on R&D should move closer if not exceed the global average of 1.8% of GDP and this level of investment should be sustained over the next decade or more. Figure 2 below brings out the R&D expenditure as percentage of GDP in select countries.

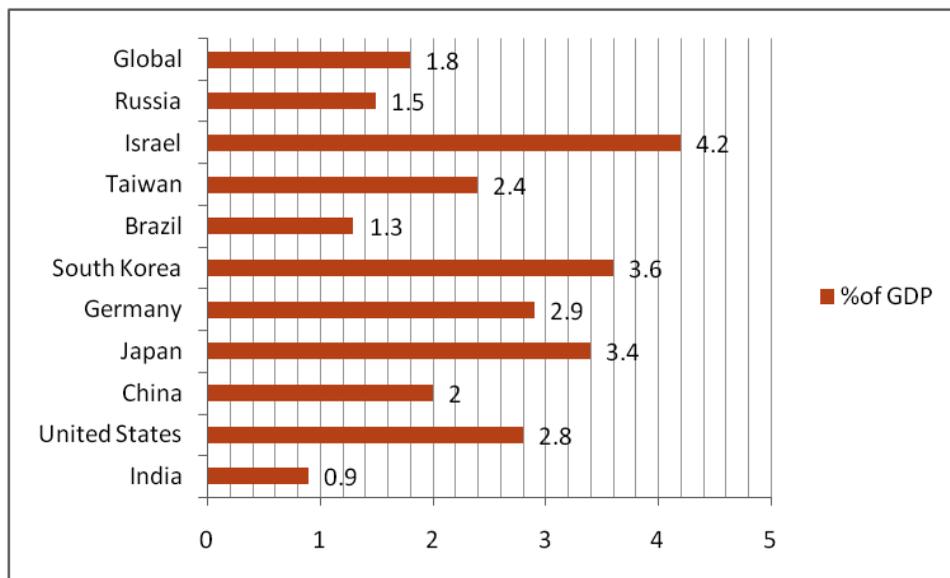


Figure 2: R&D spending as percentage of GDP in select countries in 2014

Within this share of the R&D expenditure for the entire country of PPP\$ 44billion, the share of expenditure on defence R&D is much smaller. In India, the defence R&D is largely concentrated in the Defence Research and Development Organisation (DRDO). Between 1961 and 2015, the DRDO has historically received on an average 4.6% of the Indian defence budget.¹⁴ In the last two defence budgets, 2014-15 and 2015-16, the DRDO's share has increased a little

bit and has increased to 6.05% and 6.27% of the defence budget. If estimated at the current US\$ exchange rate of (US\$66.24), the total defence expenditure 2015-16 amounts to Rs.229000 crores (US\$ 34.571 billion) and the R&D budget amounts to Rs. 14358 crores (US\$ 2.16 billion).¹⁵

In order to increase the share of indigenisation, two other bottlenecks in addition to hiking gross defence R&D expenditure have to be addressed. The first is the induction of fresh recruits into the DRDO. In the recent past, the tasks assigned to the organisation have increased manifold but the recruitment has largely continued at the same level sanctioned by the Indian Cabinet in 2001. This has resulted in a situation where the organisation is short by over 2700 scientists.¹⁶ Former Director General DRDO, Dr. Avinash Chander in an interview to the *New Indian Express* stated that close to 70 fresh scientists and engineers are recruited into DRDO as opposed to an annual requirement of 370 scientists.¹⁷ Hopefully, the current state of affairs will change with the Indian cabinet considering a move to sanction an additional 4,966 posts, including 2,776 posts of scientists in the DRDO.

The second bottleneck is the lack of adequate money available for capital expenditure in the defence budget. As Lakshman Behera points out, between the Budget Estimates (BE) and the Revised Estimates (RE) of the 2014-15 Defence Budget, the money allocated for capital expenditure was actually reduced. Further, the share of capital expenditure as part of the 2014-15 and 2015-16 defence budget has actually shrunk from 41.3% to 38.3%. Despite augmentation of the defence budget, there has been nil growth in capital expenditure between the two budgets.¹⁸

The lack of adequate allocation for capital expenditure is very worrying because of the fact that about 93% of the money budgeted for capital expenditure in 2014-15 defence budget is already allocated towards committed liabilities with a paltry 7% available for any new acquisitions. This leaves precious little with the Services for acquiring any new defence equipment developed under the ‘Make in India’ programme by Indian companies or DPSUs.¹⁹ Without increased allocation for capital expenditure by the Services, the Make in India programme is unlikely to succeed in strengthening the domestic defence industry and as a result increasing the indigenous content in the military’s defence equipment.

Need for Shorter Development Timelines and Faster Induction

In order to catch-up with the modern technologies and induct them into the military, the timeline for a platform to transition from the laboratory-scale to actual induction into the Services should be compressed to a matter of few years not decades. Given the absence of a domestic defence industry ecosystem and lack of competition between defence industry players; platforms developed within the country have historically suffered from long development timelines and delayed induction into the Services. Time and again the delays in development timelines of the Light Combat Aircraft (LCA) *Tejas* and the Main Battle Tank (MBT) *Arjun* have been cited as examples of this bottleneck. It is crucial to remain cognizant of the fact that many of these projects involve complex technologies. Also, when the country began pursuing these projects there was a lack of a domestic ecosystem to support the efforts. Thus, in addition to developing the platforms, the developers had the added task of creating and nurturing a nascent domestic defence industry ecosystem which was essential to support future projects.

Another point largely ignored is that the development timeline of the LCA-*Tejas* is comparable to the time taken for other global fighter aircraft. The LCA project began in earnest in 1993 when it received funding to the tune of Rs. 1600 crores. Taking this as the start date, the first flight of the LCA took place in 2001. If the LCA receives its final operational clearance (FOC) in 2016, the entire development timeline would be a little over two decades.²⁰ As Maggie Marcum writes, Russia and the United States despite their advanced technological know-how, experience and thriving defence industry ecosystem took an average of 12 years to go from the study to the delivery of their fourth-generation fighter aircraft like F-15 and Mig-29. Late entrants with inferior technological capabilities like China have taken close to 25 years with the J-10.²¹ Given that the LCA-*Tejas* was the first of its kind and began without any domestic capacities or capabilities to support the project, it is not surprising that the LCA project has taken longer.

Coordination between Stakeholders: That having been said, it is crucial to compress the development timelines to ensure faster induction of new platforms into the military. An essential element for this to materialise is increased coordination between various stakeholders: viz. the Military, the development agency (DRDO) and the production agency (BDL, BEL, DPSUs etc). Such coordination must begin with the phase of formulating the Qualitative Requirements

(QRs) by the Service Headquarters. Apart from formulating QRs on the basis on current and future requirements of the military, this interaction will ensure that any future development bottlenecks will be ironed out at this stage, thereby shaving off crucial months from the development timeline. Such an approach has been applied in the Advanced Medium Combat Aircraft (AMCA) wherein the ADA, the Air Force and the HAL have worked together to finalise the specifications including avionics, on-board weapons before the freezing of the blueprint of the aircraft.²²

Mechanism for Coordination between the R&D and Production Agency: In addition to this, it is crucial that the Services take ownership of the development of the platform and station their best personnel at the development agency during the design, development and testing phase. This will ensure that a mechanism is created for coordination between the User Service and the development agency thereby ironing out issues as they arise without waiting for quarterly or other such periodic review meetings. One of the best examples of such a strategy can be seen in Commodore C.D. Balaji, current Director of the Aeronautical Development Agency (ADA), Bangalore who was among the first officers to be deputed by the Indian Navy for leading the Naval version of LCA project in 2002.²³

Experience will result in shorter development timelines: The Naval version of the LCA received formal sanction from the government in March 2003. Less than a decade later, the first flight of the LCA-Navy successfully took place on April 27, 2012. Three years later the aircraft conducted a Ski-jump from a Shore Based Test Facility (SBTF) stimulating take-off from a carrier aircraft on December 20, 2014.²⁴ The direct involvement of the Indian Navy personnel backed by the experience gathered from the development of the LCA-*Tejas* resulted in the short development timelines achieved by the LCA-Navy aircraft which has received all round praise.

The initial steep learning in the Light Combat Aircraft-*Tejas* (LCA-*Tejas*) project has built up national capacity and capability in addition to creating trained manpower in the country. This experience has resulted in shorter timelines during the development of the Intermediate Jet Trainer (IJT)- *Sitara* / HJT-36 which was to replace the ageing Basic Jet Trainer *Kiran* (HJT-16). The *Sitara* IJT received project sanction in July 1999, the layout was frozen in April 2001, manufacture of parts began in June 2001 and first flight of the prototype took place in March

2003. Yogendra Kumar, former Director (LCA) in Hindustan Aeronautics Limited (HAL) notes, the first flight of the *Sitara* intermediate trainer took place a mere 20 months from first metal-cut.²⁵ It is therefore important to appreciate the fact that the pioneering effort whether in form of the LCA-*Tejas* or the MBT-*Arjun* is bound to take more time and suffer from niggling issues. However, the experience gained from the project is invaluable and should not be lost. The capacity and the capabilities so acquired - as seen in the examples LCA-Navy and the *Sitara* IJT - will result in shorter timelines in subsequent projects.

Concurrent Engineering: In July 1983, when the Indian government sanctioned the Integrated Guided Missile Development Programme (IGMDP), it put in place a three tiered management structure comprising of the Guided Missile Board (GMB), the Programme Management Board (PMB) and five Project Management Boards (PJB). In addition, it established the Production Management Committee (PMC) under the chairmanship of the CMD, Bharat Dynamics Limited (BDL), which was the lead production agency for the IGMDP project. Representatives from the BDL were part of the five Project Management Boards. This structure ensured that concurrent engineering practices were adopted and involvement of the User Services and production agency in all phases of the project right from design, development to testing and production phases of the product.

Adoption of such a mechanism in domestic research and development projects is likely to achieve similar results. In fact, such synergy between the User Service, the development and the production agency (ADA and HAL) is being seen in the Advanced Medium Combat Aircraft (AMCA).²⁶ It is also crucial that the development agency works with the production agency - whether BDL, HAL, or the Ordnance Factories (OFs) - to ensure smooth transition into production. This can be ensured by preparing proper documentation and some hand-holding of the production agency in the initial production phase to tide over the initial teething problems.

Induction into Service along-with Flight Testing by User: In 2004, then serving Chief of Air Staff, Air Chief Marshal S. Krishnaswamy speaking to journalist Shiv Aroor is reported to have stated, "I feel we should simply induct the *Tejas*. Once it is in service, a sense of ownership will come. And we can progressively improve it jointly along with the developers. The aircraft needs to get out of test and into squadrons. That is the only solution."²⁷ Eleven years

have passed and the LCA is yet to be inducted fully into the Air Force. In January 2015, an important milestone was crossed with the HAL handing over the first series production version of the LCA to the Air Force.²⁸

Given that any such technologically complex system is bound to have issues; is not possible to induct the platform into the User Service as Air Marshal Krishnaswamy suggests. The aircraft can continue to undergo testing along with active squadron service. This has been the practice globally as seen in the case of the American F-35 fighter aircraft. The User Service could look at whether they can actively test other future weapon systems (without compromising preparedness of the Service) so as to provide faster feedback which will assist the development and production agency in ironing out the issues and improving future variants of the platform.

In an important statement, the current Chief of Air Staff, Air Chief Marshal Arup Raha has said that the Air Force would induct the *Tejas* Mark-1 in large numbers if some of the features are upgraded and will not insist on Mark2.²⁹ Though such an aircraft might not meet all the specifications outlined by the User Service, it will help, as Shiv Aroor notes, in building up of a sense of ownership in the platform and provide crucial feedback to the development and production agency for improving future variants.

Augmentation of Capacities and Capabilities

In order for the “Make in India” programme to succeed, it is imperative that Indian R&D establishments as well as defence PSUs augment their capacity and capability. One major area where there is a crucial capacity gap is in supersonic wind tunnel testing and other flight testing facilities within the country. As Ajai Shukla writing in the *Business Standard* notes, the lack of flight testing facilities in the country necessitates Indian developers to ship the *Kaveri* engine to the Moscow-based Central Institute of Aviation Motors for simulated flight testing up to 15 kilometres.³⁰

In an important move, the government recently opened up the existing testing facilities with the DRDO, the three Services and other public sector establishments to Indian private sector defence companies. This move will go a long way in furthering defence production in the country as the lack of such capacity imposes financial and time constraints on domestic testing and production efforts.

A more important bottleneck is the need for serious augmentation of national capacities by Defence PSU's and Ordnance Factories to ensure that the defence equipment is produced and inducted into the Services quickly in large numbers. One area which needs augmentation of capacity on a war footing is the domestic shipyards. As a result of the Indian Navy's modernisation programme, the public sector shipyards have large backlogs in their order books. Defence journalist Nitin Gokhale writes that the Mazagaon Docks Limited has an order backlog of approximately Rs 70-80,000 crores vis-a-vis its current capacity of spending of about Rs 5,000 crores per annum.³¹ The current situation is the result of multiple factors ranging from lack of investment to augment capacities, absence of a competitive environment, poor inventory management. This situation is further compounded by limited financial and operational decision-making powers which cause further delays in projects. In addition, lack of investments into R&D and a shortage of trained naval architects and engineers have resulted in dependence on foreign design companies.³²

The Indian government seems to be seized of the issue and has recently announced a 4,000 crore package for ship builders that includes infrastructure' status for shipbuilding and ship repair industry which would enable them easier access to finances.³³ Shipping Secretary, Rajive Kumar has recently stated that the government has planned investments of around Rs 50,000 crore in 35 projects for the port sector under public-private-partnership (PPP) model.³⁴

In the case of the Light Combat Aircraft, the *Tejas* division of the Hindustan Aeronautics Division which was launched in 2002 and upgraded to a full HAL division in April 2014 is currently manufacturing the first of the series production (SP) aircraft at its Bangalore facility.³⁵ The facility is aiming to ramp up production from the existing 8 to 12 *Tejas* aircraft per year. Reports also indicate that the government is planning to sanction a second *Tejas* production line and/or look at setting up joint ventures with major international players like Boeing, Lockheed Martin, and Eurofighter consortium.³⁶ Though ramping up domestic production is the preferred route, the HAL is roping in private Indian defence players to make modules of the aircraft so as to meet the orders of about 200 *Tejas* aircraft in the shortest possible time.³⁷

Recommendations

- In 2014, India spent close to 0.9% of its GDP or (PPP US\$ 44 billion) in R&D sector. As for the defence R&D sector the spending in 2015-16 was US\$ 2.16 billion. At a minimum, the spending on R&D sector needs to double to match the global average of 1.9% of GDP. This increase should be sustained for the next decade or more.
- In order to provide economies of scale and to ensure long-term sustainability of the domestic aerospace sector, it is essential to end the separation between the civilian and the military in the aerospace sector with two different ministries in the Ministry of Civil Aviation and the Ministry of Defence shaping national policies in their respective domains with little coordination or synergy.
- To foster discovery and integration of modern technologies into the three Services, the Indian military should consider establishing their research own research laboratories. These establishments could be on the lines of the US Army’s Research Laboratory (ARL), US Air Force Research Laboratory (AFRL) and the Office of Naval Research (ONR).
- To avoid duplication of existing capacities, the three Services could assume the responsibility of managing and outlining priorities for existing defence R&D labs in the country. The three Services would assume executive responsibilities of laboratories in their domain and closely work with the parent development agency on current and future development projects in order to meet the Services’ requirements.
 - **Indian Air Force:** Aeronautical Development Establishment (ADE), Centre for Air Borne Systems (CABS), Aeronautical Development Agency (ADA), Defence Avionics Research Establishment (DARE), Gas Turbine Research Establishment GTRE).
 - **Indian Army:** Armament Research & Development Establishment (ARDE), Combat Vehicles Research & Development Establishment (CVRDE), Vehicles Research & Development Establishment (VRDE).
 - **Indian Navy:** Naval Physical Oceanographic Laboratory (NPOL),

Naval Science & Technological Laboratory (NSTL) and Naval Materials Research Laboratory (NMRL)

- Critical technologies and spares should be identified jointly by the development and production agency in consultation with the Services. Coordinated national effort involving both the public and the private sector should be initiated to indigenise these items in the medium to long term depending on the item's complexity.
- In order to compress development timelines and ensure faster induction into the Services, weapons systems should enter into active military formations to undergo active testing once all requisite certification is completed.

Conclusion

The “Make in India” programme is targeted at reducing reliance on imports for military equipment. However, the programme should be seen as a stepping stone for the long-term objective of transitioning from “Make in India” to “Made in India”. For such a transition, it is important to overcome the existing bottlenecks like lack of adequate long term financial support to augmentation of national capacity in crucial areas ranging from material to testing facilities. Compressing development timelines and ensuring faster induction of the developed platform into the User Service in large numbers is crucial in building confidence between the Services, the development and the production agencies. There is however no silver bullet given that many of these problems are symptomatic of larger structural issues. The only prescription for overcoming these ills is sustained efforts with a concerted push from the country's political and military leadership.

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Seeking Military Technology

Vijai S. Chaudhari*

“You may seek it with thimbles—and seek it with care;
You may hunt it with forks and hope;
You may threaten its life with a railway-share;
You may charm it with smiles and soap--”

- Lewis Carroll, *The Hunting of the Snark*

Background

When India attained independence and began its ‘tryst with destiny’,¹ the country was dependent on imports in almost every area of high technology. The new Government of India set out its Industrial Policy in a Resolution dated April 6, 1948, assuming that the national consensus was in favour of rapid industrialization. The policy planners saw this as a key to economic development, improving living standards and economic sovereignty. Part of their solution was to make arms and ammunition, atomic energy and railway transport the monopoly of the Central Government. The State took on exclusive responsibility for establishing new undertakings in six basic industries. The government could make exceptions, in the national interest, if involvement of private enterprise was necessary. The remaining industries were open to private enterprise with a rider that the State would also progressively participate in these areas.² Thus, the government promoted an economic policy based on import substitution and industrialisation, advocating a mixed economy. Under this policy, the Government took over a large number of private sector ‘sick units’. In 1969, the government

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nationalized fourteen of India's largest private banks, followed by six more in 1980. Meanwhile, it established a number of additional public sector enterprises that supplied products as diverse as milk and machine tools.

A government-led industrial policy, with restrictions on private enterprise, remained the template for Indian economic development until the economic crisis of 1991. An impoverished economy forced the government to consider divesting its investments in the public sector. The objective of these divestments was to raise capital besides privatizing companies troubled with poor financial performance and low efficiency. Sporadic divestment followed, leaving the defence sector largely untouched for another decade. However, the Kargil Conflict (1999) highlighted the country's continued dependence on defence exports and the limitations of the Defence Public Sector Undertakings.

The Ministry of Defence drafted a Defence Procurement Procedure in 1992. The procedure underwent a comprehensive review in 2002, followed by revisions in 2003, 2005, 2006, 2008, 2011 and 2013. The latest revision is likely to go further. The Defence Ministry wants it to be simpler, and in tune with 'Make in India'.³ It would also give a boost to the government's current policy of promoting self-reliance, indigenisation and technology up gradation. Economies of scale and increasing exports in the defence sector are some of the other objectives.⁴

After almost seven decades of independence, lack of technology continues to bedevil Indian efforts at building a sustainable defence industrial base. This paper examines concepts such as science, technology, innovation, transfer of technology and the defence industrial base to identify possible reasons for slow progress in this vital area.

Technology

Technology is, "the purposeful application of information in the design, production, and utilization of goods and services, and in the organization of human activities."⁵ Technology can be either tangible or intangible. 'Tangible' technology has physical existence and includes blueprints, models, operating manuals and prototypes. However, most people encounter technology as something incorporated in machines, computers, devices and factories. Operating these machines does not require detailed knowledge of the underlying technology. On the other hand, 'intangible' technology is knowledge that lacks

physical existence, residing only in the minds and experiences of experts. It may take the form of consultancy, problem-solving or training methods.

Both tangible and intangible technology are business assets susceptible to sale or purchase. Moreover, it is possible to divide both types into three broad categories:⁶

- High Technology is entirely or almost entirely automated and intelligent. It manipulates increasingly finer matter and ever more powerful forces.
- Intermediate Technology is semi-automated, partially intelligent technology. It is concerned with refined matter and medium level forces.
- Low Technology tends to be labour-intensive, manipulating only coarse or gross matter and weaker forces.

Technology allows people to specialise so that they do not have to produce all the goods and services that they need. This makes technology essential for any modern economy. By creating wealth, technology has allowed the rise of a leisure class. However, technology also has a darker side. It depletes natural resources, producing unwanted by-products that pollute the environment. The potential of new technologies, such as genetic engineering, nanotechnology, synthetic biology and robotics, often overshadows their pitfalls. Hence, the call for appropriate technology in situations where it is not necessary to use the latest or most advanced technologies. Technology also raises ethical questions and has the potential to influence society for better or for worse. The moot question is whether technology improves the human condition or makes it worse.⁷

Science, Engineering and Technology

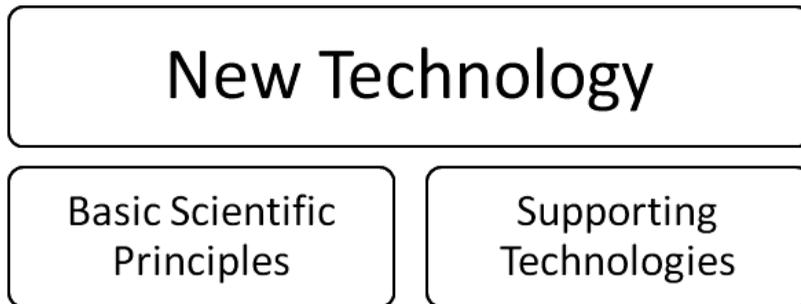
Science, engineering and technology are inter-related terms. However, they are not inter-changeable as each has a different meaning. Science is a body of knowledge about the physical and natural worlds. It seeks to describe and understand the natural world and its physical properties. Science uses the scientific method to generate knowledge. Scientific knowledge is the basis for predictions about the natural world.⁸

Engineering uses knowledge to design, build and maintain technologies. It seeks solutions for societal problems, needs, and wants. Engineers use

approaches such as engineering design processes or engineering analyses to produce and evaluate solutions as well as technology. Engineering aims to produce the best solutions with given resources and constraints.⁹

Technology is the body of knowledge, systems, processes, and artefacts that engineering produces. It is essentially knowledge about almost anything made by humans to solve a problem or to meet a need.

DIAGRAM 1: BUILDING BLOCKS OF NEW TECHNOLOGY¹⁰



Technology is the product that emerges from the process of engineering.¹¹ Table 1, below, states the major differences between Science and Engineering while highlighting that:

- Though each may depend on the other, both have distinct and separate identities.
- Both require different conditions to flourish.
- Transfer of technology is a more complex process than the diffusion of scientific knowledge.

TABLE 1: COMPARISON OF SCIENCE AND TECHNOLOGY¹²

MODERN SCIENCE	MODERN TECHNOLOGY
Human study and understanding of nature (natural philosophy)	Uses human and natural resources to attain a desirable goal. Technology is as old as human society e.g. pottery, bow and arrow, jewellery
Observation and reflection was the main tool in classical science. Modern science added experimentation about 300 years ago	Empirical cut and try is the time tested method of technological advance
Science is inherently reductionist(i.e. isolate the portion of the universe for study) and can be done in complete isolation with no feedback loops	Technology is always part of “nature + human +artefact” system with manifold feedback
Universal	Strongly influenced by local environment
Precise	Fuzzy
Simple truths, concepts and equations	Complex aggregate of information
Transfers all content alike, to all parts of the world	Takes years*, and is directed at a target audience
A single individual can understand and utilize new advances	Needs an entire system (=culture) to utilize new science or technology
Transfers relatively easily	Transfer is very complex
Many cultures do it well	Might be highly tuned to cultures that value cooperation and community over individuals

*Gestation periods are 10 to 20 years

OECD classifies the following industries as high technology:¹³

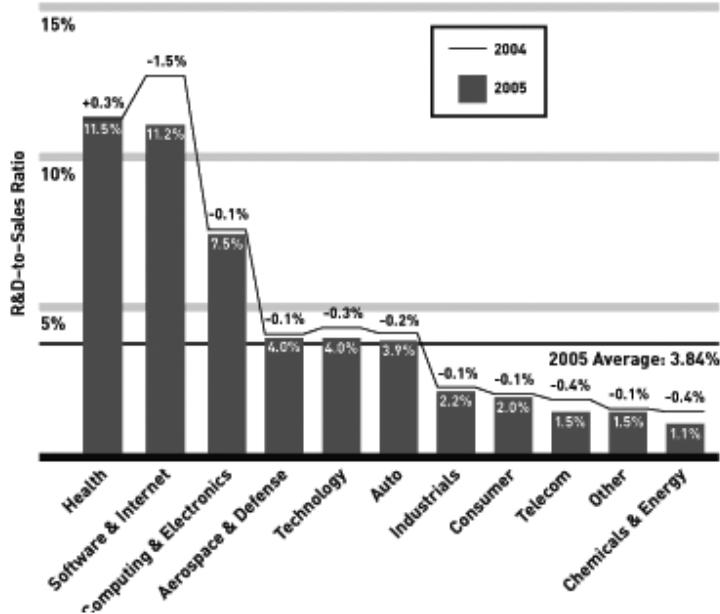
- Aircraft and spacecraft, Electrical machinery and apparatus
- Pharmaceuticals, Motor vehicles, trailers and semi-trailers
- Office, accounting and computing machinery, Chemicals (excluding pharmaceuticals)
- Radio, TV and communications equipment, Railroad equipment and transport equipment
- Medical, precision and optical instruments, Machinery and equipment

High technology industries develop or use the most advanced technology available. Investors often see them as having good potential for future growth. However, if investment exceeds actual potential, as happens from time to time, losses can be high. Thus, high technology investments offer opportunities for high profits but also carry high risks.

Technological intensity is a measure of the extent to which research and development contributes to an industry's earnings. It is commonly measured by the ratio of research that the industry undertakes to the output. However, this R&D/output percentage does not show the complete picture about an industry's R&D requirements. Industries also benefit from research by foreign affiliates, other firms in the group, first- and higher-tier suppliers, universities, and government laboratories. Table 2 shows the R&D intensity some industries.¹⁴ Aerospace and Defence, with a figure of 4%, are middle tier industries as far as R&D intensity is concerned. This is a percentage point less than the average for the data compiled. By comparison, the Defence Research and Development Organisation's expenditure, equivalent of 5.2 % of the defence budget,¹⁵ appears reasonable.

DIAGRAM 2: R&D INTENSITY - R&D TO SALES RATIO OF SELECTED INDUSTRIES (2000 -2005)

R&D-to-sales ratios show that the health and software industries invest far more of their income in innovation than telecom, chemicals, and energy do. Between 2004 and 2005, health care overtook software to become the highest-spending industry on innovation.



Innovation

Technology-based innovation creates new business ideas or concepts based on both society’s needs and knowledge of science as well as technology. The sequence is shown in Diagram 3.¹⁶

DIAGRAM 3: TECHNOLOGY-BASED INNOVATION



Real world innovation starts with creation of a business idea or concept produced by the fusion of society needs and accumulation of scientific research results. Business strategy and planning are the next step. Development and prototype production follow. Quite often, initial production does not capture a large market. Feedback from the market leads to further development and an improved product. This cycle is repeated with each cycle leading to further improvements. The process continues in an upward spiral until the firm has a successful product or it gives up. Thereafter business continues through sequence of production, sales strategy and selling until another successful innovation overtakes the original product.

On the other hand, basic research or technology development proceeds from basic or applied research to publishing of the results, ending in accumulation of human knowledge. The innovation process fuses basic as well as applied research, a business plan, and change to Research and Development. Feedback from R&D completes the cycle, leading to new fields of research.¹⁷

The number of patents registered by a country provides some indication of its innovative capacity. However, it provides no indication of the factors that contribute to innovative capacity. National innovative capacity is defined as a country's potential to produce a stream of commercially relevant innovations. Innovative capacity is related to but distinct from scientific and technical advances. This is because science and technology are not always directly associated with the creation of commercially viable new technology. Innovative capacity is also distinct from national industrial competitive advantage or productivity. These factors also do not directly lead to development and commercialization of new technologies.¹⁸

While R&D activity takes place in many countries, the development and commercialization of "new-to-the-world" technologies have historically emerged from relatively few countries. For example, during the 1970s and the early 1980s, on a per capita basis, the United States and Switzerland registered patents in numbers that far exceeded other advanced economies. This suggests that the ability of inventors to draw on technological and scientific insights from the entire world and to innovate depends to some extent on their location.¹⁹

National innovative capacity depends on the strength of a nation's common innovation infrastructure, the environment for innovation, and the strength of linkages between these two. A lot of the variation in innovation, across countries,

is due to differences in:²⁰

- Resources devoted to innovation:
 - R&D
 - Manpower
 - Spending.
- Factors associated with differences in R&D productivity play a particularly important role:
 - Policies such as the extent of IP protection, openness to international trade
 - Level of public support for basic research
 - Share of academic research funded by the private sector
 - Degree of technological specialization
 - The country's knowledge 'stock'.
- Economic geography - the impact of knowledge and innovation spillovers among firms located in the same cluster

Serendipitous technical or scientific advances may occur in countries with lower levels of innovative capacity but development and commercialization of such advances is more likely in countries with a higher innovative capacity.

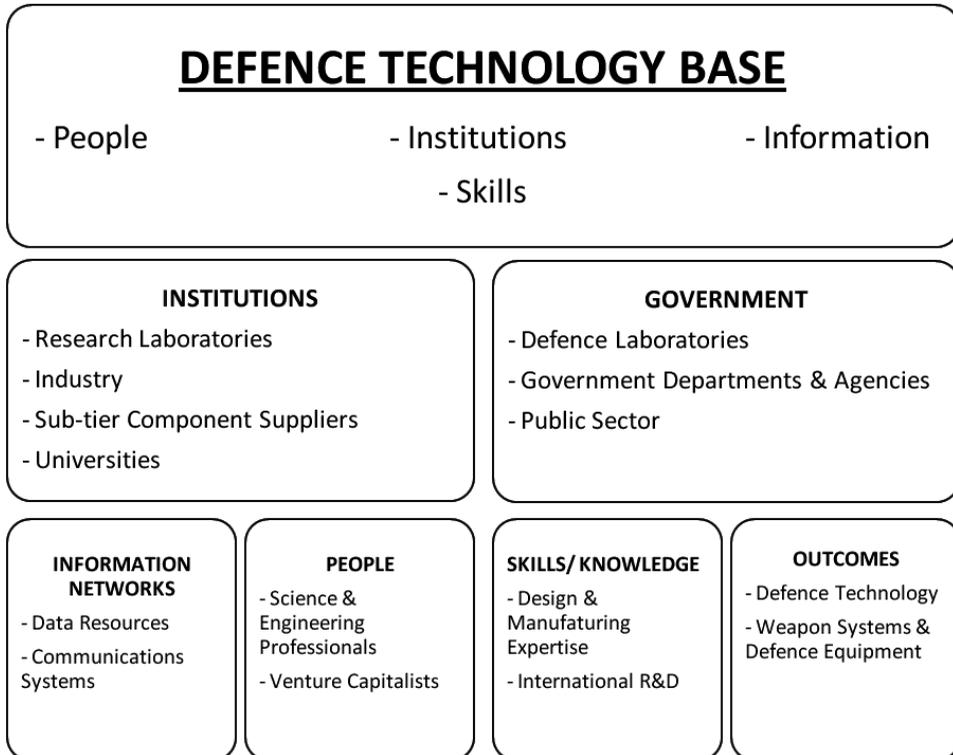
Defence Technology Base

The armed forces need Defence technology for warfare. It is largely military in nature and has few, if any, civilian applications. This is because military technology has no legal civilian applications or is too dangerous for general use. Most often, scientists and engineers develop military technology specifically for use by the armed forces in battle. Finance for developing such technologies usually comes from defence budgets. This limits Weapons Engineering to the design, development, testing and lifecycle management of military weapons and systems. It relies on several engineering skills such as mechanical engineering, electrical engineering, mechatronics, electro-optics, aerospace

engineering, materials engineering, and chemical engineering. However, there is no such distinction between military and civilian applications of technology. Most inventions and discoveries tend to be ‘dual-use’ with applications on both sides of the civilian-military divide.²¹ Sonar, radar, aircraft and computers are just a few examples of dual-use technology.

The defence technology base is a combination of people, institutions, information, and skills. It creates as well as uses technology. This technology goes into the production of weapons as well as defence systems. To undertake this range of activities, the defence technology base relies on a variety of organisations, as shown in Diagram 4. Information circulates within this network of individuals and organisations through formal arrangements such as chains of command, research contracts and other agreements. Information also flows through informal contacts within specialized technical communities, inter-departmental projects, seminars, etc.

DIAGRAM 4: THE DEFENCE TECHNOLOGY BASE²²



The Defence Technology Base consists of Ministry of Defence technology programmes and their accumulated results. However, the technology base consists of much more than this aggregation of knowledge. Almost all research and technology developments can find application in defence systems. Therefore, with the exception of classified research that is specific to military applications, the defence technology base has much in common with the larger national technology base. Not all the technology in the national technology base may be relevant for defence applications. However, any research published in open sources is a possible candidate for use in defence applications. This includes research and development anywhere in the world. Private companies often do not publish their proprietary work for fear of losing competitive advantage. Nevertheless, even proprietary technology can find its way into defence systems through outsourced systems, subsystems, or components.²³

While technology from the larger national technology base easily flows into defence systems, there are many barriers to the flow of technology in the reverse direction. The nature of defence technology is the first barrier. A lot of this technology is classified; access is therefore limited to those working on defence projects. Second, researchers and engineers working on defence projects tend to form a distinct community. Interaction with those doing non-defence work may therefore be limited. Even companies doing both defence and commercial work tend to separate the two activities. Third, companies that develop commercial products try to protect their investments by concealing key technologies for as long as is possible. Thus, cutting-edge technology often remains under wraps until it is commercialised. Fourth, government regulations and procedures can be formidable barriers. Experience of doing business with the government thus becomes a source of competitive advantage. Companies in the defence sector need the business skills to handle close scrutiny, regulation of profits, and excessive military specifications. Options are limited as there is only one main customer. Many innovative Medium and Small Manufacturing Enterprises that cannot handle this additional burden tend to drift away from the defence sector. Thus, it is only in theory that the defence sector has access to all the technology in the national technology base. In practice, numerous barriers impede the use of available technology for defence applications.²⁴

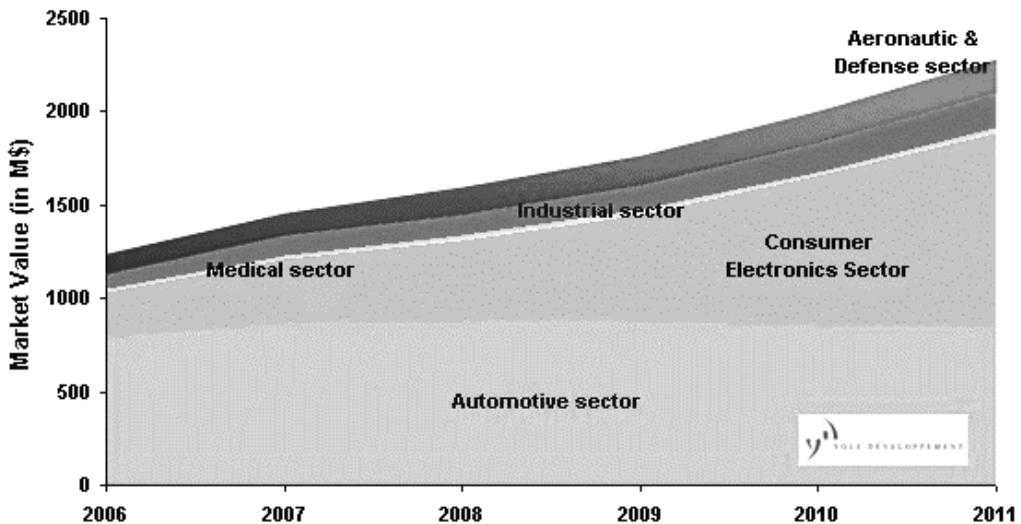
The Defence Sector

Globally, large defence contractors like Boeing, British Aerospace Lockheed, or General Dynamics design, develop, and produce weapons as well as defence systems. They not only develop technology in-house but also use technology developed by other organisations. This makes them both users of and contributors to the defence technology base. Because the defence industry sells only to the government, it must cater for government regulations and oversight. Moreover, as there is only one customer (with a few branches) and few competitors, both buyer and seller must cope with business requirements specific to the defence sector.²⁵

During the Second World War, the armed forces pioneered a number of advanced technologies including radar, radio navigation, jet engines, rockets and nuclear power. Thus, at the end of the war, purchases by the armed forces dominated many market segments, particularly in the high technology areas. However, the situation has slowly changed. Today, civilian demand dominates and controls most industrial sectors. The growing market for accelerometer and gyroscope Micro-Electro-Mechanical Systems (MEMS) is a typical example.

DIAGRAM 5²⁶

Accelerometer and Gyroscope MEMS markets



All over the world, armed forces are gradually losing their ability to drive the demand in most industries. For a secondary customer, it is difficult to lay down standards, set the direction for research, co-opt desired technology for defence applications, draw on developments elsewhere or to incorporate the latest technology into products and production. The semiconductor industry is a good example of this trend. Just a few decades ago, military demand was sufficient to support a large market for 'Military Specification' (MILSPEC) components. Today, most of the basic technology that will ultimately find its way into defence equipment comes from companies that do very little defence work. In some areas, civilian industries do keep pace with defence technology while lagging behind in other areas. However, in a growing number of segments, commercial demand drives the pace of technological development. This has already led to a perceptible shift towards commercial components or systems 'ruggedized' to commercial standards.

Defence requirements will continue to drive industries that are primarily oriented towards weapons and military equipment. However, military demand has less influence with industries that have large commercial markets. In such industries, civilian demand drives investment, research and product development. This is already happening in the computer industry. In certain areas, it is not be possible to adopt off-the – shelf commercial technologies for defence applications. Defence customers then has to consider developing technology for their exclusive use, raising costs. The only other option is to dilute requirements or to settle for older technology instead of the most advanced commercial technology.

In the final analysis, the defence sector has much in common with other industrial sectors. Though t has certain general and specific characteristics, it cannot ignore market forces. In general, the defence sector depends on a single dominant monopsony buyer (the armed forces). Defence exports are increasing regulated by national and international restrictions. Moreover, decisions related to the defence sector tend to be emotive with linkages to core values like national security and patriotism. The Indian defence sector also has certain specific characteristics. India has a large market for defence equipment, currently dependent on high technology imports, with a huge backlog of modernisation projects. Defence Public Sector Undertakings dominate the Indian defence market. The Ministry of Defence has initiated a series of cautious, incremental

and drawn out reforms. Reduced dependence on imports, efficient procurement and encouraging private sector participation are major objectives.²⁷ The slow pace of new investment and paucity of technology in the sector are attributable to systemic weakness, uncertain prospects and possibly a little timidity.

Clashing Perspectives and Clash of Interests

The government, as a whole, has an interest in the defence sector from both the national security perspective and a national economic perspective. However, the two perspectives do not always coincide as Table 2 shows.

AGENCY	PRIORITY		
	Low Cost	Technology	Quick Delivery
User (Armed Forces)	Low	High	High
MoD/ Finance	High	Medium	Low
Supplier	Low	Low	Medium

The three main stakeholders in the defence acquisition process have different priorities. The armed forces would like to have the best equipment that they can find and want the biggest bang whatever it may cost. The government also wants the biggest bang for its buck but with an eye on the bottom line. Towards this end, it looks for the most economical option. On the other hand, the equipment supplier wants the best price for its equipment. The current Indian solution to this conundrum is to follow the well-established system of selecting the lowest competitive bid, 'L1' in procurement parlance.

The system has the obvious advantage of determining the best price in a fair and unambiguous manner. A variant of the basic approach considers lifecycle cost instead of purchase price. However, both approaches also have a number of disadvantages. Open or limited competitive bidding works reasonably well when the product sought is standardised and is freely available from multiple sources. It also assumes that all products that meet the minimum criteria are equally acceptable. Moreover, there is no allowance for bidders who exceed

specifications, for standardisation, or for strategic advantage. Price discovery is the main sticking point in adopting an alternative purchase model.

The Indian defence acquisition procedure has to contend with characteristics and conventions that sometimes make the 'L1' procedure unworkable:

- Over the last two decades, there has been a worldwide shakeout in the defence industrial sector. At the same time there has been a steady expansion of technology denial regimes. Thus for any sufficiently advanced defence system there are at best a handful of potential suppliers. In the past, there has been a propensity for indefinitely blacklisting defence suppliers. This often disqualifies at least one of the small group of potential suppliers. Stringent technical requirements can then easily lead to a 'Single Vendor' situation.
- An almost institutional antipathy for 'Single Vendor Cases' that often extends to 'resultant single vendor cases' (cases where only one supplier meets the technical criteria after competitive bidding).
- Frequently, validity of the commercial bid expires before slow-moving official machinery can process the case. Thus, it is commonplace for the potential supplier(s) to face requests to extend the validity of commercial offers on one or more occasions.
- When the process does identify the technically acceptable lowest bidder (L1), the Contract Negotiation Committee (CNC) comes into play. The CNC is the successor to the former Price Negotiation Committee. In multi-vendor cases "there would be no need for any further price negotiations," by the CNC. "However, it is important that the reasonability of the prices being accepted for award of contract should be established."²⁸ In practice, the CNC expends considerable time and effort in negotiating price discounts with the successful bidder. This, despite the fact that the Chief Vigilance Commissioner's guidelines stipulate:²⁹
 - That "... there should be no post-tender negotiations with L-1, except in certain exceptional situations. Such exceptional situations would include, procurement of proprietary items, items with limited sources of supply and items where there is suspicion of a cartel formation."

- “. . . it should be ensured that tenders are invariably finalised within their validity period.”

The effect that an interminable procurement process can have on efforts to import contemporary technology is illustrated by the Indian Navy’s attempts to import Naval Multi-Role Helicopters (NMRH). The Indian Navy has substantial achievements to its credit in the area of indigenous shipbuilding. It is also working towards a three aircraft carrier policy and has been inducting a stream of major warships. The combined requirement of naval helicopters thus runs into several hundreds. What the Indian Navy actually has is an ageing inventory of Sea Kings, Kamov 28 Kamov 32 and Chetaks. The few indigenous Dhruv helicopters have yet to prove capable of replacing any of the existing helicopter types or to establish their suitability for any new role.³⁰

The Indian Navy had originally planned to acquire 54 NMRHs. Sixteen of these should have been needed by 2007 as replacements for the first lot of quarter-century-old British Westland Sea Kings. The tender, or Request for Proposals (RFP), sought 16 helicopters with an option for eight more. The Indian Navy invited bids in 2008 from Sikorsky for S-70B and European NH Industries (NHI) for NH 90 helicopters. Subsequently, the Ministry of Defence rejected the NH90 because Finmeccanina, a major partner in its European consortium, was embroiled in the controversial purchase of VVIP helicopters for the Indian Air Force. This left Sikorsky as the ‘resultant single vendor’. The firm then asked for revision in prices as the selection process had taken more than twice the stipulated time. Moreover, delivery was to take place three years after signing of the contract, roughly ten years after Sikorsky submitted its commercial offer. Unable to process the case in time, the Ministry of Defence had repeatedly sought extensions of Sikorsky’s commercial bid. This took the acquisition process timeline from less than three years to six years. Despite the delay, the Ministry of Defence stuck to its stand that there was no provision for cost escalation during the selection and negotiation process.³¹

While the Ministry of Defence continued processing the NMRH case, Lockheed Martin acquired Sikorsky from United Technologies Corporation. Meanwhile, the stalemate over the escalation in prices during the prolonged acquisition process continued. At the time of writing, Sikorsky has relented and price negotiations are likely to resume. If the negotiations end quickly,

the Sikorsky Seahawks should start arriving in 2019, more than a decade late. Though there is no official information on the price yet, estimates put the cost of 16 helicopters at more than One billion US Dollars.³² However, even before the deal is finalised, the Indian Navy is preparing a tender for another 120 NMRHs valued at eight billion US Dollars.³³ With the field thrown wide open once again, there is little apparent benefit from the eight years already invested in the Sikorsky purchase. This not only raises questions about Transfer of Technology but also about standardisation, the larger planning process and the decision-making machinery. With such whimsical decision-making, it is difficult to undertake any systematic Transfer of Technology.

Inherent clashes of interest among the main stakeholders in the defence procurement procedure further complicate the situation.³⁴ Much of this is due to the fuzzy boundaries between policy formulation and implementation as well buyer and seller. For example, the Defence Research and Development Organisation (DRDO) or its nominees participate in policy formulation and decision-making. It simultaneously provides services, approves research projects and supplies equipment either directly or indirectly. DRDO is also joint owner of an important weapons supplier. Similarly, the Department of Defence Production participates in policy formulation, implementation, purchase decisions and ownership of Defence Public Sector Undertakings. Despite the highest standards of personal probity, this web of conflicting interests is bound to strain the judgment of the concerned decision makers.

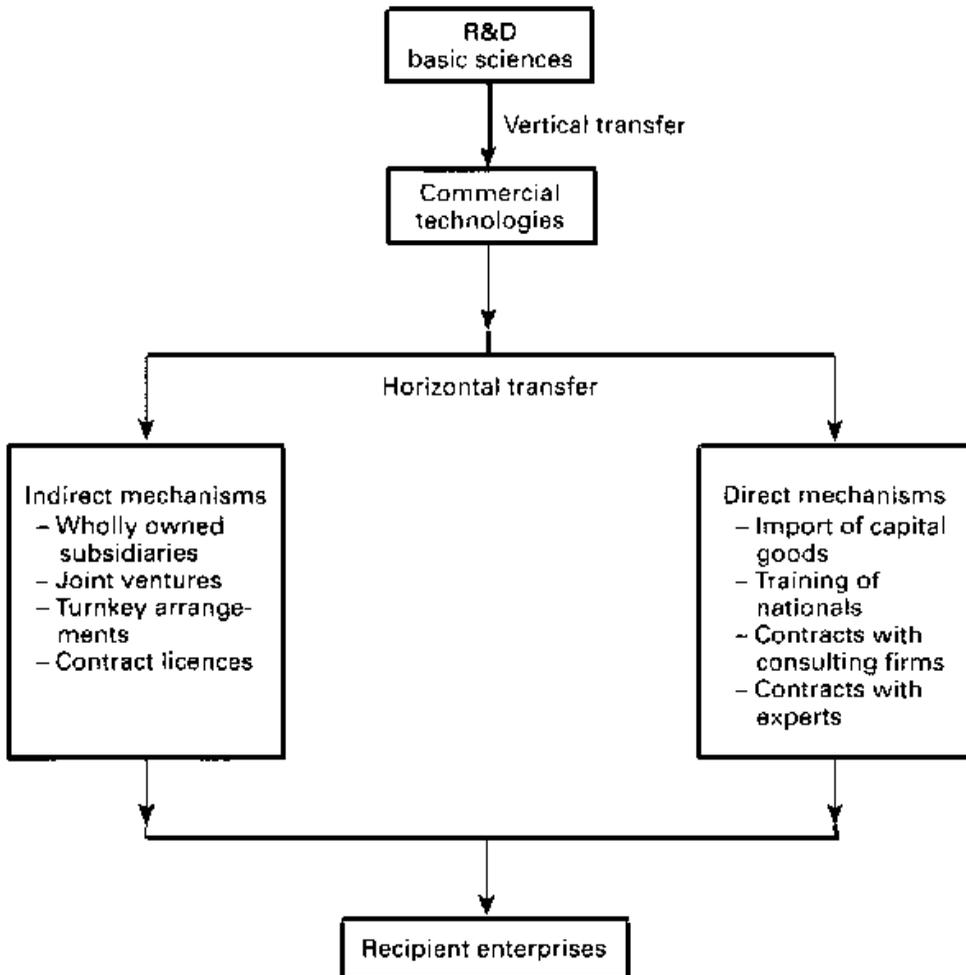
Changes to Defence Procurement Procedure – 2013, currently under consideration, are a beginning towards overcoming some of the limitations outlined above:³⁵

- Validity of Acceptance of Necessity (AoN) would be reduced from one year to six months. This could speed up the procurement machinery a little.
- An additional weightage of 10% would be allowed, while determining 'L1', for meeting enhanced performance parameters. This would address at least one shortcoming of the 'L1' procedure.
- The threshold for imposing an offsets liability on imports would be raised from Rs. 300 crore to Rs. 2000 crore. This makes some allowance

for the possibility that offsets may not be the best way of spending the defence budget.

Transfer of Technology

DIAGRAM 6: THE ANATOMY OF TECHNOLOGY TRANSFER³⁶



Technology transfer is the movement of technology into new contexts. Technology is therefore the stock of knowledge required for operation of the technology system. Initially, the term 'technology transfer' was limited to the

transformation of results from R&D, in the basic sciences, into commercial technologies. This movement of knowledge is described as vertical technology transfer. However, technology transfer now commonly means the movement of technology from one country to another. This movement is known as horizontal technology transfer.³⁷

Technology transfer is not a new phenomenon. Technology diffusion is a natural process. Historically, skills and techniques have moved from one culture to another through commerce and conquest. Today transnational corporations (TNCs) are the main channels for technology transfers, accounting for 80-90 per cent of all transfers. Technology is transferred informally through personal contacts, study of technical literature, and professional meetings. In the technology transfer framework, these could be viewed as inputs to the training and R&D subsystems. Hence they are not immediately useful for productive activities.³⁸

Formal mechanisms used in technology transfer can be direct as well as indirect. Direct transfers include the purchase of capital goods and equipment, training of nationals in specific technologies, and hiring of foreign experts or consulting firms. Indirect transfers take place through wholly owned subsidiaries of foreign companies, turnkey construction of plants and facilities and joint ventures with local companies. There are no established rules for obtaining the best terms. In the final analysis, technology transfer is the result of a negotiation process. Results depend on the ability to bargain for the best terms, including the assurance that technology transfer will actually occur.³⁹

Strategic Partnership

Even in the defence industrial bases of major arms producing nations, there is rarely room for more than one or two dominant suppliers, particularly for large and complex systems. Under the circumstances, for contracts of large, complex and technology intensive systems, Single Vendor Cases would be a regular occurrence. In a country like Britain, which has a mature defence industrial base, extensive procedures for non-competitive contracts are in place. A similar arrangement would reduce the level of discomfort that the Indian defence procurement system has with Single Vendor Cases.⁴⁰ The Dhirendra Singh Committee, appointed to suggest amendments to the Defence Procurement Procedure 2013, has taken a different approach.

After considering the unique nature of defence equipment, the Dhirendra Singh Committee has arrived at three models for Indian requirements— Strategic Partnership, Developmental Partnership and Competitive Partnership. The choice of model would depend on “strategic needs, quality criticality and cost competitiveness.” The strategic partnership model visualises selective identification of a few large private firms. The Ministry of Defence would nurture them through preferential treatment, including co-opting them for ‘Buy and Make’ and Government-to-Government procurement programmes. The Committee has also identified six segments to implement the Strategic Partners (SP) concept in the private sector:

- Aircraft: fighter, transport and helicopter and their major systems
- Warships of stated displacements, and submarines and their major systems
- Armoured fighting vehicles and their major systems
- Complex weapons such as anti-ship, air defence, air-to-air, air-to-surface, anti-submarine, land attack missiles
- Command, control, communication and computers, intelligence, surveillance, target acquisition and reconnaissance.
- Critical materials (titanium alloys, aluminium alloys, carbon composites, nickel/cobalt alloys etc.).

The Dhirendra Singh Committee has recommended that only one or two private players be nominated as Strategic Partners. To prevent ‘conglomerate monopoly’, only one Strategic Partner would be permitted in each segment. Moreover, a Strategic Partner in one segment would not be considered for other segments. The committee has justified this retrograde step by pointing out that even in the United States a few major companies produce most major platforms and weapon systems. The justification ignores the fact that the situation has resulted from the free play of market forces. Implementing the recommendation would only replace the role of free competition and market forces with selection by the Ministry of Defence. This would effectively extend the Public Sector monopoly, with all its attendant shortcomings, to the private sector.⁴¹

Conclusion

Defence technology is an established area of knowledge but it does exist and grow on its own. Instead, it relies on other areas of knowledge such as Science and Technology, supported by an ability to innovate. A combination of all of these forms part of the country's Defence Industrial Base along with a host of personnel, skills, institutions and resources. Any effort to acquire military technology in isolation, without adequate availability of the entire supporting ecosystem, is therefore doomed to failure.

Decisions related to the defence industrial sector tend to be emotive because they are closely linked with core national values. However, a surfeit of emotions should not obscure the fact that defence industries are fundamentally the same as any other industry. They are all affected in the same manner by government policies, business opportunities, and lack of infrastructure or resources. The basic laws of economics do not discriminate between industrial sectors in any manner. Therefore, any effort to acquire military technology must be grounded in hardheaded business realities.

Endnotes

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CHINA YEAR BOOK 2014*

Col C Madhwal**

General

This China Year Book 2014, an annual publication from Institute of Defence Studies and Analysis (IDSA) is a roundup of significant events and issues covering China in 2014, both in the domestic and international spheres.

The book comprises a series of twenty three chapters (articles) arranged under five sections. The first section reviews internal issues regarding legitimacy of the Communist Party of China's (CPC) rule, problems faced by Chinese society, future of Tibet and lack of media freedom in China. The second section reviews China's relations with the great powers, while the third section focuses on China's participation in the UN and in global governance. The fourth section focuses on China's relations with various regions across the globe, while the fifth section exclusively covers China's relations with countries in South Asia and is most relevant in the Indian context.

The book is edited by Dr Prashant Kumar Singh, an Associate Fellow at IDSA with a Doctorate in Chinese Studies and a special interest in Taiwan's state and society. The articles are contributed largely by Researcher's at IDSA with the relevant domain expertise.

* **China Year Book 2014**, Shri Prashant Kumar Singh (ed.), (New Delhi: Magnum Books Pvt Ltd, 2014), Price Rs. 995.00, ISBN: 978-93-82512-26-4

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Section I: Internal Issues

The first chapter on China's domestic political scenario, examines the anti corruption campaign implementation of rule of law and the Honk Kong protests, through the prism of systemic legitimacy. Chapter Two looks at tensions that Chinese society faces and the changes in Chinese society in the post-reform era, which the CPC is still finding hard to negotiate. This section also includes chapters on the curbs on media freedom, an assessment of the situation in Tibet (and a potential future solution to the Tibet Issue), and finally the state of the PLA to include budget, training, technology and the anti-corruption drive.

Section II: China's Relations with the Great Powers

This section opens with the chapter on China-Russia relations; how the relationship has undergone changes as a result of the Ukraine crisis (which has expanded the strategic partnership and 'dented western pressure on Russia'). Another chapter captures the thaw in China-Japan relation after a period of escalated tensions. On China-US relations, 'arguably the most consequential relations in the world today', the author argues that the two states sought to harmonize the complex relation amidst security concerns in the Asia-Pacific and mutuality of economic interests. The implications of China-US relations on India's strategic autonomy is also discussed. In the chapter on China-Europe relations the author highlights that while the relationship is essentially economy and development oriented, the EU has received increased attention in China.

Section III- China and Global Governance

This section analyses China's engagements in the UN which is indicative of an ongoing trend of engaging with the multilateral system when it has scope to influence it, developing alternatives to it and perverting the system from constraining its behavior when it concerns territorial issues.

Section IV: China and the Regions

This section covers China's relation with the two Koreas, the US-China dynamics and regional stability thereof. With South East Asia, the author analyses China's assertive behavior in the South China Sea and the involvement of extra regional

powers. She highlights that China's economic relation helps China portray itself as a good neighbour and shifts the world's attention away from its aggressive behavior. On China and West Asia relations, the author argues that China is slowly but surely playing a larger diplomatic role in West Asia. China's interest in looking westwards and West Asia's disenchantment with its traditional partners in the West, is gradually bringing the two closer. On China-Africa relations the author analyses developments in the context of China's overall Africa Policy. China-Australia and China-Caribbean relations are also analysed and the importance they receive in the Xi Jinping government.

Section V: China and South Asia

This section by far is the most relevant in India's security calculus. On India-China relations, the author highlights the 'development partnership' which seeks to establish stable bilateral economic ties, which will generate confidence to build confidence in other areas. On the chapter on 'China's Attitude Towards Pakistan', the author argues that the relation continued to be guided by the old balance of power logic aimed at India, besides focusing on other areas of mutual interest and concern. On China-Nepal relations, the Chinese engagement with Nepal continued to be based on its security concerns with reference to Tibet, as also its attempt to secure membership of SAARC, using its clout on Nepal. On China-Bhutan relations the author proposes that the same will continue to be India-centric. However, in the long term successful resolution of the China-Bhutan boundary negotiations may change the situation. On China's relations with Bangladesh, Sri Lanka and Maldives, the authors emphasize the deepening cooperation, the notable being Sri Lanka's and Maldives support for China's Maritime Silk Route initiative.

Recommendation

The book addresses the entire gamut of China's major strategic interests and the articles are suitably selected and grouped into relevant sections for comprehensive coverage and a smooth flow. The articles by themselves are well researched and written and can be read individually too. The 'Chronology of Important Events in 2014' and 'Conclusion' at the end of each article adds perspective to the book.

The book would have benefited from an initial chapter on 'China's Core Interests and Grand Strategy', which would have then 'connected the dots'. Culminating with a prognosis would also have added value to the book.

The book is recommended reading for all China watchers and policy makers to get a perspective on the strategic roadmap that China is pursuing to achieve Great Power Status.

Afghanistan and its Neighbourhood: In Search of A Stable Future*

Capt (IN) Ranjit Seth**

Relations between Afghanistan and India have traditionally been strong and friendly. India is the largest regional provider of humanitarian and reconstruction aid to Afghanistan. Indians are working in various construction projects, as part of India's rebuilding efforts in Afghanistan. India has worked along with the international community to promote peace and stability in Afghanistan since the overthrow of the Taliban government. After the 2008 Indian embassy bombing in Kabul, the Afghan Foreign Ministry quoted India as a '*brother country*' and the relationship between the two as one which "no enemy can hamper". Relations between Afghanistan and India received a boost in 2011 with the signing of a strategic partnership agreement, Afghanistan's first since the Soviet invasion of 1979.

As the international presence in Afghanistan wanes, the state remains fragile and heavily reliant on outside technical and financial support to sustain basic functions. The author in a crisp and sharp manner crystallizes the immediate issues that confront Afghanistan today. Taking a broad brush to explain the current and relevant issues, the reader is provided an easily comprehensible synopsis of the macro concerns that Afghanistan needs to address.

The author argues that training and equipping the Afghan army is an important step that the US has been undertaking for ever so long but the results

* **Afghanistan and its Neighbourhood: In Search of a Stable Future**, Smruti S Pattanaik, IDSA PRIO Paper, 2013, ISBN: 978-82-7288-525-9

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have been mixed. It is important to transform the Tajik dominated Army into a multiethnic army with greater representation of the majority *Pashtun* community. The author laments the poor state of the armed forces that are plagued by dissertations, fickle loyalties and indiscipline. It is interesting to learn that 6% of casualties of ISAF were caused by the Afghan Army itself. The author paints a disturbing picture for the future. In the event of ISAF forces leaving Afghanistan there is a likelihood of disintegration of the Afghan Army with the likelihood that the *Ghulzai Pashtuns* desert and join hands with the Taliban.

The reconciliation and reintegration of the *Taliban* with the national mainstream is an important political need. Here again the efforts of the Afghan government and Western allies have not yielded desired results. The recent spring offensives of the Taliban, culminating in the short-lived takeover of Kunduz indicate the little progress that has been made in suppressing the rebellious group and the renewed momentum in the Civil War.

Another issue that needs to be addressed is the safe havens available to the Taliban in Pakistan territory. Afghanistan's ability to influence Pakistan more particularly its' army and the ISI, is limited. Here again cajoling and arm-twisting by the US has not yielded any favourable outcome. More needs to be done by Western allies and China in this regard.

Much of the woes facing Afghanistan directly related to an extremely underdeveloped economy. Many studies have suggested that the country could emerge as a hub of trade and transit. China's New Silk Road initiative as well as mining ventures and the TAPI gas pipeline proposal could bring all round prosperity and gainful employment to the people of Afghanistan. But the continuing violence and instability that are a continuing phenomena in the country, are impediments to any significant economic activity. Long term stability will depend upon a thriving economy that brings about secular broad based prosperity. While allies and neighbours (India) have built infrastructure, dams and laid electricity transmission lines more needs to be done. Presently 97% of Afghanistan GDP comes from foreign aid.

Another agreement put forth by the author (a universal truth so relevant in hotspots across the world, Iraq, Syria, Nepal to name a few) is the need for proportional representation of all communities and groups in the formal power

structure. There is a need for a multi-ethnic dialogue to address the power imbalances that plague the country. It will take years to establish trust between communities, even in an atmosphere free of violence. Debate, dialogue and discussion must commence now.

Pakistan remains central for peace in Afghanistan. Encouragement and safe heavens to the Taliban have undermined all efforts in ending violence, strife and discord in the nation. Promoting fundamentalism and terrorism have remained the cornerstones of Pakistan's 'Afghan policy'. The author states that three key issues figure on Pakistan's strategic calculus, namely the Afghan-Pak problem, Indo-Pak problem and the India-Afghanistan relations. Stability in Afghanistan affects the security of both India and Pakistan and it is argued that three countries should discuss ways and means of bringing about lasting peace in the region.

On the other hand, Pakistan is increasingly being targeted by TTP militants who find safe havens in Afghanistan. How Pakistan faces up to the challenge posed by fratricidal militants in its north could determine how its Afghan Policy evolves.

The author presents the case for a regional approach for facilitating peace and stability in the region. Regional initiatives such as the New Silk road, TAPI etc could bind Afghanistan to the region. This would attract multiple stakeholders that would result in greater stability. The present uncertainty about the US pullout is causing considerable insecurity and unpredictability about the shape of the political end state.

The author concludes by stating India's engagement with Afghanistan is predicated on security and to a lesser extent on affects terrorism and along drug trafficking. India should raise the issue of Afghanistan in every forum and it should play a key role in facilitating the new regional security architecture.

The book successfully captures the various concerns of the international community about the security situation in Afghanistan. It is a thorough and insightful review of the complex situation prevalent in India's neighbourhood. I recommend it as suitable reading for those interested in security and strategic affairs of South Asia.

Strategic Direction for the Chinese Navy: Capability and Intent Assessment*

Capt (IN) Ranjit Seth**

The book focuses on China's naval modernization effort and its implications for India and the Indo-Pacific region. China's actions in asserting its maritime territorial and EEZ claims, including recent land reclamation and construction activities at several sites in the South China Sea, have led to increasing concerns that China may be seeking to dominate its near-seas region. U.S. strategic rebalancing toward the Asia-Pacific region is in no small part intended as a response to China's military (including naval) modernization effort and its assertive behaviour.

The author gives a brief maritime overview of China's history stating that since the Han period it has had a defensive continental strategy to face threats to its sovereignty. He recalls C Raja Menon's phrase 'curse of continentalism' to explain this mindset.

Four factors have spurred China to adopting a maritime outlook, viz, protection of SLOCs, resource security, need for greater leverage in global affairs and as a bulwark against coercive diplomacy. It would not go unnoticed that the value of China's Marine based industries was \$500bn in 2009 or about 10% of its GDP and is a key driver in China's quest for maritime capability.

* **Strategic Direction for the Chinese Navy: Capability and Intent Assessment**, Cdr Kamlesh Agnihotri, (New Delhi: Bloomsbury Publishing India Pvt Ltd, 2015), Price Rs. 850.00, ISBN: 978-93-84898-69-4

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China has undertaken the moderation of its Navy in a very well thought out manner and its plan includes up-gradation of its entire maritime infrastructure from shipbuilding to ports, deep sea scientific research as well as streamlining the Administration of Ocean affairs viz, maritime law enforcement capability and protection of nature resources.

A change in the Chinese outlook emerged along with and Deng Xiaoping's single-minded pursuit of a vision for a modern China. Today the Chinese are calling it the 'Century of the Oceans' and Preident Xi Jinping stated in Jul 13 that China would steadily rise as a maritime power. President Jiang Zeminn had earlier raised the status of the PLA Navy into a 'strategic force' service in his "Military Strategic Guidelines" of 1993 and newer tasks and responsibilities were later assigned to the Navy in 2004 by President Hu Juntao in his 'Historic Mission of the Armed Forces in the New Period of the New Country'.

The publication of White Papers on Defence since 1998 has provided increasing transparency in the role of Chinese Defence Forces. The missions of the Navy have gradually grown from 'predominantly defensive position', to calibrated power projection, to extension of strategic depth offshore defensive ops', to conducting in coop in distant waters, to strategic deterrence, counter attack, distant area ops and tackling non-traditional security threats. The 2013 white paper 'Diversified Employment of China's Armed Forces' classifies the tasks in two categories viz, maintaining combat readiness and supporting eco and social development through SLOCs protection, HADR and MOOTW.

The author goes on to give a brief history of the PLA Navy and its organisation. The current status of the PLA Navy surfaces forces and aircraft carrier programme, the current status of the submarine force and current status of Naval Aviation is discussed. This is covered in sufficient detail in a uniform structure.

During the last decade, the PLA Navy has decommissioned a large number of older ships and replaced them with fewer but more modern units. It is pursuing a robust acquisition programme for advanced platforms and weapon systems.

The carrier programme is discovered in considerable detail. The author foresees various challenges ahead for the operationalisation of a carrier task force with the commissioning of the *Liaoning* (Ex *Varyag*) in Sep 12 after a ten year

modernisation programme. The carrier has sailed extensively for machinery and equipment trials with commendable progress. During its longest deployment of three months in Jun-Sep 13, the ship-borne J-15 practiced take off and landings over a 100 times. Prez Xi Jinping visited the crew on board and extolled them to build a strong Navy. In Dec 13 the *Liaoning* carried at its maiden Taiwan Strait crossing. The author feels that integrating the air wing with the carrier will present numerous challenges to the Chinese Navy. In the future China is likely to construct two 60,000 ton conventionally powered carriers modelled on the *Liaoning* and later develop nuclear powered carriers to rival the US Navy.

The author covers the submarine force in considerable detail. The importance that the Chinese place on submarines is evidenced from their concept of 'Strategic idea of Offensive Defensive Operations and (to) vigorously develop long range strike weapons....'. The author shows that a mix of conventional and nuclear SM around with SLBMs would provide the long range strike options for combined offense defence ops. The author describes the evolution of the SM arm beginning modestly with boats, procured from the Soviet Union with 50s followed by with inversed production of the Golf and Romeo class boats and later indigenously developed Song and Ming class. The nuclear SM programme is described since its inception in 1958 with the Politburo's endorsement of the proposal and its coming into service in 1974 (Han Class). The first SSBN (Xia) was commissioned in 1983 and the first SLBM (JL-1) was launched from the Xia in 1988. The boats have been plagued with material problems and to fill the void in the SM force, China has acquired the Kilo class boats from Russia. The Han and Xia are being replaced by the Modern Shang (SSN) and Jin (SSBN) class submarines. The SM force provides a swift, sure and survivable deterrent strike capability.

The PLA Navy Air force is ranked third in the PLA Order Thursday, the first two being surface forces and SM, the other being coastal forces and marines. Its role is to provide maritime patrol, antisubmarine warfare, maritime strike, AEW and logistic support. The force consists of shore based fighters, bombers, LRMP and AEW and air refuellers as well as shipborne helicopters and J-15 carrier based fighters. As an interesting aside, such was the tempo and sheer momentum of getting the J-15 trials off the career that the Chairman of the aircraft company who was onboard for sailings, died of a heart attack on the very day of the first successful launch / recovery of the aircraft. In a rare report published

by Chinese media, perhaps to highlight the intensity of the Chinese endeavour, it reported “... *he worked day and night for 8 days and bore enormous psy pressure*”. The present limitation of the PLA (Navy) aviation is that it remains primarily shore based that limits its op reach and combat radius.

PLA Navy Air force could extend its coverage further seawards in the South China Sea by operating out of Woody is (Paracels) airfield that lies 180mm south of Hainan Is. An airstrip of 8000ft and logistical infrastructure has been built probably for said purpose.

The author goes on to discuss the modernisation of the Chinese Navy, with a brief background. He states that the PLA Navy has been stressing upon “increasing its capabilities for integrated offshore op, strategic deterrence and strategic counter attacks and gradually developing its capabilities of conducting coop in the distant waters and countering non traditional threats.

It is following a three step development strategy viz laying a solid foundation by 2010, making major progress by 2020 and finally its strategic foal of being capable of winning wars under conditions of informationization by the mid 21st Century. In the first phase the PLA (Navy) arm was to establish blue water presence in the SCS, ECS and the yellow sea, in the first IS Chain. In the second phase the navy would acquire capability to exercise presence in the Second IS Chain running from Sakhalin to the IS of the South West Pacific. In the last phase it would be a truly blue water fleet with credible presence in the third Is Chain extending from the Aleutians Is to the Antarctic.

The author lists out five factors that are driving Chinese naval modernisation at a blazing pace viz the Taiwan issue, asserting its territorial claims in the SCS and ECS, enforcing its sight to regulate foreign mil activities in its EEZ, displacing US influence in the Western Pacific and asserting China’s status as a leading regional power and major world power.

The author examines the Blue Water and Power projection ambitions of China in clinical detail. He states that due to the limitations in size and number of carrier force, the PLA Navy would only be able to undertake modest force projection in the SCS; force projection capability in the IOR would be quite limited for some time in the future. By examining various scenarios the author**and assesses the case for China’s likely actions in the South China Sea viz Vietnam

and Taiwan, power projection upto the Central Pacific ie the II Is Chain and the A2AD concept against the US Navy.

The imperatives for China in the IOR are broadly two. The first concerns security of its sea lanes of communication; the second relates to the need for a growing power to find larger operating space and strive for presence in all global hotspots so as to be able to influence events in favour of its own national interest. The author discusses the expected role of the SM and carriers task force in the area and concludes that their presence will definitely impact upon the operational pattern of the Indian Navy.

The Chinese Navy has been very active in the North Arabian Sea for over a decade under the antipiracy, escort mission. Till end Dec the PLA Ns and task forces involving 42 warships had escorted 5463 merchant ships, thwarted 32 pirates attacks and rescued 42 merchant ships. The PLA Navy used this opportunity to undertake many maritime and diplomatic missions which were author associated with or complimented the presence of its ships in the Gulf of Aden. They enhanced their interoperability by jointly operating with foreign naval ships and conducted joint exercises. They also carried out 'flag showing' missions in over ten countries.

In China there is a growing interest in setting up overseas bases to support its naval forces. The PLA Navy would need a firm base in the region for prolonged development and force projection in the IOA. The author examines various options available to China, Myanmar, Bangladesh, Sri Lanka, Pakistan and Maldives and finds that Pakistan and Sri Lanka or Maldives are likely choices.

China has been actively engaging with Maldives and Seychelles with offers of eco assistance, infrastructure development. It emerges that Seychelles is ideally suited what is virtually in the certain of the western IOR to support PLAN Navy's presence in the region. The establishment of such a base with IOR would have considerable security implications for India by limiting the maritime space for its Navy and curtailing its area of influence.

The debate for a strong modern and assertive nation is alive in Chinese media. It covers that the nation needs to demonstrate a few key abilities to safe guard its maritime rights and interests viz, psychological bent of the people, economic strength, infrastructure development, law enforcement agencies

such as Coast Guard and a strong naval forces. All indications are that all these attributes are being addressed and the PLA Navy is fast approaching the critical mass required for it to undertake proactive measures to assert its maritime resolve.

I find that this book is favourable due to its good structure, simple and readable language and comprehensive study of the subject. While it may not serve as an encyclopaedia of the Chinese Navy, but as a ready reckoner it is flawless. It would be of value to naval officers as well as students of strategic studies in the maritime domain.

Andaman and Nicobar Islands: India's Untapped Strategic Assets*

Capt (IN) Ranjit Seth**

Sanat Kaul's *Andaman and Nicobar Islands, India's Untapped Strategic Assets* is a valuable addition to the growing literature on the nation's strategic challenges and opportunities. The author states that the purpose of writing the book is his dissatisfaction with the functioning of the 'system' (government?) The author is a retired bureaucrat and having served in the IAS in various capacities, his observations grab the reader's undivided attention. His two tenures in the Andaman and Nicobar administration including as the Chief Secretary make him imminently qualified to write on the topic.

He contrasts the achievements of the North East Initiative of the 1950s that led to the creation of Arunachal Pradesh, with the failure of our Tibet-China policy leading to the defeat in 1962, the disappointing performance of the Island Development Authority (IDA) set up by PM Rajiv Gandhi and the missed opportunities in the Look East Policy (LEP) under PM Narasimha Rao.

The author is firmly convinced that the Andaman and Nicobar Islands offer a strategic advantage to India that could be leveraged to counter balance our reverses on the North and West borders lays emphasis on the location of Greater Nicobar Is which sets atop the Western entrance to the Malacca straits and argues that with suitable policy initiatives, India could increase its strategic depth

* **Andaman and Nicobar Islands: India's Untapped Strategic Assets**, Sanat Kaul, (New Delhi: Pentagon Press, 2014), Price Rs. 995.00, ISBN: 978-81-8274-774-6

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in the Indo Pacific (probably he alludes to the South and East China Seas). He calls for replacing the present policy of 'Masterly Inactivity and Benign Neglect' with a 'Proactive Development' approach.

The author has structured the book with case and thought. He examines the strategic value of India's Eastern outpost in ten chapters with a background of the Andaman and Nicobar archipelago that has some interesting small histories associated with it. He discusses the importance of the Malacca Straits, China's Malacca dilemma and examines other alternatives for seaborne transit to and from the Indian Ocean with the Pacific. He provides a brief history of the UN convention of the Law of the Seas to explain the concept of littoral boundaries and the rights of nations in international and territorial waters. The book covers the South China Sea that is in China's sights much to the discomfiture of ASEAN littorals. The section on China's disputes with its maritime neighbours is particularly engaging. The reader is logically led to the issue of regional groupings in the Indo Pacific, such as the ASEAN, BISMTEC, IOR-ARC and the Mekong Ganga Project. The author feels the developments in the region and China's assertiveness has led to greater awareness by neighbouring countries about the need for safety, security and trade as a means for harmonious development.

The author briefly touches on Indian naval and defence initiatives such as the Malabar Exercises, IONS, Milan, JINTEX, SIMPEX. Defence initiatives are an important aspect of strategic dialogue. India has maritime boundary agreements with all its eastern neighbours. India participates two multilateral and three naval exercises that are important confidence building measures. Just as China is building its string of pearls around India, the nation's Look East Policy needs a naval dimension in the Indo-Pacific which can perhaps counterbalance Chinese initiatives on the Indian Ocean.

The strategic shift in India's Defence Policy is discussed in detail. The most significant aspect has been the gradual shift of the US towards India. China's growing assertiveness coupled with closer US ties with India has drawn both Japan and Australia closer to India. Further, American active participation in the Asia Summit and reinforcing their security commitment on the Asia Pacific has calmed ASEAN nerves that Chinese assertiveness will not go unchallenged.

The author is not on slippery ground when he discusses the possibility of

Indian forces blockading the Malacca straits to offset the Chinese advantage in the North and West borders. An Indian naval blockade on China's oil and trade flows would take time to take effect – especially given that China is building a US style strategic Petroleum Reserve (SPR) but a longish blockade would have a calamitous effect on (the) Chinese economy. Such assertions tend to underestimate the practical challenges associated with any single country attempting to blockade international straits, even one as favourably positioned as India. The only conditions under which an operation to cut China's SLOCs would likely be effective or even feasible would be in the event of a large scale, multi-nation conflict with the Indian Navy operating in conjunction with global powers (US), the littoral straits in the Malacca Straits and others.

The author concludes by stating the building up the Andaman and Nicobar through infrastructure and developing tourism would draw ASEAN closer to India, giving a fresh impetus to India's Look East Policy. The formation of the unified command on the Andaman and Nicobar in Oct 2001 is a major step in shaping India's military preparedness.

The Andaman and Nicobar constitute a valuable geopolitical asset for the country and would play a pivotal role in any maritime competition between India and China in the 21st Century. The Islands constitute 0-2 percent of India's landmass but provide 30% (6 lac sqkm) of the country's EEZ. Till now the 572 islands have remained a long neglected outpost in the Eastern Indian Ocean. They have occupied only a marginal position in India's strategic consciousness but change has been perceptible with the establishment of a new Andaman and Nicobar Command, India's only joint tri service command.

The book is absorbing, well written and excellent material for officers of the navy, and defence personnel at the Andaman and Nicobar Command as well as academics and students of strategic affairs. It is an interesting read and I would recommend all officers of HQIDS who are interested in extending their knowledge of India's remote eastern islands, to buy the book.

India and South Asia: Exploring Regional Perceptions*

Col Saikat Roy**

The Institute for Defence Studies and Analyses (IDSA) organizes South Asian Conference on an annual basis, to invite exchange of ideas amongst experts from India and all SAARC countries, on major issues of common interest to the region. The 7th South Asian Conference was held on 30-31 Oct 2013 at IDSA. The Theme of the conference was “**India and South Asia: Exploring Regional Perceptions**”. Participants from Afghanistan, Pakistan, Nepal, Bhutan, Bangladesh, Sri Lanka, Maldives and Myanmar attended the conference and made valuable contribution by putting forth the point of view and perceptions of their native countries. The book titled “India and South Asia: Exploring Regional Perceptions” is a compilation of the deliberations and proceedings of the two day conference. The Inaugural Address was delivered by the then Hon’ble Defence Minister, Shri AK Anthony. The 228 page book has been edited and compiled by Mr Vishal Chandra, Associate Fellow at IDSA. The Foreword has been penned by Brig Rumel Dahiya, SM (Retd), Deputy Director General, IDSA.

The book focuses on the fact that South Asia is one of the least integrated regions of the world, rife with mutual suspicions and negative perceptions amongst each other. Reasons for South Asia lagging behind in the efforts towards regional cooperation may be attributed to a turbulent past, radicalization of societies, high unemployment rate, terrorism and divergent geo-strategic

* **India and South Asia: Exploring Regional Perceptions**, Vishal Chandra (ed.), (New Delhi: Pentagon Press, 2015), Price Rs. 995.00, ISBN: 978-81-8274-812-5

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imperatives. Discourses about India, in neighboring countries are often colored by its prominent size, population and economy, leading to the common perception of India being an over bearing ‘*big brother*’. The participants also discussed the inadequacy of efforts on India’s part to be more sensitive to the natural fears and apprehensions of the smaller countries, and being unable to reinforce its image of being a developmental partner for them.

The two day conference sought to examine and address the following issues:-

- (a) What are the perceptions about India in the region? Is India looked upon as a reliable or reluctant partner in the development of the region? Has India been able to connected and relate to its immediate neighborhood?
- (b) Which are the key institutions and forces shaping perception about India, in the neighborhood? What has been the role of the media in shaping and perpetuating the perceptions? How perceptions have defined / transformed the inter-state relations in South Asia?
- (c) What are the Indian perception and approach to the South Asian Countries? Has the region failed to connect to India?
- (d) How best can India improve the perception and connect to its South Asian neighbors? What role should India play in the immediate and long term perspective to enhance regional cooperation?

The book is structured as a compilation of 16 essays arranged in three parts corresponding to the sub themes of the conference. The book ends with a separate section on “The Way Forward: Key Recommendations”, which brings forth certain recommendations that emerged.

- (a) **Chapter 1: Does Academia Matter to the Shaping of Mutual Perception in South Asia**, by **Pratyoush Onta**. The author in this chapter primarily brings out the lack of institutionalized measures to promote area studies in India and Nepal, while suggesting the way forward to address the anomaly.
- (b) **Chapter 2: ‘Not India: Pakistan, India and the Self**, by **Yakoob Khan Bangash**. The author emphasizes upon the requirement of both the

- states and particularly so, Pakistan, to discard the function of viewing every aspect from a prism coloured and convoluted by anti-India fervor.
- (c) **Chapter 3: Changing Relations between Bangladesh and India : Perceptions in Bangladesh**, by **Humayun Kabir**. The author has highlighted the important milestones in Indo-Bangladesh relations in the recent past. However he cautions that the promises and dialogues have not been pursued in all earnest by the Indian authorities, which causes a apprehensions about India's intent.
 - (d) **Chapter 4: The Geo-Strategic Matrix and Essential Dimension of Sri Lanka's Conflict, Post War Crisis and External Relations** by **Dayan Jayatilleka**. The author has given a insight of the Sinhala v/s Tamil issue and the dynamics and linkages it shares with Tamil Nadu.
 - (e) **Chapter 5: Perceptions and Memories Making Sense of Bangladesh India Outlook** by **Partha S Ghosh**. The author has labored on the three social trends which shaped Bangladesh – Hindu Nationalism, Muslim Nationalism and the composite Hindu-Muslim Nationalism.
 - (f) **Chapter 6: Changing Dynamics in Nepal-India Relations**, by **Dinesh Bhattarai**. The author has reflected on the perceptions which Nepal has with regards to India. Nepal views itself as a vibrant Nation between two most populous and fastest growing economies and looks to draw benefits from both the economic power houses.
 - (g) **Chapter 7: Rising India and Bangladesh-India Relations : Mutual Perceptions and Expectations**, by **M Ashique Rahman**. Bangladesh no longer considers India as a regional hegemon and is in fact looking forward to bandwagon its own National interests alongwith India's. However, the author cautions that the tardy progress on the promises made, makes India seem like '*not a trustworthy neighbor*'.
 - (h) **Chapter 8: Indo-Afghan Relationship: Afghan Expectations and India Reluctance**, by **Davood Moradian**. The author describes the shared value, common national interests and complementary economies that bind India and Afghanistan as strong partners in the developmental process.

- (j) **Chapter 9: Shift in Maldivian Perception Towards India During 2012 Political Crisis**, by **Mohamed Naahee Naseem**. A sizeable No of Maldivians rely on India for trade and commerce, health care and higher education. Similarly, India too has its interests in Maldives. The 2012 political crisis, displayed how important India remained for Maldives. The paper summarizes the major initiatives for regional integration, the limitations and challenges encountered in fostering the bilateral relation.
- (k) **Chapter 10: Myanmar's Perception of India**, by **Denzil Abel**. Myanmar looks upon itself more as a South East Asian country rather than a South Asia Country however its contiguous land border with the North Eastern states makes Myanmar an important strategic bridge between the North Eastern states and the ASEAN market.
- (l) **Chapter 11: Bhutan and Its International Collaborations – 2013**, by **Pema Tenzin and Chhimi Dorji**. The author has discussed the history, demography, social development and economy of Bhutan. The author very candidly brings out that Bhutan has started taking very small and cautious steps towards globalization.
- (m) **Chapter 12: South Asian Economic Integration: Potential, Challenges and the Way Forward**, by **Nagesh Kumar**. The eight SAARC countries share cultural, ethnic, linguistic and historical commonalities that can facilitate integrated production network. It assumes significance from its potential to contribute to a balanced and equitable regional development befitting smaller and poorer part of the region.
- (n) **Chapter 13: Stepped-Up Inter State Dialogue as a Key to Improving SAARC Developmental Prospects**, by **Gabriel Ian Lynn Ockersz**. The resurgence of the region is subject to the cordial ties amongst India and Pakistan. Both countries must seize the opportunity. Unless the issues are resolved constructively it could lead to irrevocable rift among the SAARC.
- (o) **Chapter 14: China and South Asian Cooperation Under SAARC**, by **SD Muni**. The author has explained the China's South Asia focus and increased interest as a function of its unstable Western border to incl Tibet and Xinjiang, economic interest and requirements to open new

markets and its strategic interests. India is therefore learning to cope with increasing Chinese desire for greater role and participation in SAARC activities.

- (p) **Chapter 15: India's Trade with Neighbors; Perceptions and Reality – With Special Reference to India-Pakistan Trade**, by **Indra Nath Mukherjee**. All bilateral perceptions are ultimately shaped by the bilateral relations between the concerned countries. The author contends that under very adverse security environment, quite often Non-Tariff measures are likely to be implemented in a more trade restrictive manner translating into Non-Tariff Barriers.
- (q) **Chapter 16: Seizing New Opportunities for Regional Cooperation and Understanding**, by **Shahmahmood Miakhel**. The instability in Afghanistan and mutual mistrust amongst India and Pakistan has impacted the region adversely. The three countries must set aside their differences and enter into a serious dialogue process to address contentious issues and work together for the economic prosperity of the region.
- (r) **The Way Forward: Key Recommendations**. The team has broadly identifies the key reasons for the misperceptions prevalent in the region and thereafter made key recommendations which could make a material difference in the perceptions and bilateral relations amongst the nations comprising South Asia.

Conclusion

Most Nations were of the opinion that the response from India on the promises and agreements were wavering, thereby raising speculation amongst the countries, on the commitments made to them and hence the popular perception of India being a *reluctant neighbor*. A lot of water has flown since the conference was held in 2013, especially so, post elections in India, the Modi Govt has seize the opportunity and has been on a hyper drive with respect to diplomatic exchanges with India's immediate neighbors.

A strong and astute leadership of the PM has transformed and infused fresh energy in the bilateral dialogues, large amount of funds has been promised as aid, quick response during the recent natural calamity in Nepal are testimony to

the winds of change sweeping the corridors of power in New Delhi. The dynamics of foreign policy has changed for the better in the recent past. In this context the book “**India and South Asia: Exploring Regional Perceptions**” provides good references to the causative factors to the perceptions harboured by India’s various neighbours, the events in the past which shaped such perceptions and India’s diplomatic successes and failures in dealing with such events. A word of caution though, the conference was held in 2013 and hence the recent Indian diplomatic initiatives have to be factored to extrapolate and arrive at a correct current perspective.

Feedback: Visit of Philippines Command and General Staff College to CENJOWS

Col C Madhwal, VSM*

Introduction

1. A 34 member delegation of the Command and General Staff College (CGSC) of the Philippines had an interaction with CENJOWS on 04 Sep 2015 at Kota House.
2. The delegation was led by Col Espino, Isaias Naypa with 30 student officers largely from the Philippines Navy.

Conduct

3. The programme commenced with the introductory remarks of Lt Gen AS Kalkat, SYSM, PVSM, AVSM, VSM (Retd), Director Emeritus and Maj Gen KB Kapoor, VSM (Retd), Director CENJOWS who welcomed the Delegation and highlighted the mutual interests of the two nations in various fields and the importance of greater convergence.
4. This was followed by a presentation on 'India-Philippines Relations' by Col C Madhwal, VSM, Senior Fellow CENJOWS. The presentation highlighted the following points:-
 - (a) Commonalities between the two nations.
 - (b) Mutual Convergence of Interests.

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- (c) Areas of Co-operation (The key areas for cooperation were identified as Defence, Security (terrorism/insurgency/cyber) and trade).
- (d) The way forward wrt India-Philippines relations.

5. This was followed by a question/answer session in which the key issues addressed by the Philippines Delegation are as under:-

- (a) The Rise of China & concerns thereof.
- (b) India's 'Look East' Policy.
- (c) Areas for Defence Cooperation.
- (d) China's forays in the Indian Ocean Region.
- (e) India's technological successes.

6. This was followed by lunch and dispersal.

Conclusion

7. The visit was fruitful and helped both sides get a view of each others perceptions, identified areas for cooperation and is likely to improve defence relations between the two nations.

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