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Challenges and Opportunities Facing India's Domestic Defence Industry, With A Focus on The Role of State Defence Production Agencies and The Private Sector

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ABSTRACT

The Indian defence industry has a long history, although modern weapons are just roughly 200 years old. The oldest known activity7 was the founding of the Gun Carriage Agency by the East India Company close to Calcutta at the start of the eighteenth century. It wasn't a particularly noteworthy development, but it signalled the creation of the Defence Industrial Base and slowly cultivated the country's specific skills, artisanal work practises, and knowledge for producing weapons. Since the military gear needed could be simply, conveniently, and affordably supplied from British ordnance companies, the British made very little of an effort to boost local capacities, as was anticipated of any occupying authority. The beneficial effects of World War II were fleeting, though. Local machinery producers, such as Coopers, became involved in this modest defence-industrial effort through the increased provision of machine tools necessary for the growth in ordnance production. But, as a matter of interest, India‘s material support to the allied war effort in the Far East was miniscule when compared to the huge number of native soldiers who fought as part of British Army. During World War II India fielded the biggest volunteer land army in the World, comprising over 2.5 million men, about 1 million more than the present day combined strength of the Indian Armed Forces.

KEYWORD: Defence expenditure, Defence industrial base, Defence production, Private sector, Strategic independence

INTRODUCTION

One personality which greatly impacted the genesis of Indian DIB is Mr Patrick Blackett, who functioned as a Military Consultant and Scientific Intervener for almost three decades after India‘s Independence11 . Mr Patrick Blackett‘s can be rightly called as scientific affairs intervener and research advisor in India. He formed a bridge between the scientific and political community of India thus providing a fillip to science and technology. He very effectively emphasised the role of scientific research in Military Development and greatly promoted both the careers and interests of scientists. Post 1965 war, the national forex reserves having denuded called for a major devaluation where in the Rupee became almost 66% cheaper as compared to the dollar thus making imports highly expensive. It was here that Patrick Blackett, furthered the importance of Self Reliance in Defence Production. The role played by Patrick Blackett was instrumental in enhancing the science and technology as related to Defence and was a hallmark in itself. In the post British era, the newly created country of Pakistan, right on its inception attempted to extend its frontiers by force. The 1947-48 India Pak conflict was a clear reminder that Pakistan would continue to foment troubles in times to come. This was never given the due importance it deserved and the new found India continued on its path of peaceful development, relegating the security of the country to the lowest rung. This relegation had a negative impact on the country‘s defence preparedness. Indian Armed Forces continued to operate vintage weapons and equipment, with a fallacy that the nation was unlikely to go to war.

Strategic Culture of a Nation is largely dependent on its historical growth, coupled with an intrinsic aspiration of both maintaining the integrity or extend the boundaries with application of force. In the Indian context, barring few Rulers, who displayed potential for enlarging their territories and did so successfully, controlling major parts of undivided Hindustan, most of the others remained content with what they inherited from their forefathers. Present day India as

such was divided into small kingdoms, each fighting for its survival. The arrival of British as traders presented them an ideal opportunity, given the sub divisions in the continent to transform themselves into rulers. The environment that prevailed in the country was hence bereft of any strategic culture other than a deep desire to seek independence from England. Post India Chinese War of 1962, however a large number of measures were undertaken, however they still fell short of the desired requirements. The strategic culture however could not be ingrained for the next four decades, with India focusing essentially on Pakistan. This restricted vision pegged India with Pakistan, negatively impacting stature and standing commensurate to its capabilities. It is only in the last decade and half; the strategic culture has been nurtured, giving disproportionate dividends, which should have accrued much earlier.

India on the eve of independence, inherited a weak economy and low technological base. These two critical facets which drive a nation to prosperity were a result of excessive British exploitation of natural resources and well planned decimation of local Indian industry, which still remain restricted to primitive technology, given the fact that the industrial revolution had bypassed the country. The First Industrial Revolution of the 18th century ushered in an era of mechanisation followed by the second one in 19thcentury in the field of electrification, while the third wave in the 20th century brought in automation. India as a nation was bypassed by the first and second wave, being an occupied nation, with rulers paying no attention to its modernisation, it was only the third industrial revolution, which touched an independent India, but the non-participation in the first two, greatly impeded the nation. It was only the Fourth Industrial Revolution, which had an impact and the nation was in a position to integrate to a large extent, its cyber and physical systems. Smart Manufacturing as it was termed created an ecosystem integrating human and machine seamlessly. India was relegated simply to a natural resource base, with final product manufactured in the British factories. The Indian rupee had little value in the world market, placing the country in a very weak economic situation and abject poverty.

It is essential to trace the development of defence industry since the country became independent. The country had decided that Defence Production would remain the exclusive domain of the State, with no role for private sector. The indigenous DIB was accordingly created as a State preserve. In the absence of high end technological base, which could meet the aspirations of Indian Armed Forces, weapons and equipment, continued to be imported from friendly foreign countries. Post imports, the available technological base attempted to manufacture the same in house, with transfer of technology. The arms acquisition process followed the conventional path followed by other developing countries. The process started with acquisition of imported weapons system, followed by co-production ventures, although at the elementary level restricted to assembly of parts and sub-assemblies imported as Completely Knocked Down (C.K.D) kits from abroad. The next stage was essentially a refinement of the second. The industry was primarily engaged in assembling the imported equipment commencing from locally produced low technology items such as nuts and bolts and moving upwards towards more complex sub-assembly production. This stage finally culminating in production of the armament. However, this sequence of development took a decade or so, only to realize that the model imported became obsolescent by the time indigenous production was effected. Marut 2 conceived in 1950s became obsolete, by the time it entered service in 1964. The next stage necessitated availability of cutting edge technology for adapting and producing existing foreign weapons systems to local design of the next higher-stage of weaponry.

Self Reliance : Key to National Defence Preparedness

Self Reliance in any segment is an important parameter to determine a Nations' Capability. The most profound being Self Reliance in Defence Production as it impacts the very existence of the Nation itself. Post initial conflicts with belligerent neighbours, the importance of self-reliance in defence was understood by all. Initially, the term used while referring to defence need was self-sufficiency. However, self-sufficiency implied carrying out all stages of defence production from initial design to indigenous production, including availability of raw materials. Realising that self-sufficiency may not be a feasible concept, shift to self-reliance was a natural outcome. It is extremely important to delve into the dynamics of Self Reliance, before understanding its strategic importance. Self-Reliance should not be misconstrued with no access to external military technology or any other assistance from foreign sources. A nation can be selfreliant by involving other countries and creating interdependencies that act as a form of insurance. True test of self-reliance is the degree of dependence on foreign sources, which result in vulnerability to changes of policy by the external power. The path chosen by India was of adopting a balanced model for achieving self-reliance in defence production. The model implied import of urgent requirements in sync with developing indigenous defence capability. Diversification of sources of supply remained critical to this model. Post adoption of Balanced Model, the next step was to gradually reduce the import component by either developing the technology in-house or in sync with others, the primary objective being to reduce dependency. The —Aatm Nirbhar Bharat‖ campaign launched in the Country Nation-wide when applied to the defence production sector means initiation of all out efforts to achieve in-house creation and exploitation of defence tech, leading to Self Reliance.

Defence production is a highly technical and specialized, intricate and poses exclusive challenges. The defence hardware produced has to be essentially safe, reliable, consistent in quality and capable of functioning in a multi-varied terrain under extreme climatic conditions. Accordingly, a wide variety of engineering technologies, ranging from metallurgy, textiles, leather, optics, sensors etc. are required to be constantly updated and imbibed so as to ensure high quality and productivity along with self-reliance. Amongst the military and para-military services, army is the largest client of the Ordnance Factories. Lately Ordnance Factories have also opened their doors for meeting requirements of Civil Trade and foreign customers. The OFB's significant contribution towards defence effort is as under: -

(a) Quality Management System (ISO-9001:2000) have been adopted by all OFs.

(b) OF Bhandara, successfully developed and manufactured propellant for Schilika AD Gun.

(c) OF Medak, successfully developed and manufactured Aluminium Pod Assembly for stacking PINAKA rockets. The factory also has to its credit production of MPVs (Mine Protected Vehicles) with remotely controlled weapons systems.

(d) OF Jabalpur, successfully developed and manufactured, Chaff Launcher, christened Kavach for Indian Navy.

(e) OF Kanpur, indigenously developed 5.56mmINSAS (Indian Small Arms Systems) family.

The details of DPSUs are as under: -

(a) Bharat Dynamic Limited, Hyderabad (BDL).
(b) Bharat Electronic Ltd (BEL).
(c) Bharat Earth Movers Ltd, Bangalore (BEML).
(d) Garden Reach Shipbuilders and Engineers Ltd, Kolkata (GRSE).
(e) Goa Shipyard Ltd, Goa (GSL).
(f) Hindustan Aeronautics Ltd, Bangalore (HAL).
(g) Hindustan Shipyard Limited (HSL)

(h) Mazagon Dock Ltd, Bombay (MDL).
(i) Mishra Dhatu Nigam Ltd, Hyderabad (MDNL).

The Indian DIB essentially rests its edifice on 41 OFs, 9 DPSUs and select PSUs. Nurtured since last seven decades these constituents of the Indian military industrial complex have not evolved into state of the art production agencies capable of producing cutting edge defence technology. DRDO, the primary research agency of the country has miniscule technological achievements to its credit. DGQA, the quality assurance agency has only added to the production costs, rather than ensuring quality of the final product. Capability audit of all the four key components of defence production to include the Research Agency (DRDO), Production Agencies (OFB & DPSUs) and Quality Assurance Agency (DGQA), clearly reveal numerous issues which plague these agencies and in turn cap their capabilities. Being an integral part of the Govt, their functioning has mirrored over the years that of the MoD. Armed Forces being captive clients are forced to accept the produce, irrespective whether it meets the standard or not. It is imperative that a detailed analysis be carried out of each component which impacts our DIB, ranging from Government reforms to changes necessary at OFB, DPSU, DGQA and DRDO to pinpoint the existing anomalies, in order to recommend suitable measures for enhancing the operational effectiveness of the base. Comprehensive understanding of the existing DIB status will facilitate process of recommending changes and reforms necessary for creating a resolute DIB.

Challenges : Indigenous Defence Production Sector

Having steered the nation to freedom, the political leadership‘s foremost objective was to usher in development as the environmental realities and the under developed status of the country, left little room for other facets of nation building. Defence preparedness was relegated to the lowest echelon of National Policy and Planning. Nehru was convinced that the optimal strategy for development was to deemphasize the importance of defence. Nehruvian vision to develop a socialist state discarded any external threat to the country. It was widely believed that diversion of resources in terms of capital, labour, and technology for defence would only be at the cost of national development and hence was an avoidable consumption176. The leadership made the gravest mistake of classifying defence expenditure as consumption, instead of investment towards national security. This was the biggest challenge for the indigenous defence industry since its very existence was questioned by the national leadership. This policy had a negative influence on the National DIB, which could not be nurtured in the country‘s formative years. The whopping60% present day import of defence requirements is a result of the same.

Since India followed the Non Alignment policy, its collaboration with any foreign country in the field of defence was hence a taboo. In the absence of any receipt/ exchange of military technology the country‘s defence industry continued to follow primitive practices and was only able to produce basic weapons and equipment which were fell short of meeting the emerging security challenges. Furthermore the private sector having been totally excluded from the defence production sector, did not venture into any Research and Development. The same was left to government agencies, which also due to moderate competence were unable to provide quality weapon and equipment meeting the soldiers‘ satisfaction.

Another major limitation faced by Indian defence industrial complex was it having been bypassed by the industrial revolution. The western nations while they were reaping the benefits of industrial transformation, the nation was engaged in providing the raw material which was machined into precision by foreign industries. Even after a conscientious view was taken for promoting the defence industry in the overall national interest and signing the Indo-Soviet

friendship treaty of 1971, the indigenous defence base could at the best emerge as an assembling hub only. The core reason for the same was the inability to absorb the advanced technology. In the absence of desired technology absorption and any subsequent development the country failed to manufacture future variants.

Metallurgy remains at the core of the defence equipment‘s and the government owned defence entities have been unable to achieve excellence in this key segment. A common complaint from the user is the poor quality of metallurgy of the same platform, when compared to those manufactured abroad. Surprisingly the private sector has excelled in this field and there are examples of Indian private companies exporting key metallurgical components, notable amongst them is Bharat Forge which had bagged an order of supplying barrels for German Army‘s Leopard Tank.

Opportunities: Indigenous Defence Production Sector

The defence industrial complex provides multiple opportunities impacting the entire national spectrum. The industrial complex like any other industry at the outset gives employment to the national work force apart from enhancing the security. It also provides major opportunities for the private sector to engage in this specialised field and seek expertise while profiting from the successful venture. Once the country achieves self reliance the defence export component provides unparalleled source of revenue since the overall cost of any defence weapon/ equipment includes its manufacturing cost, profit, dovetailed with the developmental cost. The later being many times higher than the former. The import of American Sniper Rifle @ Rs 20 lakhs is a stark example of the cost which the nation pays to meet its defence requirements. At a very rough estimate the manufacturing cost even with reasonable profits would at best be only onetwentieth of the final negotiated cost.

Indian Defence Industrial Complex : Road Traversed

Indian defence sector has greatly evolved commencing from a mere maintenance, repair and overhauling setup for weapons/ equipment, ex-import to a level of a world class arms manufacturer, with capacity to export as well. In spite of no handholding of both the public sector in the beginning and the private sector in the 21st century, the Indian defence industry has achieved credible indigenous production capacities. The Indian DIB started its journey as a licensed arms producer of weapons/ equipment, sourced from abroad. Nehru, only after the 1962 debacle, commenced the process of attaining ‗Self Sufficiency‘ in defence production and laid foundations of the DPSUs, and nurturing these entity was taken as the road ahead to achieve the objective177 . Self-sufficiency in the critical arena of arms is practically impossible, given the ever changing technology goal posts. Every advanced nation over the time has developed complete supremacy and monopoly in select defence production segments. For instance Boeing is a world class aircraft manufacturer, Israel excels in unarmed aerial vehicles and UK‘s MBDA is a renowned missile manufacturing hub. The SelfSufficiency in the defence production sector, needs to be replaced by Self-Reliance. Self-Reliance does not prevent a nation from importing technology, but is a measure of its DIB capability to absorb the same and gear up to produce future variants without external support. It is also a factor of Nation‘s dependency on foreign sources. India is pursuing the objective of self-reliance by both indigenous research and importing cutting edge technology to meet critical requirements, where the former cannot meet the desired time lines.

Strong Defence Industrial Complex : Nation‟s Pride

DIB is a critical component of National Security as it anchors the Armed Forces on terra firma. Furthermore, it has various ramifications depending on its credibility. Major industrialised and developed nations have over the years created sturdy DIBs, which provides them ample leeway

in the form of both Military and Political clout. Arms industry has been in vogue since times immemorial and have chalked out the destinies of nations. Developed countries with state of the art defence industry have carved an exalted status for themselves and follow independent policies meeting their national interests. USA, Russia, China, France, Germany and others are clear examples where the DIB has promoted the countries national interest. Few of these examples are placed in succeeding paras.

CONCLUSION

—For the Security of India and its People, it is necessary that we develop our Defence Capacity and Capability, so that even the most powerful Country in the World has to think a thousand times before planning any thing that endanger our Interests"

Self-Reliance in defence is a National Objective. As an emerging global power, India needs to project its influence in the country and offshore. In order to fulfil its security commitments, the nation requires a dynamic Defence Industrial Base (DIB). As on date India's 60% of the defence requirements are imported. This heavy dependence on imports challenges the nation's defence capability. Needless to say, this dependence does impact the execution of the foreign policy and consequently the national trade and commerce. In order to exercise an independent policy to ensure national growth, it is only logical that the current import proportion is reversed with the indigenous content and steadily reduced further. Viewing historically, defence planning was not given priority for long. Lack of focus and priority, adversely affected the modernisation of armed forces. Post 1962 India-China war, defence production was upgraded and given the desired priority. Still however the country had to wait for another four decades to kick start the Indian DIB in keeping with the immense requirement of armed forces. The DIBs capability deficit leaves no option but to seek defence imports. This dependence on foreign nations directly affects the national security. The same is evident from the Aircraft Carrier Gorkshov case, supply of nuclear fuel to India and the Russian backtracking on rocket engine technology under US pressure202 . Indian DIB is central to nation's emergence as a global power. The present DIB includes the OF, DPSUs with limited contribution by the private sector. Being a government preserve the OFs and DPSUs executed the business of defence production in an environment of monopoly, without any competition. This has been the key to the poor performance of a huge DIB. Govt of India reforms since 2001 till date have to large extent transformed the defence sector.

Key Recommendations

Key Recommendations of the study are as under:-

National Objective : Self Reliance. The country needs to relentlessly pursue the objective of self reliance to meet its security challenges and also take it's position as a responsible world power.

DIB Pillars. Ordinance Factory board, DPSU, DRDO, DGQA & Private Sector are the five pillars on which rests the Indian Defence Industrial Base. These pillars need to be strengthened by initiating suitable government policies and incentives with an ultimate objective of achieving self reliance in defence production.

Revitalisation : State Owned DIB. Ordinance Factory board, DPSU, DRDO and DGQA form the major component of the Indian DIB. Their performance however has been below par when compared to the capital and manpower invested in them. There exists an emergent need to analyse the anomalies which have impeded their productivity and then initiate suitable measures to include corporatisation, resizing, technological infusion, high calibre work force, incorporation of best practices etc. Above all the

monopoly created by them should be decimated and entities encouraged to achieve the same through excellence and not bureaucratic control being part of the government.

Ordinance Factory. In pursuit of reforming the ordnance factories Corporatisation is one major step which needs to be undertaken coupled with achieving zero interference by MoD. The corporatization of Ordnance Factories under a competent management is required. It apart from strengthening Ordnance Factories shall also make them accountable for their operations. The R& D component needs to be upgraded to carry out innovations, upgradations, receive and absorb state of the art foreign technology.

REFERENCE

1. Agarwal Rajesh K, Defence Production and Development, New Delhi, ArnoldHeinemann Publishers (India) Pvt Ltd, 1978.
2. Arnett Eric, Military Capacity and the Risk of War, China, India, Pakistan and Iran, SIPRI, 1997.
3. Arnett Eric, Military Technology: The case of India, SIPRI Yearbook Oxford: Oxford University Press, 1994.
4. Bajwa JS, Modernisation of the PLA, New Delhi, Lancer Publishers, 2002.
5. Banerjee Gautam, The 21st Century Army Strategies for Future, New Delhi, Manas Publications, 2012.
6. Behera Laxman K, Indian Defence Industry, IDSA, Pentagon Press, 2016.
7. Behera Laxman K, Defence Acquisition: International Best Practices, Pentagon Press, 2013.
8. Berliner Joseph S, The Soviet Defence Industrial Complex from Stalin to Khruschev, New York, St Martin Press, 2000.
9. 9. Birla Institute of Scientific Research, Self-Reliance and Security Role of Defence Production, New Delhi, Radiant Publishers,1984.
10. 10. Bose, V.S.C. and Krishna V, Integrated process for Smooth Transition from Development to production of Weapons Systems. Defence Science Journal, Vol. 52, No.1, January 2002.
11. Bolks, Sean and Stoll Richard J, The Arms Acquisition Process, Journal of Conflict Resolution, Vol 44, 2000.
12. Chatterjee Manas, Arms Spending Development & Security, New Delhi, APH Publishers, 1996.
13. Khanna DD, Defence Versus Development, New Delhi, Indus Publishers, 1993.
14. Gates Bill, Stockholm International Peace Research Institute Year Book, New York, Oxford University Press, 2010.
15. Geiger Manas, Britain and the Economic Problems of cold war, London, Ashgate Publishing, 2004.
16. Ghosh Ranjit, Indigenisation: Key to Self-Sufficiency and Strategic Capability, Pentagon Press, 2016.
17. Haglund David G, Defence Industrial Base and the West, London, Routledge, 1995.
18. Juvale RP, Military Nano Technology, Cyber Tech Publications, 2008.
19. Kaushal Vinay, Defence Acquisition, New Delhi, Pentagon Press, 2013.
20. Katoch PC, Modernising Indian Defence New Delhi, Mans Publications, 2010.
21. Mathews Ron, Defence Production in India, New Delhi, ABC Publishing House, 1989.
22. Mishra Vinod, Case Concerns in Indian Defence and Imperatives for Reforms, 2014.

23. Mohanty Deba R, Changing Times India's Defence Industry in the 21st Century, Germany, Published by Bonn International Centre for Conversion, 2004.
24. Nato Nabam, Defence Import and made in India Ghaziabad (UP), Rathore Publishers & Distributers, 2018.
25. Narang SC, Defence Economics, Delhi, Prashant Publishing House 2012.
26. Narain Pratap, Indian Arms Bazaar, New Delhi, Shipra Publications 1994.
27. Palhan SK, Defence Industrial Base, Delhi, Vij Books India Pvt Ltd, 2010.
28. Panikar KM, Problems of Indian Defence, Asia Publishing House, 1960.
29. Padmanabhan S, A General Speaks, New Delhi, Manas Publications, 2005.
30. Phadke Ramesh, China's Power Projection, New Delhi, 2005.
14. Gates Bill, Stockholm International Peace Research Institute Year Book, New York, Oxford University Press, 2010.
15. Geiger Manas, Britain and the Economic Problems of cold war, London, Ashgate Publishing, 2004.
16. Ghosh Ranjit, Indigenisation: Key to Self-Sufficiency and Strategic Capability, Pentagon Press, 2016.
17. Haglund David G, Defence Industrial Base and the West, London, Routledge, 1995.
18. Juvale RP, Military Nano Technology, Cyber Tech Publications, 2008.
19. Kaushal Vinay, Defence Acquisition, New Delhi, Pentagon Press, 2013.
20. Katoch PC, Modernising Indian Defence New Delhi, Mans Publications, 2010.
21. Mathews Ron, Defence Production in India, New Delhi, ABC Publishing House, 1989.
22. Mishra Vinod, Case Concerns in Indian Defence and Imperatives for Reforms, 2014.
23. Mohanty Deba R, Changing Times India's Defence Industry in the 21st Century, Germany, Published by Bonn International Centre for Conversion, 2004.
24. Nato Nabam, Defence Import and made in India Ghaziabad (UP), Rathore Publishers & Distributers, 2018.
25. Narang SC, Defence Economics, Delhi, Prashant Publishing House 2012.
26. Narain Pratap, Indian Arms Bazaar, New Delhi, Shipra Publications 1994.
27. Palhan SK, Defence Industrial Base, Delhi, Vij Books India Pvt Ltd, 2010.
28. Panikar KM, Problems of Indian Defence, Asia Publishing House, 1960.
29. Padmanabhan S, A General Speaks, New Delhi, Manas Publications, 2005.
30. Phadke Ramesh, China's Power Projection, New Delhi, 2005.

Article

1. Ahmed Amin, ―India has World's Third Biggest Defence Spending Now‖, DAWN, 28 Apr 2020.
2. Ajit Doval, ―India's Defence Production and Research – Need for Transformational Up-gradation", Vivekananda International Foundation, 06 Feb 2012 (Retrieved from https://www.vifindia.org).
3. Arvind Kadyan, ―India's Defence Budget (2010-2011): Wake Up Call for Defence Managers", Defence Studies and Analysis, 03 Mar 2010 (Retrieved from : https://www.idsa.in)
4. A Richard, ―Defence Industries in Russia and China‖, 2017 (ISS-European Union Institute for Security Studies-iss. Retrieved from : https://www.iss.europa.eu).
5. Bharath Gopalswamy & Guy Ben-Ari, ―India's Defence Production Policy: Challenges & Opportunities‖. Centre for Strategic and International Studies, 01 Aug 2011 (Retrieved from https://www.airobserver.com).
6. Bikramdeep Singh, ―Defence Indigenisation: Made in India, by India, for India‖,

28 May 2013 (Retrieved from https://www.indianarmy.nic.in).
7. Confederation of Indian Industry, "Indian Defence Industry‖, CII, (Retrieved from https://www.cii.in).
8. Deba R Mohanty, ―Changing Times? India's Defence Industry in the 21st Century‖, Bonn International Centre for Conversion, Germany, 2004 (Retrieved from https://www.bicc.de).
9. Defence & Security Alert, Evolution & the Way forwards, ―India's Defence Industrial Base‖, D & S Alert, Aug 2012 (Retrieved from https:// www.idsa.in).
10. Defence Review Asia, ―India's Growing Defence Industrial Base‖, Defence Review Asia, (Retrieved from https://www.defencereviewasia.com).
11. Dinakar Peri, ―Budget 2019 : Defence Allocation Disappoints Military‖,07 Jul 2019 (Retrieved from https://www.thehindu.com).
12. Dhiraj Mathur, ―The Holy Grail of Indigenisation-Achieving Self-Reliance in Defence Equipment‖, Price water house Coopers Private Limited (Pw CPL), Jun 2013 (Retrieved from https://www.pwc.in).
13. Eric Arnett ―The Indian Defence Industry Market Opportunities, Entry, Strategies Analysis and Forecasts", 31 May 2012 (Retrieved from https://www.prnewswire.com).
14. GD Bakshi, ―View on Defence Industrial Base for India‖, Defence Security Alert.