

UP DEFENCE CORRIDOR: A GATEWAY FOR AN

ATMA NIRBHAR BHARAT

**Dissertation submitted to the Panjab University, Chandigarh
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CERTIFICATE

I have the pleasure to certify that Brig D P Singh has pursued his research work and prepared the present dissertation titled "UP Defence Corridor: A Gateway for an ATMA NIRBHAR BHARAT" under my guidance and supervision. The dissertation is the result of his own research and to the best of my knowledge, no part of it has earlier comprised any other monograph, dissertation or book. This is being submitted to the Panjab University, Chandigarh, for the purpose of Master of Philosophy in Social Sciences in Partial fulfilment of the requirement for the Advanced Professional Programme in Public Administration of Indian Institute of Public Administration (IIPA), New Delhi

I recommend that the dissertation of Brig D P Singh is worthy of consideration for the award of M.Phil degree of Panjab University, Chandigarh.



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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
ASSOCHAM	Association of Chambers of Commerce
ASC	Alternate Simplified Credit
BMD	Ballistic Missile Defence
BMS	Battlefield Management System
BRADS	Board of Research for Advance Defence Sciences
CII	Confederation of Indian Industry
CKD	Completely Knocked Down
CSIR	Council for Scientific Research
CCS	Cabinet Committee on Security
CDS	Chief of Defence Staff
DAPRA	Defence Advance Research Project Agency
DAP	Defence Acquisition Procedures
DPP	Department of Defence Production
DGOF	Director General of Ordnance Factories
DIB	Defence Industrial Base
DOFB	Defence Ordnance Factory Board
DPP	Defence Procurement Procedures
DPR	Detailed Project Report
DPSU	Defence Public Sector Undertaking
DRDO	Defence Research and Development Organisation
DIEG	Defence Industrial Enterprise Group
DMA	Department of Military Affairs

EU	European Union
EW	Electronic Warfare
EWP	Elevated work Platform
FDI	Foreign Direct Investment
FICCI	Federation of Indian Chambers of Commerce and Industry
GDP	Gross Domestic Output
GSQR	General Staff Qualitative Requirements
GAD	General Armament Department
HAL	Hindustan Aeronautics Limited
HSL	Hindustan Shipyard Limited
IAI	Israeli Aircraft Industry
ICV	Infantry Combat Vehicle
IMI	Israel Military Industry
IDDM	Indigenously Designed Developed and Manufactured
IDS	Integrated Defence Staff
IIT	Indian Institute of Technology
IPT	Integrated Project Team
ISRO	Indian Space Research Organisation
IT	Information Technology
JV	Joint Venture
LWL	Light Weight Launchers
LUC	Landing Utility Craft
LPG	Liberalisation Privatisation and Globalisation
MoD	Ministry of Defence
MSME	Micro Small Medium Enterprise
MBT	Main Battle Tank

MRO	Maintenance Repair and Overhaul
NATO	North Atlantic Treaty Organisation
NDIA	National Defence Industrial Association
OEM	Original Equipment Manufacturer
OFB	Ordinance Factory Board
OFs	Ordinance Factories
PLA	Peoples Liberation Army
PSUs	Public Sector Undertakings
PPP	Private Public Partnership
PFI	Private Finance Initiative
QR	Qualitative Requirements
R & D	Research and Development
RFP	Request for Proposals
RUR	Raksha Udyog Ratan
SI	System Integrator
SIDM	Society of Indian Defence Manufacturer
SKD	Semi Knock Down
SME	Small and Medium Enterprise
SQR	Service Qualitative Requirement
SLR	Self-Loading Rifle
SDIF	Strategic Defence Industry Fund
SOEs	State Owned Enterprises
SPM	Strategic Partnership Model
SEZ	Special Economic Zone
TDE	Technical Development Establishment
ToT	Transfer of Technology
TDF	Technology Development Fund

TRLs	Technology Readiness Levels
USA	United States of America
UPDIC	Uttar Pradesh defence Industrial Corridor
UPEIDA	Uttar Pradesh Expressway Industrial Development Authority

ABSTRACT

1. The Asian generation, which includes India and China as major players, is regarded as the twenty-first century. With the end of the Cold War and the rising impact of globalisation, India is redefining its regional and international role and work. India, the recognized leader of the South, is transcending its position to play a larger global role, a pattern that both the US and the European Union (EU) have adopted in their strategic alliances with India. The military might of India enables it to deal with any external threats from its neighbours. However, indigenization of military equipment and defence infrastructure is a major issue that must be addressed in order to help bridge any military power gaps, especially between India and China. The key to strategic capability and self-sufficiency is to realize this. Despite being one of the world's top 15 defence hardware manufacturers, India's existing defence manufacturing base is unable to fulfil the armed forces' firearms, weaponry, and infrastructure requirements. Thanks to the government's Make in India Security programme, things have changed for the better in recent years. Over the years, the DRDO has developed indigenous products like the BRAHMOS, AKASH Weapon System, ARJUN Main Battle Tank, ATAGS (Advanced Towed Artillery Gun System), and our own light combat aircraft, TEJAS.

2. The Defence Procurement Protocol (DPP) of 2020 lays out the groundwork for private sector procurement and public-private partnerships. Armed forces can take the lead in supporting Make in India by purchasing equipment from Indian manufacturers. We should work to improve the competitiveness of defence PSUs, corporatize ordnance factories, and apply the PPP model to various aspects of defence production and procurement as a nation. Partnerships with foreign defence behemoths, original equipment manufacturers, and private sector companies must be facilitated in order to acquire better technology and aggressively

seek generational technical innovations through a dedication to cutting-edge defence R&D. (R&D). In low-technology manufacturing segments, a joint venture (JV) strategy with foreign manufacturers can be used. With the launch of the Indo-Russian Rifles Private Limited rifle manufacturing facility in Korwa, this was recently achieved in the case of Kalashnikov rifles (Amethi, Uttar Pradesh). The Indian government recently placed a ban on the import of some weapons used by the Indian armed forces and raised foreign direct investment limits in defence manufacturing from 49 percent to 74 percent in an attempt to improve Make in India Defence output.

3. After independence, India has worked to strengthen and expand its industrial defence base in order to achieve self-sufficiency. The Defence Research and Development Organization was born out of the ordnance factories that were founded under British rule in 1958. (DRDO). The Ordnance Factory Board (OFB) and the Defence Public Sector Units (DPSUs) actually dominate the Indian defence manufacturing sector, while the Defence Research and Development Organisation (DRDO) manages the R&D sector exclusively (DRDO). Despite the fact that the defence market was opened up to private domestic players in 2001, the private sector's overall participation in defence procurement has remained minimal. Among developing countries, India has one of the largest defence manufacturing bases in the world. Approximately two lakh people work in the country's various defence manufacturing units/laboratories. The DPSUs, Ordnance Factories (OFs), and DRDO—all under the control of the government's Ministry of Defence (MoD)—as well as a few private sector firms, both large and Micro, Small, and Medium Enterprises (MSMEs)—make up India's current Defence Industrial Base (DIB) (MSMEs).

4. With India's private sector as one of the most active participants in the industrial defence complex, the industry's face has changed drastically. The industry's vital and

strategic existence, as well as its direct impact on the country's national security and foreign policy interests, were frequently cited as reasons to prevent the private sector from entering the defence sector. However, the Indian defence industry opened its doors to 100 percent private sector participation in 2001, following the impressive success of the private sector in the decade following liberalization in 1991, and the public sector's relative lacklustre performance. The private sector now plays an important role in the defence industry. The private sector has made considerable strides in its relatively short history, having been awarded and executing a variety of high-profile transactions. It served India's DPSUs as a small supplier of raw materials, semi-finished goods, parts, components, and limited services until 2001.

5. The Hon'ble PM announced the development of a defence industrial corridor in Bundelkhand while speaking at the UP Investors Summit in Lucknow in February 2018. This follows the commitment made by the UP Chief Minister, Shi Yogi Adityanath, to build an expressway in the area. The proposed Defence Corridor is expected to bring in Rs 20,000 crore in investment and provide jobs for 2.5 lakh people. The Union budget 2018 made the formal announcement to create two defence industrial development corridors to promote the defence industry. The defence corridor is designed as a route through which domestic manufacturing units of defence equipment by the public sector, private sector, and MSMEs are lined up with the aim of improving the operational capability of the defence forces. Six nodal points have been listed for the corridor in Uttar Pradesh. Agra, Aligarh, Lucknow, Kanpur, Chitrakoot, and Jhansi are the cities in question. Interactions with stakeholders have already taken place in Lucknow, Kanpur, Agra, and Jhansi.

6. Uttar Pradesh is well positioned to become the country's largest defence manufacturing

centre. Uttar Pradesh has the following advantages:

- a) It is the country's fourth-largest state and third-largest economy.
- b) It is home to 16.5% of India's population.
- c) The world's largest economy and customer marketplace.
- d) One of the top five manufacturing states in the nation.
- e) India's second-largest number of SMEs.
- f) Has an export growth rate of 13.26% (CAGR) (2012-17)
- g) The state already has a large network of DPSUs and Ordinance Factories.
- h) These districts have a large ancillary base to meet defence production needs and maintain a steady supply of raw materials, labour, and other necessities.
- i) In the Bundelkhand area, large tracts of affordable land are available.
- j) The state's current and planned highways and expressways are excellent.

7. Over the past two years there has been considerable work done in development of the defence corridor. The salient aspects being: -

a) Provision of land bank as per requirement of investors with the basic infrastructure as under:

- i) Roads.
- ii) Electricity.
- iii) Water.

- iv) Security wall.
 - v) Integrated police cum fire stations.
 - vi) Commercial banks.
- b) Uttar Pradesh Defence and Aerospace Unit and Employment Promotion Policy (First Amendment) 2019 has been published by Government of Uttar Pradesh with the objective of attracting investments in U.P. Defence Industrial Corridor.
- c) Guideline/Procedure for Allotment of Industrial Plots in Defence Corridor has been published for seamless land allotment procedures.
- d) Uttar Pradesh Electronics Manufacturing Policy 2020 has been promulgated.
- e) MoUs have been signed between UPEIDA and various companies to establish manufacturing units at the nodes for U.P. Defence Industrial Corridor (Appx 'C') .
- f) MoU signed between UPEIDA and Indian Navy on 13 Aug 2020 to facilitate identifying problem areas, finding solutions and manufacturing through Indian Industry.
- g) Centre of excellence related with defence industrial corridor being established with IIT Kanpur and IIT BHU.
- h) DRDO has been incorporated as technical partner.
- i) Hand holding of industry in all aspects.
- j) Assisting MSME of non defence background to turn to defence manufacturing.

k) Provision of common facility centre for prototyping, incubation, startups and skilling at Lucknow.

l) Creation of defence testing infrastructure at nodes initiated by MoD.

m) Creation of land bank at all the six nodes. Land bank of 3800 Ha (Approx) was to be created of which 1350 Ha has already been acquired by the state government.

n) Committee has been formed to analyse Human Resource requirements, devise/modify syllabus at all it is and engineering colleges.

8. UP Defence Corridor has the potential to develop into a major defence industrial hub in the country. Aspects that will enhance the investors interest in the defence corridor and enable it to evolve as an integrated defence industrial complex are as under: -

a) Central government needs to lay down a policy for development of both the defence corridors. There should be clarity with regards to the defence equipment that can be produced in the respective defence corridors. This will enable development of a complete ecosystem for production of a particular equipment resulting in economy of effort and better utilisation of resources. Presently both the defence corridors are promoting same kind of equipment to be manufactured in their corridor. As part of the TN corridor Chennai is proposed to be developed as an aerospace hub also the UP government has taken out a detailed policy for development of aerospace industry in the UP Defence corridor.

b) Central government to formulate policy guidelines to ensure that big ticket investments in the defence industry as part of the strategic partner programme for the next five years should be restricted to these defence corridors. In absence of any policy large number of states are attracting investments by defence industry. This

would result in haphazard development of defence industrial base in the country and the proposed defence corridors would not develop as desired.

c) UP government to develop each of the six nodes as centres of excellence for a particular defence product. This will enable a complete ecosystem for production of that equipment to be developed in close vicinity. At present in the absence of this thought process land is being allotted to any industry that is approaching the government. A case in point is Aligarh where all the land parcels have been allotted to companies involved in varied products starting from small arms, ammunition, aerospace, drones and textile units.

d) The offset policy needs to be tweaked to give a higher multiplier factor for industries that will be set up in the defence corridor as part of offset. This will provide incentive to the foreign vendors to invest in the defence corridors.

e) UP government is providing incentive in procurement of land to the defence industry for investing in the defence corridor. However, land cost is less than 5% of the total investment in setting up a defence and aerospace unit. This could be a reason for no major defence and aerospace company investing till date in the defence corridor.

f) The proposed nodes are being confined to a small geographical area. The Lucknow node is planned to be developed in an area of 200 Ha for which contiguous land is proposed to be acquired. Land acquisition today has its own challenges and time penalty. There are large number of PSU in and around Lucknow which have either closed or are on the verge of closing like Scooter India Ltd in Lucknow and ITI at Rai Bareilly. These PSU have huge land banks that can be optimally utilised.

g) Based on the response received to the questionnaire circulated to the industry and the existing defence industrial infrastructure in the country the following can be developed as part of the UP defence corridor: -

i) Maintenance Repair and Overhaul Hub. With the boom in the aviation industry both military and civil, there is tremendous opportunity for developing MRO facilities. With South India emerging as a Hub for production of aircrafts and helicopters the UP Defence Corridor could become the Hub for MRO for these aviation assets. Presently, the MRO industry is still in its nascent stages. With good policy incentives by the centre and state governments, world class MRO facilities can be set up at the Jhansi node where adequate landbank is available.

ii) Electronics Hub. There is a requirement for developing an electronics hub to cater for communication equipment and radars for the Defence forces. Presently 65% of the requirement of the defence forces is being imported. The existing MSME base in and around Aligarh and Agra can be utilised to set up this hub. The electronics technology is dual use and can supplement the requirements in the civilian field. UP Government has proposed an electronic city around the upcoming Jewar Airport which could be done away with and all the resources of the state be pooled to develop the proposed nodes at Agra and Aligarh into an electronics hub. This sector has the added advantage of training and employing women.

iii) Textile Hub. The total active strength of the defence forces and paramilitary personnel in the country is approximately 39 Lacs. These troops need to be provided uniforms and various kinds of special clothing like Winter

clothing for Siachen glacier, super high altitude areas in Kargil and high altitude areas and also clothing for troops deployed in deserts, sea and jungles. The existing textile hub in and around Kanpur can be developed to cater for the clothing requirements of the defence forces and paramilitary.

iv) Small Arms and Ammunition. The existing infrastructure at Korwa in Amethi where AK- 203 series of rifles are being manufactured and the Ordnance factories in Kanpur can be utilised to develop a small arms hub. The ammunition hub can be developed utilising the land banks of the Sick PSU's like Scooter India and ITI Rai Bareilly.

v) Defence Testing Infrastructure. MoD has announced the setting up of Defence testing Infrastructure in the country. The proposed infrastructure could be developed as part of the Jhansi node which has an existing firing range for Artillery and tanks.

vi) Combat Medical Products. The medical hub to cater for both Defence and Civilian use can be developed in and around Lucknow. Presently, there is very little focus on Combat medical products which has huge potential both for domestic use and export in the coming years.

vii) Human Resource Development. The Defence Industry require special skill sets among the workforce that is employed in these units. UP Defence Corridor could take the lead in setting up Institutions to cater for the specific requirements of the Defence Industry in collaboration with Institutes of excellence like IIT, Kanpur and IIT, BHU.

CHAPTER 1

INTRODUCTION

The Global World Order

1.1 The fall of the Berlin Wall, the disintegration of the Soviet Union, the breakdown of the Warsaw Pact, and the subsequent end of the Cold War were perceived by the Western world as heralding the start of a new world order. The notion that democratic forces and capitalism had defeated communism and that the West would now be able to set the rules that the international community would enforce. The wars that erupted shortly after in parts of the former Soviet Union, the Balkans, West Asia, and most of Africa quickly shattered this euphoria. As the Western world was struggling to come to terms with these changes, the terrorist attacks of September 11, 2001 in New York and Washington happened, followed by US-led operations in Afghanistan and, later, the US-led invasion of Iraq. Because of these incidents, the contours of the international system that we were familiar with in the latter half of the twentieth century have profoundly changed. The most important element of this transformation is the United States' dominant role as a global competitor. It is now a superpower in every sense of the word, with the exception of demonstrating creative statesmanship and providing trustworthy leadership. It possesses unrivalled political, economic, military, and technological influence. There is no other country or grouping in the vicinity. Because of its substantial interests in West Asia and along the Pacific coast, the United States is not only a major player in the Americas and Europe, but also in Japan, Korea, Taiwan, and the Philippines. If it degenerates into the contradictions of over-reaching itself by trying to conquer the entire world on its own, it will eventually remain the dominant economic and military force for the majority of the twenty-first century.

1.2 United Europe will remain a significant political and economic participant on the international stage. Many European countries would like to see Europe have a counterbalance to the United States' absolute supremacy, but this has been unlikely for some time. The continuation of US forces in the NATO support system would be critical to Europe's military clout. Nonetheless, it appears that the trans-Atlantic alliance is loosening, which is pushing Europe to establish its own defence architecture. In reality, it's possible that Europe is attempting to restructure its relationship with the United States. In certain ways, it may try to find out where it fits in between the United States and a resurgent Asia. In the aftermath of the Soviet Union's disintegration, some see the Russian Federation taking on the contours of Germany, which resulted from the Versailles Treaty after World War I. A rageful mood and economic dissatisfaction; a feeling of deprivation; a loss of prestige; and a shattered sense of ethnic pride. All of this is exacerbated by Russia's political and military establishment's obsession with NATO's eastward expansion and, more recently, the assumption that the US-led Western world is attempting to implement aggressive political systems in its backyard. Given Russia's vast material resources and the pride and determination of its people, the country is more than likely to emerge powerful and prosperous once more. Only time will tell how long it will take and whether or not this step will cause conflict.

1.3 China's role will undoubtedly be crucial. It is now a major international power that is increasingly expanding economically and modernizing its military. Given the need for oil for economic development, China is already aggressively bidding for and securing rights to oilfield output in various parts of the world. It is not implausible that it will go to great lengths to safeguard the oil-rich South China Sea basin for its own gain. Similarly, China's western flank borders on Central Asia's known oil reserves, which it intends to exploit. China's immediate focus, according to an objective assessment, is economic growth. Beyond

posturing and rhetoric, it is therefore difficult to instigate some kind of confrontation. Even with Japan, political movements are driven by expediency, as anti-Japanese feelings help to sustain Chinese nationalism, which is useful in pursuing domestic policy. Japan is becoming more assertive in foreign relations and suggesting a desire to play a larger role. Its defence budget is just 0.5 percent of GDP, but considering the scale of the country's economy, that's a sizable amount. It has ships and rockets with a track record of success. Despite the fact that Japan has not gone nuclear, it has a significant nuclear capability. Given the region's history of what was perceived as brutal Japanese rule, neighbours such as China and the Koreans are watching the new developments in Japan with interest. The Japanese reason for their acts must be interpreted in the light of a perception that the United States' commitment to Japan's security might not be absolute in the medium or long term.

1.4. The United Nations has been steadily marginalized in recent years. The UN Security Council's rejection of NATO's involvement in Kosovo in 1999 fuelled marginalization, which reached a climax with the unilateral US-led invasion of Iraq. Ironically, while the United Nations sees the United States as a roadblock to the global policies it wants to pursue, the developing world sees the UN as dominated by the US and its Western allies, who are more than willing to use the world body as a front to pursue the developed world's goals through political, military, and economic pressures. Indeed, the latter position has a lot of merit due to the developed world's immense clout in both military and economic terms. Recent attempts at organizational change, like that of the United Nations Security Council, have been based on political expediency, and there seems to be little hope for any substantive progress in the way the world body has been operating for quite some time. Its authority and importance, which have been questioned at best in recent years, seem to be on the decline. Resurrecting the United Nations would necessitate a show of statesmanship of the highest order.

India's Neighbourhood.

1.5 When it comes to the protection of the South Asian Region, some unique features of the region's geography demand special attention. The sheer size of India in terms of land mass, population, and capital is its most distinguishing feature. The second is that India shares common land borders with all but the Maldives of the seven states that make up the immediate region, despite the fact that Sri Lanka shares a land border with mainland India due to its geographical proximity; none of the other states share common land borders. The third point is that, with the exception of Nepal and Bhutan, only India has shared ethnic affiliations with the populations of other countries to some extent. To appreciate this unique feature, it is essential to have a thorough understanding of the sub-complex region's inter-state political and security dynamics.

1.6 Recent developments in Nepal have been a source of concern for India because of the impact they have on the large Nepali migrant community in India as well as Nepali nationals serving in the Indian Armed Forces. There was also concern that hostile external powers would take advantage of Nepal's ambiguous situation to promote anti-India activities. The restoration of democratic processes and the dialogue between the Seven Party Alliance and the Maoists provide some hope for the region's return to normalcy in this case. The UN has been asked to assist in the supervision of gun control and the administration of election procedures. It is not impossible that India could play a leading role in such activities. Which it must follow in the region, as well as for Nepal's long-term stability as a major stakeholder.

1.7 Sri Lanka's situation remains unpredictably volatile. Any resumption of open conflict on a large scale would have serious implications not only for Sri Lanka but also for India.

Needless to say, this would necessitate statesmanship and resolve of the highest order. India is concerned about the Sino-Sri Lankan relationship, as China has invested heavily in Sri Lanka's infrastructure projects. China's increasing presence in Sri Lanka has been well established, especially in terms of its substantial infrastructure investment. However, even within Sri Lanka, these have sparked debate because some of the terms of China's loans, in which these infrastructure projects were constructed, were rather unfavourable. Indeed, the Hambantota port has become a prime example of the dangers of what has been dubbed China's debt-trap diplomacy.

1.8 Bangladesh had all of the ingredients for a successful democracy. However, the recent course of events has dimmed the optimism. The advent and assimilation of fundamentalist elements into the government apparatus resulted in the persistent hatred and personal disdain displayed by Khaleda Zia and Sheikh Hasina towards each other and translated into political machinations. The spawning and nurturing of terrorists as a result of Al Qaeda and other terrorist affiliates' allegiance is exacerbating the issue. The large-scale illegal migration from Bangladesh to India is applied to this in terms of India; at the end of the count, there are estimated to be between 16 and 20 million illegal migrants from Bangladesh in various parts of India. With Pakistan attempting to recruit potential terrorists from refugee camps in Bangladesh, the Rohingya crisis has the potential to affect the security situation in the country.

1.9 Pakistan is in the midst of yet another pivotal time in its short history. The democratic political processes that began after General Zia-ul-death Haq's proved to be a mirage. The continuity of the old feudal order, nepotism, corruption, and military adventurism have all taken their toll, resulting in the futility of the Kargil misadventure. Pakistan has been under direct military rule for many years, with no end in sight. Internal strife and sectarian conflict,

sparked by the easy availability of weapons, are sources of concern, and the 'Talibanization' of Pakistani society appears to be a real possibility. Needless to say, developments in Pakistan are a source of concern for India, particularly given the terrorist activity carried out by groups with mentors and supporters in Pakistan. India is concerned about China's successful participation in the Belt and Road Initiative in Pakistan.

India – China Equation

1.10 For more than 2000 years, India and China have had a close friendship. The first mention of such a relationship dates from the 2nd century BCE. In the Arthashastra, Chanakya, the Mauryan Empire's minister, mentions Chinese silk. The strongest link between the two countries has been Buddhism. China has the world's largest Buddhist minority, accounting for 18.8% of the Chinese population. Trade and people-to-people communication are the most critical aspects of bilateral ties. Spices, opium, and tea were the most commonly traded goods between the two great powers. In the 7th century AD, a number of travellers, including Hsuan Tsnag, paid a visit to the silk. Bilateral ties steadily declined in the highly complex world scenario. The advent of colonialism and British rule in India sowed the seeds of conflict between India and China. The British's mercantile and expansionist policies resulted in the Anglo-Chinese Opium Wars. The consequences of such a war were so devastating that India and China failed to establish friendly ties even after independence. China and India had close bilateral ties in the early post-independence period, marked by mutual support and cooperation on a number of important national, regional, and international issues. Following that, in 1954, New Delhi and Beijing signed the Panchsheel

Agreement, which was never implemented. The agreement provided India with an opportunity to publicize its anti-colonial stance. China, on the other hand, saw this display of "Communist unity" as a way to combat rising anti-communist sentiment in the West. With the 1962 Indo-Chinese War, communist ideals were forced on India. It was a breach of Panchsheel, and the relationship between them deteriorated after that.

1.11 The relationship between India and China is highly complicated, and it is widely misunderstood both within the two countries and throughout the world. The passionate discussions about China in India, as well as the external perspectives on Sino-Indian ties, do not correspond to the actual direction of Sino-Indian relations. Within India, there is a deep schism between those who see China as India's greatest long-term threat and those who, in collaboration with China, have long romanticized the prospects of an Asian century for ideological reasons. After a long period of relative decline, India and China did not find it easy to develop good neighbourly relations in the middle of the last century, despite their gratitude on the international stage. Even as lofty goals of collaboration were proclaimed, the two titans found themselves in inevitable conflict. Mistrust over Tibet prompted India to sign bilateral security treaties with Nepal, Bhutan, and Sikkim in 1949-50.

1.12 Over the last few decades, China and India have put a lot of effort into resolving their differences and handling their 2,100-mile contested frontier. Both sides must strike a delicate balance, fighting and sparring along several fault lines while maintaining a veneer of comity and avoiding crossing each other's red lines. China's acts have sometimes thrown the balance off, prompting a stern response from India. In 2010, Beijing declined to grant a visa to an Indian military officer from Kashmir; in 2014, Chinese submarines surfaced in Sri Lanka; and in 2017, the Chinese military attempted to expand a road into the disputed Doklam plateau. China's most recent border incident has set a pall over ties. To counter China's

increasing presence in its neighbourhood, India is rebalancing its relations with other countries, especially the United States.

India's Aspirations

1.13 The Asian generation, which includes India and China, is referred to as the twenty-first century. With the end of the Cold War and the growing effects of globalisation, India is redefining its place and function both regionally and internationally. After the economic liberalization of the 1990s, which resulted in annual growth rates of 6-7 percent, India's global presence has grown steadily. India's rise is shaped by two factors: the political dividend it has earned as the world's largest democracy and its increasing economic position, which, according to projections, would see it emerging as the world's largest economic driving force, alongside China. India, the acknowledged leader of the South, is transcending this status in order to play a greater global role, a development that both the United States and the European Union (EU) have embraced in their strategic alliances with India. To assess where India is heading today, it is necessary to look at the period immediately following independence in 1947, especially the first 10-15 years. India was active in its soft-power strategy and played an important role in the decolonization process. The country was also involved in international organizations such as the United Nations and in heading the Non-Aligned Movement. India's foreign policy decisions, on the other hand, were limited by Cold War policies that developed India's political, economic, and security relations with other countries. Power dynamics between nations are changing in post-Cold War global politics, and the Cold War rubric no longer includes India in South Asia. On the economic front, India

is still transitioning from a developing to a developed nation. Changes in international structures and regimes, regional stability, domestic economic development, and internal political stability will all affect India's ability to play a global economic, political, and security role. To address its security issues, India has used a combination of domestic and societal policies as well as foreign policy variables. Democratic modernisation has fuelled policy momentum in the areas of internal and economic stability. To address its security issues, India has used a combination of domestic and societal policies as well as foreign policy variables. Democratic modernization has fuelled policy momentum in the areas of internal and economic stability. Of course, 9 percent economic growth must be disaggregated to see how non-performing sectors, especially agriculture, can lead to a major problem of food security and social unrest. Only with robust investments in health, education, and infrastructure that link business needs to skill building in the young workforce can India's demography become an advantage. In order to strengthen external stability, an inclusive nuclear strategy based on minimum deterrence and a 'No First Use' policy is also prioritized. As Asia's defence spending steadily increases, the question of how military modernization affects political stability will become even more pressing.

1.14 India is engaged by the world in a globalized world, just as the world is engaged by India. The most important change has occurred in the relationship between India and the United States. These two countries have gone from becoming 'estranged democracies' to becoming 'engaged democracies,' due to the end of the Cold War rhetoric. The new dynamism in the India-US relationship is so profoundly different that the US engages it as being completely de-hyphenated from Pakistan for the first time in its bilateral relationship with India. Second, a Strategic Partnership with India is being pursued, which acknowledges India's current and future potential in the region and around the world. Third, the India-US

Civil Nuclear Deal has de facto acknowledged India as a nuclear state, and it has been given exemptions from the existing nuclear regime. In other words, India has been involved on its own terms. India's pursuit of closer ties with its neighbours in the region, as well as with key external actors in the region, is not haphazard. Instead, India is systematically targeting states that will provide it with real and tangible defence, political, and economic benefits, as one would expect. China has a diverse region around it to its benefit, including Macau, Hong Kong, and South Korea, which are fuelling creation and bureaucratic reform, allowing it to be the architect of its new destiny. The lack of a diverse, immediate neighbourhood and the existence of a stagnant bureaucracy in India are India's problems.

1.15 India's military might allow it to deal with any hostile neighbours' threats, particularly given the doctrine of cold start and the aversion to "hot war" due to nuclear deterrents. There is one obvious problem that must be addressed in order to help bridge any military power gaps, especially between India and China: indigenization of military equipment and defence infrastructure. This is the secret to strategic capability and self-sufficiency. In the aftermath of the Galwan conflict, India tried urgently to get its defence purchases supplied by allies such as France. However, the time between that and a potential later escalation or another standoff with China over Pangong Tso or Galwan puts us in a precarious position. Though war must be avoided at all costs, one must be prepared and equipped with the required facilities, weapons, and infrastructure to face any degree of escalation by China's People's Liberation Army (PLA). The Indian defence-industrial complex has expanded rapidly in recent decades. According to the 2018 Defence Development Policy (DPrP-2018), India's defence industry aims to become one of the top five global aerospace and defence manufacturing producers by 2025, with an annual export target of \$5 billion. India is currently the world's largest arms importer by volume,

accounting for 12 percent of total global arms imports between 2013 and 2017. Even though India is one of the top 15 defence hardware producers in the world, the country's current defence manufacturing base is still unable to meet the armed forces' weapons, arms, and infrastructure needs. Things have changed in recent times, for the better, thanks to the Narendra Modi government's Make in India Security initiative. The development of a roadmap for promoting indigenization and self-reliance in defence, efforts to reduce red tape and bureaucratic delays to improve the ease of doing business in the defence sector, the establishment of Defence Corridors (in Uttar Pradesh and Tamil Nadu) to build a Defence Industrial Complex, and the replacement of the Wassenaar Arrangement List of Munitions with a Defence Prod List DRDO has developed indigenous products such as the BRAHMOS (a universal long-range supersonic cruise missile system that can be launched from land, sea, and air), AKASH Weapon System, Varunastra (electrically-propelled anti-submarine torpedo), 125mm FSAPDS Mk-II ammunition for T-72/T-90 tanks, and Main Battle Tank Arjun. We have recently developed our own light combat aircraft, the TEJAS, as a country.

1.16. There is still a long way to go, and with all of these accomplishments. Overdependence on the public sector, both for research and development as well as for production, has been one of the major flaws in our drive towards indigenization. The 2020 Defence Procurement Protocol (DPP) goes some way towards setting the groundwork for private sector procurement and looking towards private-public partnerships. I believe that the initiative must be taken by the armed forces, but with high standards of transparency, in the acquisition and enhancement of goods ideally purchased from indigenous market players. As a country, in various avenues of defence production and procurement, we should look towards making defence PSUs more competitive, corporatizing ordnance factories and using the PPP model. Via partnerships with foreign defence behemoths, the original equipment

manufacturers, private sector organisations must be encouraged to obtain (or preferably develop) better technologies and aggressively look at generational technology innovations through committed pursuit of cutting-edge defence research and development (R&D). In low-technology manufacturing segments, a Joint Venture (JV) strategy with foreign manufacturers can be adopted. This was achieved recently with the opening of the Indo-Russian Rifles Private Limited rifle manufacturing facility in Korwa (Amethi, Uttar Pradesh), in the case of Kalashnikov rifles. Recently, in an attempt to improve the production of Make in India Defence, the Indian government placed a ban on imports of some weapons used by Indian armed forces and raised limits on foreign direct investment in defence manufacturing increased to 49 percent to 74 percent. However, though eight selected ammunitions have been approved for production under the flagship programme since 2017, there are many others that are still being imported, such as anti-material rifle ammunition. This has got to improve. Sophisticated technical solutions to the military challenge must be established by MSMEs and start-ups, with such technological advances possibly being used simultaneously in civilian applications to compensate for the financial burden that can be accrued. The iDEX Defence India Start-up challenge initiative may help encourage this. Larger enterprises and major private players must act as hubs of research and development (R&D) – with an emphasis on the three areas highlighted by the Ministry of Defence (No.1(18)/02/Indigenization/DP(Plg-ES)/818): electronic chips technology, materials technology and engine technology – and manufacturing, while the smaller enterprises can provide ancillary support and spur competition to create a healthy, efficient and optimum self-sustaining defence production and procurement ecosystem in the country.

CHAPTER 2

RESERCH METHODOLOGY

Statement of the Problem

2.1. The defence budget of India is ₹4,71,378 crore which is 2.10% of the GDP and 15.49% of the total central government expenditure for the financial year 2020 -21. ₹ 1.18 Lakh crore is the capital outlay, ₹ 2.18 Lakh crores is the revenue head and ₹ 1.33 Lakh crores is for pensions. Out of ₹1.18 Lakh crores that is to be spent on procurement of defence equipment, 70% of defence equipment is likely to be imported which will not contribute to the economy of the country. For India to be a major player in Asia and the world it will have to achieve self reliance in defence production. The Atma Nirbhar Bharat dream can be realized only when the country is able to create a defence industrial base which can meet the requirements of the defence forces in a given time frame. The private sector with large scale investment in R&D and collaborations with international defence firms is well poised to take up the challenges of meeting the requirements of the armed forces.

2.2. The existing Defence Public Sector Undertakings (DPSU) in the vicinity of the proposed UP defence corridor along with the existing and proposed infrastructure provide an opportunity for UP to emerge as a major defence industrial hub of the country. With the availability of large tracts of land and complementary infrastructure in terms of roads, the proposed industrial hub would be a game changer for this region. The development of the industrial hub would enhance the economic development of the region, state and the country as a whole since the large amount of defence budget presently being spent on purchase of

armament from abroad would be spent within the country. In the long run, India could also look at exports of defence equipment in the neighborhood in line with its Strategic Security Imperatives.

Research Objectives

2.3. The research objectives of the study are: -

2.3.1 To study the various models of defence industrial hubs of United Kingdom, France, United States and Israel and propose the best suitable model for development of the UP defence corridor:-

2.3.2 Identify the requirements of the defence public sector units to set up centers of excellence in the proposed corridor:-

2.3.3 Identify the requirements of the private sector by interacting with CII, FICCI etc based on the existing policy and changes envisaged by the private sector.

2.3.4 To identify the requirement of complementary infrastructure to enhance the potential of the defence corridor and make it more attractive for private and public sector investment:-

Research Design

2.4 The research would be a mixed research i.e both the qualitative and quantitative approaches will be adopted. The study would give an insight into the measures to be taken to develop the Elevated work platform (EWP) defence corridor into a major defence industrial

hub. The research would involve collecting data from the Ministry of Defence, Department of Defence Production and Department of Military Affairs to identify the strategy for achieving the aim of Atma Nirbhar Bharat.

2.5 The research will aim to define the private sector's ambitions to manufacture world-class defence equipment in cooperation with foreign firms to meet the defence forces' requirements. The research will also undertake to define the infrastructure criteria that need to be built up to make the corridor both competitive and desirable for investment in the corridor by private establishments. It will also aim to define the inner economic benefits that will help the area develop and the skill sets that local people need to be able to participate effectively and reap the benefits of industrialization in the area.

Rationale / Justification

2.6 The Make in India initiative was launched in 2014 by the Government of India with the aim to give thrust to the manufacturing sector with specific emphasis on the defence industry. The government had enhanced the Foreign Direct Investment in defence sector to 49% in 2014 and now in 2020 to 74% with the hope of attracting major international defence firms to invest in India thereby reducing the burden of imports on the country. However, from 2014 to 2020 the defence sector has not seen any major investment by the private firms. India is still dependent on foreign sources for most of its defence equipment.

2.7 The UP defence corridor is an opportunity for the country to establish a vibrant defence industrial hub to meet the future requirements of the defence forces. For the initiative to be a success, the government (defence establishment) and the private players need to be in synergy. The defence industry (manufacture of state-of-the-art defence equipment's like

Aircrafts, tanks and ships) requires heavy investment in Research & Development and the private sector well poised to contribute to the same thereby reducing the burden on the government. There is also a need for a clear distinction between the field of work of the defence public sector units and the private players for optimum results in an earlier time frame.

2.8 The defence corridor has the potential of changing the economic conditions of the region of Bundelkhand and for the people to derive economic benefits. There is a need to identify the skill sets required by the industry and put in place a mechanism to train the locals to acquire these skill sets. Large number of other economic activities can be generated along with the proposed defence corridor which need to be identified and policy measures be instituted to ensure that optimum benefits percolate to the citizens.

Research Questions

2.9 The research questions that arise are as under: -

2.9.1 What should be the model for developing the defence industrial base?

2.9.2 What are the policy frameworks in terms of land availability, labour policies, incentives to invest in the defence corridor that need to be put in place by the Union and UP government to attract private investment?

2.9.3 What are the fields in which the defence public sector units need to focus so that level playing fields are provided to the private players to invest in the defence corridor?

Scope / Limitations/ Delimitation

2.10 Limitations of this research process are as follows:

2.10.1 Collection of primary data from various sources would be restricted due to COVID-19.

2.10.2 Availability of data and information on defence industrial and technical capabilities are restricted due to security issues.

2.10.3 Accessibility to policy makers and key stake holders in Government of India former employees of UP government, armed forces, DRDO and industry captains for interview.

2.10.4 UP defence corridor being a new initiative (launched in 2018) has limited data in the public domain.

Literature Review

2.11 The government of India has taken up the initiative of self-reliance in defence production in the last six years. In the recent past there has been considerable coverage of the same in defence literature. Most of the literature is on the journey of the history of defence manufacturing in India from British era to present day. The problem faced by the defence forces due to inordinate delays in indigenous products and their effect on defence preparedness have been discussed by a lot of writers. The reason why India has not been able to set up a defence industrial base that is able to keep pace with the world and meet the aspirations of the services and the way ahead. There is very little literature available on the UP Defence corridor being a new initiative of the government. Various policies that have been put in place by the Union government and the State government for promoting self-reliance

in defence production have been analysed in detail. Some of the papers and articles are given below: -

2.11.1 Kelkar Committee Report on Defence Procurement (2005). India is a new player in international market for conventional weapons. The international market for defence equipment is highly competitive. The international market for conventional weapons has been shrinking rather than growing in size till the late 90's. In this shrinking market, established players have a natural edge making it difficult for developing countries like India to make a niche for itself in exports. However, to succeed, India will have to survive long enough to break into and establish itself while ensuring that it maintains edge in its market niches, specifically the industry should target a sizeable portion of the smaller nations market. Simultaneously, it will have to develop new areas of expertise.

2.11.2 Enhancing role of SME's in Indian Defence Industry (2010). The report has been published by "Ernst & Young" in collaboration with confederation of Indian Industry (CII). This brings out the role of SME sector in the industrial growth of the country. The challenges that the SME sector has faced and how it can be an engine for the growth of manufacturing sector and its impact on the economy. The paper also dwells on the Indian Defence Industrial Base and how it has developed over the years. The reasons why the industry has not been able to meet the defence requirement of the country. The implications of the procurement policy on the industry with special reference to SMSE's. The SMSE's are an important component of the value chain of the defence industry and have great potential to contribute in the 'Atma Nirbhar Bharat' plan.

2.11.3 Maj Gen GD Bakshi (2012). "Building a vibrant defence base" published in defence security alert brings out that establishing a vibrant defence industrial base (DIB) in India is an imperative not just for reasons of strategic autarky but to provide urgently

needed jobs for our rising demographic youth bulge and highlights that no viable DIB can be established in India without a Public-Private partnership. The license production route gives us an optical illusion of self-reliance. As part of military modernisation, post-independence saw us spending a measly 1-2% of GDP on defence, heavily dependent upon Soviet Union and entirely dependent on imports- a sad reflection of our failure to credit a modern DIB. He argues that we must exploit the potential of disruptive that enables us to leapfrog technology bottlenecks and denial regimes.

2.11.4 Col Venugopal, IDSA (2011). “Public-Private partnership in procurement practices” brings out the factors that restrict the endeavours of the SME’s in defence production viz, high cost of development, preferential treatment to DPSUs and the OFB, fluctuating orders being placed resulting in uncertainty and lapse in cost effective business, unilateral changes in specifications, lengthy procedural and financial processes, reluctance to risk sharing by the service HQ’s, especially when keeping in mind liquidated and consequential damage, adhocism in procurement and delays in payment.

2.11.5 The Indigenisation of Indian Defence Industry (2019). This report was written by Dhruva Jaishankar, published by Brookings institution India centre. The paper brings out the necessity of indigenous defence industry in the existing security environment. In spite of the focus of the government since the early 90’s to achieve 70% indigenisation of defence production, we have been barely able to reach about 25-30% indigenisation that also in law/technology sector. India faces a number of dilemmas in trying to reform the defence industry: normal rules of market economics do not apply; ideal objectives of quality, cost and time frames cannot be achieved simultaneously; nature of defence supply is changing. The paper elucidates on the need to have a mechanism to ensure predictable capital expenditure, in order to incentivise investment.

2.11.6 Deba Mohanty, Changing Times-India's Defence industry in the 21st century (2016). The advent of Soviet assistance in the 1960's, alongside licensed deals with some European nations, catapulted license production as India's primary defence production model. After initiating the production of MIG series as frontier fighter jets, HAL also license produced the Cheetah & Chetak helicopters from France's Aeropostale, and jaguars from the Anglo-French ventures. Similarly, the Heavy Vehicle Factory at Avadi licensed manufactured the Vijayanta tanks based on the British Vickers during the 1970's and 1980's followed by Ajeya MBT based on soviet T-72 MBT and the T-90 MBT. Consequently, licensed systems dominated the land forces in such a manner that no design activities were taken up in this segment for a long period until the launch of the Arjun MBT and INSAS projects in the early 1980's. Throughout this period, OFs engaged in indigenous production of weaponry, mostly with foreign inputs, which still constituted large quantities of relatively low to medium technology items.

2.11.7 Kapoor Ketan, Defence Production: Should the markets be kept out (2008). In Private Finance initiative (PFI), the department contracts "services" rather than "assets", so the MoD first needs to decide whether it would be practical to meet the requirements by means of a contract under which services are provided, rather than by the outright purchase of assets such as buildings and equipment. If so, the department next considers whether such an approach has the potential to offer better value for money than if it bought assets directly, PFI aims to achieve this by allowing the MoD to focus on its core military tasks supported by a private sector partner, who can offer more services efficiently or at less cost because it is able to do things that MoD cannot. Payments are made only after satisfactory completion of the project, the incentive to deliver the project in question becomes stronger. There is very little scope for additional payments within budget.

2.11.8 Industrial Investment and employment Promotion Policy of Uttar Pradesh (2017). This was promulgated by the Uttar Pradesh government on 13 July 2017. The policy lays down the mission of the state government to increase capital investment by providing quality infrastructure and policy framework to create a business friendly environment. It focuses on the measures to build infrastructure, fiscal incentives to the industry, policies for improving ease of doing business, promoting start-up's and support to MSMEs for creating employment. It brings to light the guidelines for promoting sustainable and inclusive growth with special provisions for SC/ST women and differently abled.

2.11.9 DRDO policy and Procedures for Transfer of Technology (2019). Defence Research and Development Organisation (DRDO) is mandated to develop defence technologies, systems and products that are required for Indian Armed Forces. Some of the defence technologies developed by DRDO also have utility in the civilian market. Such technologies are transferred to the industries with dual licensing rights for defence sector/Departments of GOI and commercial market. Thus, Transfer of Technology (ToT) of DRDO developed technologies to Indian Industries contributes to self-reliance in Technology, Industrial Growth and National Development. The objective of Transfer of Technology (ToT) policy is to disseminate DRDO developed technologies through a framework that ensures seamless transfer of technology to industries to boost the growth and capabilities of defence manufacturing sector for achieving complete self-reliance. DRDO developed technologies and categorised them as Category 'A' and Category 'B', as elaborated below: -

2.11.9.1 Category 'A'. These are the technologies for which Indian Armed Forces/ MHA/ other Govt. agencies (both central & state) are the only end

users. Category 'A' technologies are military technologies and are referred to as "MILTECH".

2.11.9.2 Category 'B'. Category 'B' technologies are the Dual use technologies (including spin-off technologies) that are not security sensitive and have commercial potential beyond Defence applications.

2.11.10 Tellis Ashley J (2000). "Measuring National Power in the Post-Industrial Age- Analyst's Handbook" has analysed the components of national power and a methodology to measure the same. He defines national power as the capacity of a nation to pursue strategic goals through purposeful action. Military capabilities, understood to be product of the cyclic interaction of both national resources and national performance, may be treated almost as the "output" of national power production because they represent the effective coercive strength that a country can bring to bear against any competitors. Defence industrial base of a nation is a strategic resource and a significant variable of a nation's military capability.

2.11.11 Keith Hartley, the economics of the UK Defence Industrial strategy (2007). For some equipment, MoD is the only (monopoly) buyer purchasing from UK monopoly supplier (nuclear powered submarines, etc) Where MoD is a major or monopoly buyer, it can use its buying power to determine the size, structure, behaviour, performance and ownership of the UK defence industrial base. The UK model also involves fostering a commitment towards long term, self -reliance in defence and emphasises on sharing of information between the MoD and the industry. This also involves inviting ideas and solutions of the industry at the beginning of any contracted project so as it has a better understanding of the capabilities of the firm in

question and also come up with solutions for the many problems associated with any project.

2.11.12 Maj Gen Mrinal Suman (2011). “Import of key technologies-need to revisit policy” argues that despite the fact that India has been following ToT route for decades for all large scale purchases like Tanks and Aircrafts. However, no genuine and substantial technology has been transferred to India. Worse, foreign vendors have been charging hefty amounts for allowing licenced production. He says that Indian policy makers have been using the term ToT in a highly misleading manner. Under the taxonomy of ToT, they have been seeking know-how to assemble systems in India. Whereas technology implies total knowhow for product manufacture from component level, indigenous production remains limited to assembling sub-assemblies. Not a single imported technology during the last three decades has provided a springboard for the development of superior technologies testifies the total failure of the current dispensation.

2.11.13 Stephen P Cohen & Sunil Dasgupta (2012). “Arming without Aiming”- India’s military modernisation” argues that India’s deeply ingrained traditions of strategic restraint most powerfully explains that puzzling inability of the Indian state to generate sufficient military power to alter its strategic positions vis-a’-vis its neighbours. We see the restraint as deliberate, the result of Indian political leaders deciding that the international environment was at least somewhat benign, or put another way, that India had the possibility of politically managing the threats, the balance of resource allocation between defence and development had to favour the latter and there must be an ideological rejection of armed forces as an instrument of state policy, a view stemming from colonial experience and the great power politics in which India became independent in 1947. While expensive and redundant, India

approach and arming without strategic purpose is not without wisdom. The political performance of restraint has wisely sought to escape the security dilemma rather than embrace it.

2.11.14 Brig Gurmeet Kanwal (2014). “Defence Procurement-Slow march to Indigenisation” brings out that though it seeks to encourage the public-private partnerships, privately the govt continues to retain its monopoly on R&D and defence production through DRDO, the OFs and the DPSUs. 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. The DRDO must concentrate its efforts on developing critical cutting-edge technologies that no strategic partner is likely to be willing to share. Other future weapons platforms should be jointly developed, produced and marketed with India’s strategic partners in conjunction with the private sector. The development of technologies that are not so critical should be completely outsourced to private companies. Also, 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 increasing service life. Gradually, the universities and the IIT’s should be involved in undertaking defence R&D. This will help to raise India’s technological threshold over the next two decades by an order of magnitude.

2.11.15 Neihzial N, IDSA (2016). “What is wrong in India’s defence industrial policy” argues that the policy of maximising indigenous production without a strong R&D policy back-up would not bring tangible results. Licence production is more of an economic compromise between the supplier and the buyer, and it does not and cannot being about significant technology transfer without an inbuilt specific and suitable mechanism. Every country at one point of time or the other will attain a

saturation level when it comes to supplying certain categories of equipment for its armed forces. Therefore, the ultimate defence industrial policy goal must be to foster defence exports without which it is difficult to sustain the economic base of a country's defence industry.

2.11.16 Middleton, Browns, Hurlley, Reud. The effect of Defence R&D on equipment of quality. Defence R&D spending is recognised as critical to delivery of battle winning capability. The defence industrial strategy presents evidence of the relationship between equipment capability and R&D investment over the past 10-25 years. The relationship shows that 'you get what you pay for' with a time and equipment capability advantage from R&D spending, although the relationship is subjected to diminishing returns. The high level of USA R&D spending has brought it a time advantage of about 5 years over the UK, but at a cost of some 10 times the level of UK R&D spending. However, the UK's current position in relation to the USA is due to its R&D spending in the 80's. If UK's defence R&D spending continues to decline, the technology gap with the USA will increase and this will lead to a decline in the UK's export performance. In 2001, the UK's defence R&D spending gave it a time advantage over France, Germany and Sweden.

2.11.17 Air Marshal Samir Sen, Military Technology, Governance and Self-reliance in Weapon acquisition. Every country in the world which successfully makes weapon systems, has done so by setting up companies or corporates in associations which allow them to both develop and manufacture weapons under an integrated management, whether in the public or private sector, through collaborators, joint ventures or outsourcing. Such companies remain accountable as the prime contractor, to their customers. The fact that we have succeeded in making strategic weapons, but yet fail in conventional weapon making, ought to be noted. Whereas we have taken

enough care to ensure that an integrated management system structure exists for both development and bulk production in making our strategic weapons. We have a divided house where the making of conventional weapons is concerned. The Secretary, DRDO is responsible for developing a weapon system, Secretary (DP) is responsible for bulk production. To compound this further, the user is removed from the decision-making process. This unique system exists only in our country.

2.11.18 Laxman Kumar Behera, estimating self reliance in India's Defence Production. A ten-year self-reliance plan formulated in 1992, under the then SA to RM Dr APJ Abdul Kalam, defined the self-reliance in the form of an index, reflecting the percentage share of indigenous content in total procurement expenditure. And estimated the index would progressively increase from 1992-93 estimation of 30% to 70% by 2005. Although India has developed a vast defence industrial base over the years, the objective of achieving 70% self-reliance has not been achieved and that the self-reliance index has barely improved from 1992-93 estimation of 30% to 36.4% in 2011-12 which indicates the failure of India's defence industrialisation process and demands serious introspection.

2.11.19 Amit Cowshish, IDSA, FDI in Defence: Making most of Status Quo. The MoD is not in favour of increasing the FDI in defence beyond 49%. It seems that the MoD is of the view that allowing foreign companies to set up manufacturing and assembling facilities in India will impasse the growth of indigenous design and development activities and perpetuate our dependence on foreign OEM's for modern weapons. The argument proposes that indigenous design and development have been flourishing, or have started looking up, even under the existing restrictive FDI regime and that any relaxation in the FDI cap will adversely affect these activities.

Research Gaps

2.12 Scanty literature is available on the UP Defence corridor. There is no study on the implementation of the UP Defence corridor and its impact on self reliance in defence production. This study seeks to explore the feasibility of setting up a defence industrial base in the proposed corridor for the production of high end defence equipment's to meet the requirement of Armed forces. The study also aims to identify the policy frame work to be put in place by the union and state government to attract private investment for production of high end defence equipment.

Research Methodology.

2.13 The methodology proposed to be adopted is exploratory in nature and comprises the following:

2.13.1 Critical review of the secondary literature.

2.13.2 Collection of primary data by interview method (Government officials in the MoD, UP government and industrialist part of FICCI, CII and PHD chambers of commerce) and questionnaire to industry.

2.13.3 Information collected from the primary and secondary source will be interpreted and analysed to impart a logical flow of thoughts and arrive at specific facets of the problem.

2.13.4 Data sources

2.13.4.1 Interview of policy makers in Ministry of Defence, UP government and captains of the Industry.

2.13.4.2 Questionnaires to industry for their views on the equipment that can be indigenised in collaboration with multinational companies dealing in defence equipment and scope for the public sector.

2.13.4.3 Secondary data available in public domain i.e books, policies and reports published by the government agencies, papers published in various journals etc.

2.13.4.4 Data available on various websites of the government of India and UP government.

2.13.4.5 Discussion with policy makers and experts.

2.13.4.6 Inferences based on exploratory research for analysis of the information and formulation of views.

CHAPTER: 3

DEFENCE INDUSTRIAL BASE MODELS OF OTHER COUNTRIES AND LESSONS

Introduction

3.1 Traditionally, the relationship between defence and economic development has been framed as a 'guns-versus-butter' debate. Defence spending is often seen as siphoning money away from the civilian economy. Furthermore, high levels of defence spending place unsustainable financial strains on society, potentially leading to economic uncertainty or ruin. On the other hand, defence spending, insofar as it contributes to stable states, creates an atmosphere that is conducive to foreign investment and private economic activity, and thus serves as a foundation for economic development and growth. In a nutshell, a strong national defence manufacturing base is seen as an important part of national pride and sovereignty. Other reasons for defence industrialization are often cited. One of the most important reasons is that having a national defence industrial base ensures supply protection and removes the risk of relying on potentially unreliable foreign suppliers of critical defence equipment, especially during periods of crisis or war. As a result, there is a strong desire to stop relying on foreigners for vital defence equipment. The potential effect of defence industrialization on overall economic growth, especially in developing countries, is the second reason with implications for broader economic growth. Developing an indigenous defence industry capable of meeting the majority of the needs of the defence establishment could be a way to save scarce foreign exchange, promote the mastery of emerging technology, and kick-start a broader socio-economic industrialisation process.

China

3.2 Reforms are being implemented to improve China's defence-industrial sector's

competitiveness and capacity to meet the People's Liberation Army's (PLA) aggressive conventional weapons requirements are transforming the sector. China's defence-industrial base is becoming more decentralized, with local state-owned enterprises (SOEs) and privately owned enterprises having more opportunities to contribute to R&D and production. Article 43 of the Popular Program of 1950, which served as the People's Republic of China's first de facto constitution, enshrined technological advancement "to serve the construction of national defence." By 1950, the defence-industrial sector had grown to 45 factories with a total workforce of 100,000 people. China's defence-industrial model after 1949 was remarkably similar to that of the Soviet Union. Defence-industrial production was solely the province of the state, and China's defence-industrial base had a highly centralized control system and a bureaucratic structure. All SOE weapons development and defence-related R&D was either assigned to a research institute reporting to one of China's Ministry of Machine Building Ministries in charge of various aspects of the country's arms programs or carried out by academic institutions reporting to the State. Though the PLA's large arms requirements certainly resulted in significant economies of scale, there was no apparent requirement to ensure that arms manufacturing was economically viable.

3.3 China's defence industry was still one of the world's most technologically outdated in the late 1990s; most indigenously developed military systems were at least 15 to 20 years behind those of the West—basically comparable to technology from the 1970s or (at best) the early 1980s—and quality control was chronically poor. Aeronautics, propulsion (such as jet engines), microelectronics, computers, avionics, sensors and seekers, electronic warfare, and advanced materials were all identified as areas where China's defence R&D foundation was found to be lacking. Furthermore, China's military-industrial complex still lacks systems integration, or the capacity to design and assemble military equipment that integrates

hundreds, if not thousands, of disparate components and subsystems and functions as a single entity. As a result, apart from a few "pockets of excellence" such as ballistic missiles, the Chinese military-industrial complex seemed to have few capabilities for designing and producing relatively advanced conventional weapon systems. Long development cycles, recurrent program delays, and limited production runs have all resulted from China's difficulties in bringing designs into production. The J-10 fighter jet, for example, took more than a decade to build and more than 20 years to enter operational service with the PLA Air Force, making it China's most advanced fourth-generation plus combat aircraft. Even after the Chinese began working on a weapon system, manufacturing runs were usually short and intermittent. According to Western reports, China's entire aircraft industry, which employed about 600,000 people at the time, produced just a few dozen fighter planes per year during the majority of the 1990s, mainly J-8 IIs and J-7s from the 1960s and 1970s. China only launched three destroyers and nine frigates between 1990 and 1999, averaging just over one major surface combatant per year. Furthermore, the lead boat in the Song-class submarine program—first China's indigenously built diesel–electric submarine—was commissioned in 1999, just eight years after construction began. As a result, despite years of arduous efforts, China's domestic defence industry has been unable to deliver the technological breakthroughs needed for advanced weapon production. As a result, Beijing has continued to rely heavily—even more so—on direct foreign technological inputs in critical areas. For example, the J-10 bomber is thought to be heavily based on technology from Israel's now-cancelled Lavi fighter-jet program. China is particularly dependent on jet engines, marine diesel engines, fire-control radar, and other avionics.

3.4 The most recent round of defence industry reforms began more than a decade ago, in September 1997, when the Fifteenth Communist Party Congress set out an ambitious agenda

for restructuring and downsizing the SOE sector (including defence industries), as well as opening up SOEs to free-market forces, such as supply-and-demand dynamics, competitive products, quality assurance, and fiscal self-responsibility. The Ninth National People's Congress refined this policy in March 1998, announcing plans to restructure the government's defence industry oversight and control apparatus, as well as the creation of new defence enterprise organizations. The establishment of a new PLA-run General Armaments Department (GAD), which acts as the PLA's primary buying agent and oversees defence procurement and new arms programs, was one of the most significant decisions made at the 1998 congress. Another important aspect of the latest defence reforms was the creation of ten new defence industry enterprise groups (DIEGs) in July 1999. These DIEGs were meant to function as true conglomerates, combining R&D, manufacturing, and marketing. The aim of dismantling the old SOEs was to enable the new business enterprise groups to bid for PLA procurement contracts.

3.5 Another important aspect of these latest reform efforts was the stated intention to drastically reduce the Chinese military-industrial complex, including the elimination of up to one-third of its workforce (through retirement, turnover, or even layoffs). At the same time, Beijing encouraged defence companies to produce more civilian goods in order to acquire dual-use technology that could be used to promote weapons manufacturing. Microelectronics, space systems, new materials (such as composites and alloys), propulsion, missiles, computer-aided manufacturing, and especially information technology are among the main areas of China's new emphasis on dual-use technological growth and subsequent spin-off. China's military shipbuilding appears to have benefited the most from CMI activities over the last decade. China's shipyards have advanced towards more sophisticated ship design and

construction work since the mid-1990s, after an initial phase of mostly low-end commercial shipbuilding—such as bulk carriers and container ships.

3.6 The reforms made to improve the defence industrial base's capacity have paid off, and China's defence industry appears to be booming. After eight years of losses, China's military-industrial complex finally broke even in 2002. In recent years, the missile and shipbuilding industries have been especially profitable. It's also becoming clear that China has significantly improved its military capabilities in recent years, especially in terms of power projection, stand-off precision strike, and improved command, control, communications, computing, intelligence, surveillance, and reconnaissance (C4ISR). The fourth-generation J-10 fighter, an upgraded version of the JH-7 fighter-bomber, the HQ-9 long-range surface-to-air missile (similar to the US Patriot air-defence missile), the improved Song-class diesel-electric submarine, and the Type-052C destroyer are among the advanced weapons systems that China's defence industry has begun manufacturing and delivering to the PLA (which incorporates low-observable features and an Aegis-type phased-array air defence radar into its design). The majority of development in increasing armaments production, both quantitatively and qualitatively, appears to have occurred in spite of—or at least in response to—reforms in the defence industry. Many of the so-called achievements in developing new-generation weapon systems were simply the result of design and development decisions taken years, if not decades, before the late 1990s reforms were implemented. These weapons programs were already in the works and set to go into production in the late 1990s and early 2000s, and although recent reform attempts may have aided in the acceleration or expansion of production of these weapons systems, they did not play a significant role in their inception. The success of the Chinese shipbuilding industry, for example, tends to be largely due to

decisions taken in the early 1980s to commercialize the business, open it up to international technology inputs, and compete on the global market.

Singapore

3.7 Based on the experience of a number of countries which faced problems during critical stages in procurement of military hardware from foreign countries Singapore embarked on indigenous weapons manufacturing capability development early. The abrupt withdrawal of Soviet military assistance in the 1960s, as well as the Western weapons embargo following the Tiananmen Square massacre, fuelled China's appetite for arms self-sufficiency. The question for these second-tier countries is not whether indigenous manufacturing is viable given the current state of the defence market and technology, but whether the defence firms that make up a significant part of the overall defence industrial base will actually survive in their current forms amidst escalating costs, reduced demand, and ever-increasing technological barriers. By the 1990s, Singapore's defence manufacturing base had undergone a significant transformation. First, the defence industry's flagship firm, Singapore Technologies (ST), was civilianized, resulting in a significant reduction in its overall reliance on Ministry of Defence contracts. Despite the fact that the military industry remained the backbone of ST, accounting for 70% of sales, there was a concerted attempt to extend civil operations. Furthermore, ST began to play an increasingly important role in promoting technology transfer to the civilian sector.

3.8 Singapore Technologies has clearly taken a multi-pronged approach to meet the challenges and constraints of globalization in the defence industry, as well as rising economic and technological costs. The key issue in terms of civilianisation, dual-use technology, and export strategies is whether these policies are still feasible in a declining defence sector. However, the more pressing topic is globalization policy. It could be argued that Singapore

Technologies' alliances with top-tier defence firms (particularly in the United States) obstruct defence indigenisation.

3.9 The Singapore Armed Forces (SAF) unveiled the Singapore Self-Propelled Howitzer dubbed the Primus - in November 2003, which was notable, if not unusual. The Primus was notable for being developed and launched entirely in-house by the Defence Science and Technology Agency, ST Kinetics, and the SAF, bucking the prevailing trend of second-tier countries outsourcing, purchasing 'off-the-shelf,' and customizing to local requirements. The Primus emphasized the limits to which defence manufacturing could be outsourced, and that the decision to grow and manufacture domestically was seldom made solely on the basis of cost considerations.

3.10 As can be seen in some of ST Engineering's recent moves both locally and abroad, Singapore's defence industrial base has taken steps to mitigate growing costs of domestic design and development as well as the limited domestic market. Furthermore, as global tensions (to the degree that they affect traditional weapons spending) have subsided, the economic argument for the defence industrial base has begun to take precedence over the political one. In the case of Singapore's defence industrial base, the shift from mercantilistic roots in the 1960s (with the declared goal of autarky) to liberal approaches in the 1990s (with the tacit recognition that true autarky was not feasible) has been reflected in some of Singapore Technologies' strategies.

3.11 Singapore's defence industrialization experience is noteworthy because it occurred in tandem with a highly active economic growth plan focused on interventionist industrial policy and export-oriented industrialization. The steady advance up the value chain from low-tech textiles in the late 1960s to high-tech semiconductors and memory chips in the late 1980s, through to the current reengineering of the economy towards greater knowledge-

intensive technology such as IT and biotechnology, has clearly been the determining factor. Singapore does not suit the 'prototypical' Third World scenario of defence spending creating optimistic externalities in this regard. This is due to the fact that Singapore's defence industrialization occurred in the context of increasingly growing economic production and a consistent growth dynamic that was unaffected by defence spending.

France

3.12 The public regulation of weapons production in France dates back to the Popular Front government's nationalisation campaign in 1936. Arms manufacture was carried out by state-run institutions until 1870, as a continuation of the Ancien Régime's arsenals, forges, and foundries, which were changed by the Revolution after 1789 and then by Napoleonic forces. The heavy demand for weapons created by increasing tension and preparation for revenge after the Franco-Prussian war of 1870 could not be met solely by supply from state-run establishments from the end of the nineteenth century onwards. As a result, a large number of orders were passed on to private industry, assisting in its production. This shift corresponds to a fundamental shift in the French weapons production structure, as reflected in the Law of August 14, 1885, which liberalizes the production and transfer of armaments.

3.13 From the 1930s onwards, however, this private-sector growth trend was severely stifled. Between 1933 and 1939, successive governments enacted a series of laws that strictly regulated the manufacture, commercialization, and export of weapons. The establishment of a Direction des Fabrications d'Armements within the Ministry of War in 1933 to organize and supervise all weapons operations, and the nationalizations enforced by the Law of August 11, 1936, are two notable events from this time. The military institution took on a completely new economic significance during the 1950s, confirming the central position of state institutions and the unique existence of their relationship with the economy. The Direction

générale pour l'armement (DGA) was to take center stage in the development of weapons from this point forward. In effect, since its inception in 1961, this and the technological agencies under the Ministry of Defence's supervision have become the focal point of France's industrial and technological policy, to the detriment of the State Planning Commission (Commissariat général au plan), the Department of Trade and Industry, and the Ministry of Foreign Trade, to name a few, all of which are a priori more competitive.

3.14 In contrast to the American Pentagon or other European procurement agencies, the DGA, which is at the centre of the French defence sector, is the key instrument of particular state interference in the French weapons manufacturing industry. It is more unified and has more influence in the defence industrial market. The DGA not only buys firearms, but also conducts much of its own R&D and production and runs a network of public arsenals. The DGA has been tasked with four key missions since its inception:

3.14.1 Establish and execute systems for weapons research, design, and manufacturing (and later maintenance, repairs of an industrial nature and modernisations).

3.14.2 To supervise and control private companies participating in armament projects, as well as state-run establishments and national companies.

3.14.3 To ensure that weapons systems established in cooperation with foreign countries are organized and monitored.

3.14.4 Within the sense of the government's strategy, encourage weapons exports and ensure their control.

3.15 Faced with the constant impossibility of both providing the armies with the most appropriate equipment at the lowest possible cost and ensuring the existence and

development of a national and independent DTIB capable of meeting the full demand for materials from the beginning, the DGA has been significantly reorganized three times in the last few years (1986, 1994 and mostly 1997). Despite these successive reorganizations, which demonstrate that these two conflicting objectives will never be reconciled, the DGA remains an unavoidable interface between supply, which it largely determines, and demand, which it heavily adjusts, ensuring the coherence and balance of the meso-system.

United States of America

3.16 The United States has the world's largest defence market and is also the largest exporter of defence equipment. The defence sector is dominated by five large US-based defence companies: Lockheed Martin, Northrop Grumman, Raytheon, Boeing, and General Dynamics. To interact with the countries' defence establishment as well as policymakers, private defence players have developed a highly integrated structure.

3.17 Structure of the industry The US Department of Defence is the industry's primary policy-making body as well as a major customer. The National Defence Industrial Association is the DOD's conduit to private industry. It brings together government officials, military and industry experts, and organizations representing the military branches, homeland security, and first responders. It has divisions and working groups that cover a variety of topics. The NDIA's main responsibilities are as follows:

3.17.1 Government Policy Advisory. Assist in the development of policy agendas as well as educational awareness campaigns.

3.17.2 Legislative Information Division. Provide access to key government and industry officials for NDIA members.

3.17.3 Procurement Division. Monitors and promotes sound and practical procurement/acquisition policies and procedures on all matters affecting Government/industry business relationships related to the procurement/acquisition process. The Division also helps member companies by keeping them up to date on acquisition-related developments.

3.18 Defence Procurement. The procedure for domestic procurement in connection with foreign sales is defined by the US Department of Defence (DoD). This is a strategic move aimed at establishing a controlled environment. However, the Department of Defence's policymaking and procurement arms are clearly defined, with separate directorates for procurement and acquisition policy and defence acquisition and contract management.

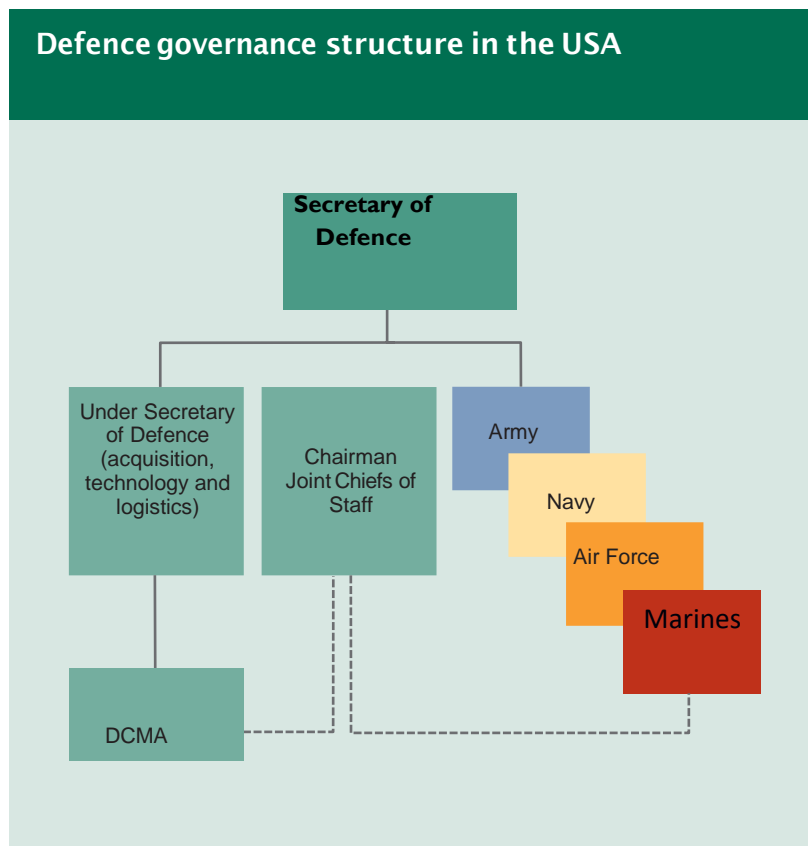


Figure: 3.1 US Defence Governance Structure

3.19 The directorate of procurement and acquisition policy is in charge of procurement policy. Contract management is managed by the Defence Contract Management Agency, which reports to the Department of Defence.

31.9.1 Before a contract is awarded, DCMA offers advice and services to help buyers create successful solicitations, identify potential risks, choose the best contractors, and draft contracts that meet the needs of DoD, Federal, and allied Government agencies.

3.19.2 Following contract award, DCMA closely tracks contractors' performance and management processes to ensure that costs, product quality, and delivery schedules are in line with the contract's terms and conditions.

3.20 In order to share the burden associated with its more volatile or R&D dependent procurement, the United States often uses a cost-plus contract arrangement. The contract's 'plus' is tailored to meet particular requirements. This may include reward and bonus payments based on output efficiency, as well as delay clauses, among other things.

3.21 Approach to research and development. The Pentagon's R&D budget in the United States is by far the highest in the world. This represents a US approach to mitigating risk early in the growth of defence capabilities that is quite appealing to defence companies and investors. Unlike the United Kingdom and other European countries, which frequently insist on firm price contracts with vendors even during the early stages of Defence Industrial Strategy programs, the United States prefers to use cost-plus deals before the risk is quantified and manageable.

3.22 The United States also offers a number of tax breaks to promote innovation in the aerospace and defence industries. A simple R&D tax credit and an Alternative Simplified Credit (ASC) designed to improve incentives for high-risk defence and aerospace research by

allowing aerospace companies to assert a possible advantage on Eligible Research Expenditures are included in the tax incentives. Few states in the United States also demonstrate rapid amortization for depreciable assets sold to the US military.

3.23 Defence Advanced Research Projects Agency (DARPA). The US government created DARPA as a direct response to the Soviet launch of Sputnik. This is a one-of-a-kind, independent setup that reports directly to the Secretary of Defence and operates in tandem with the military R&D establishment. A small and flexible organization with a lot of autonomy. It recruits scientists and engineers from the best public and private institutions, tackles major technological challenges, and allows technical staff to be hired on a temporary basis for at least 3-5 years. The project managers hired are technically excellent, entrepreneurial, and have excellent management skills, and failure is fully accepted. All work in this model is project-based and typically lasts 3-5 years, with a focus on the end result.

Israel.

3.24 The Israel's defence production model is similar to the US models and also receive tremendous technological support. The major catalyst for Israel's metamorphosis from a small arms manufacturer to a producer of sophisticated military systems came after the six-day war in 1967 due to the French Arms embargo. To express displeasure at Israel's rejection of advice against starting the war, President Charles de Gaulle of France unilaterally imposed an immediate embargo on the further shipment of weapons to Israel. Undelivered orders, even those for which Israel had already paid, were withheld and no further orders of ammunition were accepted. As a result: -

3.24.1 Israel made an all-out policy of self-sufficiency trying to develop and produce all defence needs. This sense of urgency to achieve independence from foreign

suppliers led the country into an unprecedented industrial revolution, the main thrust of which was directed towards the manufacture of military equipment. Subsequently, the in-house military industry quadrupled its output, R&D intensified and the independent design and manufacture of major sub-systems was favoured over licensing co-production arrangements involving foreign companies.

3.24.2 The four major industries, IMI (Israel Military Industry), IAI (Israel Aircraft Industry), Rafael and ELTA formed the backbone of the defence industry in Israel. These companies from Govt owned to become semi govt companies. Whilst, these companies are the lead integrators, the work of upgrades and improvements which essentially involved IT work was taken-up by the private sector. These leading industries and the Govt have given extensive support to the private sector.

3.24.3 All the leading companies have their own R&D divisions well supported by Research Institutes, Universities and private industries. The Govt R&D set-up is very lean and is engaged in getting projects. These companies are primarily follow the philosophy of: -

3.24.3.1 Defining mission capability.

3.24.3.2 Emphasis on acquisition of technology and not the product.

3.24.3.3 Participation of user in the design and production team, to bring-in practical experience and specific requirement.

3.24.3.4 Explore collaborative development with other countries.

3.24.4 The defence production base and defence research in Israel is under a unified command structure. The structure of defence industry is a multi-tier one and is as follows: -

3.24.4.1 State owned large corporations that are essentially lead integrators.

3.24.4.2 Private/Public sector-the small system assembly manufacturers.

3.24.4.3 High tech specialty firms-the component and part suppliers.

United Kingdom

3.25 The defence and security industries in the United Kingdom contribute significantly to the country's advanced manufacturing base. Defence spending and exports support about three lakh jobs in the United Kingdom. As a result, the government's approach to defence and security procurement has a significant impact on the scale and shape of these major UK industries. The Ministry of Defence of the United Kingdom released a white paper titled "National Security By Technology: Technology, Equipment, and Support for UK Defence and Security" in February 2012, which replaced the previous Defence Industrial Strategy. The white paper emphasizes the importance of equipping the Armed Forces and national security agencies with the best capabilities that the country can afford, while also ensuring that taxpayers get the best value for their money.

3.26 The UK MoD is the sole (monopoly) buyer of special platforms (such as nuclear-powered submarines), and it uses its purchasing power to shape the configuration and ownership of the UK defence industrial base. The UK model also entails cultivating a long-term commitment. Self-reliance is a concept used in defence that emphasizes knowledge sharing between the Ministry of Defence and industry. This also includes bringing in industry innovations and solutions at the start of any contracted project to get a greater understanding of the firm's strengths and to come up with solutions to the many issues that come with any project.

3.27 The UK white paper seeks to fulfil the defence and security requirements through open competition in the domestic and global market and buy off-the-shelf where appropriate. UK favours bilateral collaboration on technology, equipment and support issues and continue to work in collaboration with NATO, EU, etc.

3.28 Most equipment and service arrangements are bolstered by technology. To safeguard the United Kingdom's interests, the nation is investing in defence science and technology to develop future systems and equipment that will provide an operational advantage. The UK's white paper recognizes the importance of thriving, creative, and cost-effective suppliers in developing and maintaining key defence and security capabilities, as well as leading to export-led development and a rebalanced economy. A well-regulated defence and security trade allows the UK government to strengthen strategic relationships and improve the security capabilities of its allies.

3.29 In November 2011, the United Kingdom introduced a cyber security policy aimed at making the country one of the safest places in the world to do business in cyberspace, protecting its interests in cyberspace, and promoting open societies.

3.30 The United Kingdom also believes in fostering favourable conditions for global private-sector investment while maximizing public-sector benefits. A stable defence and security sector, like SMEs, has broader economic benefits in terms of creating employment, retaining skills, and contributing significantly to the budget.

3.31 Private Finance Initiative (PFI). The PFI program in the United Kingdom is vast and complex, encompassing resources such as lodging, housing, information systems, utilities, training facilities, and equipment. This resulted in a two-billion-pound increase in the defence industry by the private sector. The PFI helps the government to share risks with the private sector, which is best equipped to handle them. The most important things are:

3.30.11 Since PFI contracts 'services' rather than 'properties,' the MoD must first determine if it is feasible to satisfy its requirements through a contract that provides services rather than the procurement of assets such as buildings and equipment. PFI allows the Ministry of Defence to concentrate on its core military mission while being funded by a private sector partner that can provide services more quickly or at a lower cost. Payments are made after the project is completed, which increases the motivation to produce the product. As a result, there is no space for extra payments within budgets.

3.31.2 In 2011, the UK govt initiated a fundamental reassessment of PFI and in Dec 2012 came up with a white paper titled “A new approach to public private partnerships, providing access to wider source of equity and debt finance to improve the value for money of financing projects, increasing the transparency of the liabilities created by long term projects, speed up reduce the cost of procurement process and provide greater flexibility in services.

3.32 Smart Acquisitions. In October 2000, the Smart Procurement System was introduced with the aim of improving Defence capabilities by purchasing and supporting equipment more efficiently in terms of time, expense, and efficiency. The client, procurement department, and logistics organization are all involved in the process, with the frontline commands determining the availability and sustainability specifications for in-service equipment.

3.33 In order to see that the long-term relations between the industry and the MoD are established, UK has also introduced concepts like sharing of profits. The two key approaches are: -

3.33.1 Incentivisation wherein positive incentives may include paying bonuses where value is added beyond the baseline contractual requirement and more flexible use of interim payment arrangements.

3.33.2 Gain sharing, where the re-opening and examining of existing contract may bring benefit to both MoD and Industry.

3.34 Significant mergers have occurred in the UK defence sector, which is dominated by domestic monopolies in air, ground, and sea systems (BAE systems, Rolls-Royce, Augusta Westland, etc). The majority of UK industry is privately owned, with the exception of the defence science and technology laboratory, which is a state-owned enterprise. The government owns a portion of BAE and Rolls-Royce. The defence industry in the United Kingdom is more profitable than alternate uses of energy on average (i.e. the UK DIB makes a net contribution to UK national output).

3.35 The delivery of battle-winning capabilities relies heavily on defence R&D investment. Over the last 25 years, the defence industrial strategy has provided proof of the relationship between equipment capacity and R&D spending. With a time and equipment capacity advantage from R&D investment, the relationship shows that “you get what you pay for,” while the relationship is subject to diminishing returns. The United States' high level of R&D spending has given it a five-year head start over the United Kingdom, but at a cost ten times that of the United Kingdom's R&D spending. In 2001, the UK had a time advantage over France, Germany, and Sweden due to its defence R&D spending.

Lessons for India

3.36 Use of MoD's buying power to structure the Indian defence industry in terms of size, structure, behaviour, performance and ownership.

3.37 Explore privatisation of services viz, housing, real estate management, etc.

3.38 Encourage foreign investment in Indian defence sector, explore collaborative development and R&D between Indian and Foreign companies.

- 3.39 Identify areas of defence science and technology, essential to maintain national sovereignty, provide maximum leverage in strategic terms and provide maximum technology benefits.
- 3.40 Explore the option for privatizing, corporatizing, consolidation of the OFs and DPSUs and declare unneeded plants as excess.
- 3.41 Govt R&D to be lean and focussed. Need more synergy amongst research institutions, universities and private players. Greater resource allocation for R&D is inescapable.
- 3.42 MoD should formalize and publish a “Defence Industrial and Technology strategy”.
- 3.43 Transparency in defence production.
- 3.44 Entire defence production as well as procurement is through an open and transparent competitive bidding, thus making entire process transparent.
- 3.45 Need for greater degree of trust and transparency between govt and private industry in their dealings.
- 3.46 Creation of an organisation like DARPA to get the best out of the industry and the scientific community for defence of the nation.

CHAPTER 4

EXISTING POLICY FRAMEWORK: TO PROMOTE DEFENCE PRODUCTION

Introduction.

4.1 India is one of the few countries in the world that relies heavily on foreign sources to meet its defence needs. India is the world's largest arms importer, accounting for 14% of global arms imports, according to the Stockholm International Peace Research Institute (SIPRI). This reliance on imported weapons serves as a stark reminder of how far India has fallen short of the target of substantial self-reliance in defence production that it has aspired to since independence. But it's not just doom and gloom. The National Democratic Alliance (NDA) government's "Make in India" (MII) initiative, launched by Hon'ble Prime Minister Narendra Modi, provides a ray of hope. 25 industries, including defence manufacturing, have been listed as part of the initiative to revive India's industrial growth and, more importantly, propel the country as a global manufacturing hub. If the MII's goals in the defence manufacturing sector are to be met, the government must resolve a number of pressing issues that have hampered India's push for self-sufficiency.

4.2 Make-in India Policy. The import-export ratio of India's defence industry is lower than that of countries with a much smaller defence industrial base. The 'Make in India' strategy for the defence sector aims to correct the existing gap between defence equipment imports and domestic manufacturing without jeopardizing the user's specifications, capacity, or preparedness. For strategic and economic reasons, achieving self-reliance and that reliance on foreign countries in defence is now a requirement rather than an option. The demand for domestic defence equipment is greater than any other sector because it can save precious foreign exchange while also addressing national security concerns. The 'Make in India'

strategy aims to encourage investment and innovation in India's manufacturing sector. Since the government is the sole purchaser, 'Make in India' in the defence sector would be controlled by India's defence procurement policy. The Defence Procurement Policy accurately reflects the Government's policy of supporting domestic defence industry, with "Buy (Indian)" and "Buy and Make (Indian)" types of acquisition receiving preferential treatment over "Buy (Global)". Since Indian companies may lack adequate technological capabilities, they are encouraged to form joint ventures, technology transfer agreements, and tie-ups with foreign companies.

DAP 2020

4.3 DAP 2020 focuses on streamlining the defence procurement process and institutionalizing tracking systems by concurrent actions that use digital technologies and data bases to select the best equipment in a transparent and competitive manner, offering ample opportunities to capable vendors. The Make in India initiative of the Indian government aims to increase the participation of Indian vendors, including MSMEs, and as a result, the "Make" procedure in DAP 2020 has been refined to make it more objective and time bound, with a focus on Indian industry, especially MSMEs. Reduced appropriate timeframes for various activities and the implementation of robust procedures to monitor for probity at various stages of the acquisition phase are among the features of this DAP.

4.4 Capital Acquisition schemes are listed as: 'Buy,' 'Buy and Make,' Leasing, 'Make,' Design and Development (D & D), and Strategic Partnership Model (SPM). For overhauls, major refits, improvements, and replacements of capital products, the Other Capital Procurement Procedure (OCP) can be used. Procurements are graded as 'Buy (Indian - IDDM),' 'Buy (Indian),' and 'Buy 2 (Global)' under the 'Buy' scheme. Procurements under

the 'Buy and Make' scheme are divided into two categories: 'Buy and Make (Indian)' and 'Buy and Make (International)' (Global - Manufacture in India).

4.5 Prioritization of Categorization Under this procedure, the above-mentioned categories will be used to procure defence equipment. The categories were prioritized based on their relative significance to indigenization, with the exception of Make, Leasing, D & D, and SPM. If all of the lower category's conditions are met, a vendor who qualifies in a higher category is not barred from participating in the lower category. The priority of categories will be as follows, in decreasing order of priority: -

4.5.1 Buy (Indian – Indigenously Designed Developed and Manufactured) i.e. Buy (Indian-IDDM).

4.5.2 Buy (Indian).

4.5.3 Buy and Make (Indian).

4.5.4 Buy (Global - Manufacture in India).

4.5.5 Buy (Global).

4.6 Definition of Acquisition Categories

4.6.1 Buy (Indian-IDDM). The 'Buy (Indian-IDDM)' category refers to the purchase of goods from an Indian vendor that are indigenously designed, created, and manufactured with at least 50% Indigenous Content (IC) on a cost basis of the base contract price, i.e. total contract price less taxes and duties.

4.6.2 Buy (Indian). The 'Buy (Indian)' group applies to the purchase of goods from an Indian vendor that were not designed and manufactured in India and have a 60 percent

IC on the cost basis of the base contract price. Vendors who qualify for the 'Buy (Indian-IDDMM)' category will be allowed to participate in this category if they have an indigenous concept and a minimum of 50% IC on a cost basis of the base contract price.

4.6.3 Buy and Make (Indian). The 'Buy & Make (Indian)' category refers to an initial purchase of equipment in Fully Formed (FF) state in quantities deemed necessary from Indian vendor(s) in a tie-up with a foreign Original Equipment Manufacturer (OEM), followed by indigenous production in a phased manner involving Transfer of Technology (ToT) of critical technologies as per specified range, depth, and scope from a foreign Original Equipment Manufacturer (OEM). A minimum of 50% IC on the cost basis of the Make portion of the contract, less taxes and duties, is expected under this category of acquisition. This category of acquisition can also be carried out without the need for any initial equipment procurement in the FF state.

4.6.4 Buy (Global - Manufacture in India). Buy (Global - Manufacture in India) refers to an outright purchase of equipment from foreign vendors in quantities deemed necessary, followed by indigenous manufacture of the entire/part of the equipment, spares/assemblies/sub-assemblies/Maintenance, and Repair and Overhaul (MRO) facility (only in cases where these are part of the main contract) for the equipment, through its s. Vendors from India will be allowed to participate in Buy (Global - Manufacture in India). This category of acquisition can also be carried out without the need for an initial purchase of four pieces of equipment in the FF state. As per the deal, all payments for the 'Manufactured' component will be made in Indian Rupees to the vendor.

4.6.5 Buy (Global). 'Buy (Global)' category refers to outright purchase of equipment from foreign or Indian vendors. In case of procurement through foreign vendors, Government to Government (G2G) route/Inter Government Agreement (IGA) may also be adopted, for equipment meeting strategic/long term requirements. An Indian Vendor participating in this category would be required to meet minimum 30% IC, failing which such vendor would be required to discharge offsets as applicable in the case. Foreign vendors will need to discharge offsets in all Buy (Global) cases with Acceptance of Necessity (AoN) cost of ₹ 2000 crores or more, other than all ab-initio single vendor cases, including procurements based on IGA/FMS.

4.7 Offsets. The Offsets clause will apply to Buy (Global) procurement categories with an average AoN cost of 2000 crores or more. In order to participate in the Buy (Global) group, an Indian vendor must meet a minimum of 30% IC, failing which the vendor would be allowed to discharge offsets as necessary. The DAC can consider a partial or complete waiver of the Offsets clause under some circumstances. In the event of a waiver for a specific acquisition, eligible/selected Indian vendors are not excluded from the IC requirements. In all ab-initio Single Vendor Situations, including procurements based on IGA/FMS, no offsets will be applied.

4.8 Make and Innovation. Acquisitions covered under the Make and Innovation including Innovation in Defence Excellence (iDEX) and Technology Development Fund (TDF) categories refer to equipment/system/sub-system/assembly/sub-assembly, major components, or upgrades thereof, to be designed, developed and manufactured by an Indian vendor/processed by the Services through their internal organisations, such as Base Workshop/Dockyards/ Base Repair Depots etc. with or without participation of Private industry.

4.9 Strategic Partnership Model (SPM). Acquisitions under the Strategic Partnership model refer to private Indian firms participating in 'Make in India' in defence alongside foreign OEMs and acting as a System Integrator by assembling a large eco-system of development partners, specialized vendors, and suppliers, especially from the MSME field. Over and above the current production base, Strategic Partnerships will aim to expand indigenous defence manufacturing capabilities through the private sector.

4.10 Leasing. Leasing, in addition to the current 'Buy' and 'Make' acquisition categories, has been added as a new category for acquisition since it offers a creative method of financing equipment/platforms. Leasing allows you to own and run an asset without having to pay for it outright, and it's a good way to replace large upfront capital investments with regular rental payments. Leasing will be allowed in two subcategories: Lease (Indian), where the Lessor is an Indian entity that owns the asset, and Lease (International) (Global).

Analysis DAP 2020

4.11 The Defence Procurement Procedure 2020 has 12 chapters and 657 pages, which is 5 chapters and 168 pages longer than the Defence Procurement Procedure 2016. (DPP 2016). Although the size of the paper is intimidating, there is a profound architectural consistency between the two.

4.12 DAP 2020 is based on a system of capital procurement classifications aimed at encouraging indigenous design and development (D&D), a multi-stage procurement cycle, bespoke processes for particular forms of procurement, standardisation of tender and contract documents, and offsets.

4.13 Under this broad context, some conceptual, structural, and procedural improvements have been made "to ensure timely procurement of military equipment, programs, and

platforms as needed by the Armed Forces in terms of performance, capacities, and quality requirements, thus maximizing the use of budgetary resources.”

4.14 Starting with only two procurement categories in the DPP 2002 – outright purchase and domestic licensed manufacturing – the DAP 2020 has added three or four more, including ‘buy (global – produce in India)’, which has features that overlap with at least two other categories – ‘buy and create (Indian)’ and ‘buy and make’ – both of which may potentially be merged into one.

4.15 First, as part of what is known as "forced indigenization," the Ministry of Defence has issued guidelines and a list prohibiting the import of some products. From December 2020 to December 2024, a 100-item embargo will be in place, with the import of another item – the Long-range Land Attack Cruise Missile – being prohibited in December 2025.

4.16 International investors may be less eager to invest in India now that all foreign investment will be subject to pre-approval scrutiny and post-approval review at the government's discretion, based on nebulous grounds of national security.

4.17 DAP 2020 aims to be everything to everyone, but it adds more complexities to the legislation by adding additional chapters on the procurement of information and communication technology systems, post-contract management, and leasing, which the MoD has used in the past.

4.18 DAP 2020, like previous DPPs, is a set of procedures to make acquisition easier, but it won't be possible until all of the acquisition programs have enough funding.

4.19 DAP 2020 emphasises the use of artificial intelligence, indigenously developed military materials, special alloys, indigenous software, aero-engines, and silicon wafers. This seems relevant for SQR formulation, but the associated instructions are tenuous and not well integrated with the procurement procedure.

4.20 The planning framework, which acts as the base for capital purchases, has been strengthened. However, in the absence of an overarching bespoke organization dedicated to defence planning, a national security policy paper, or even composite plans covering not only the armed forces but all other MoD instrumentalities such as the Coast Guard and Border Roads Organizations, as well as a lack of financial pragmatism, the problems that have plagued defence acquisitions in the past could persist.

4.21 Discontinuation of transfer of equipment and services (except MRO) as an eligible avenue/area for discharging the offset obligation, recasting of the list of eligible goods to concentrate more on finished equipment and platforms rather than parts, revision of the list of transferable technologies that qualify for offsets, and rejigging of the offset policy are among the adjustments made.

4.22 The SHQs are responsible for contract management, while the Acquisition Wing of the MoD is responsible for post-contract control, according to the DAP-2020. Pre-dispatch and joint-receipt checks, vendor name changes, bank assurances, fees, delivery schedules, liquidated damages, contract amendment, IC verification, buy-back, lawsuits, arbitration, contract termination, and so on are all part of this. These are essential roles, but without step-by-step guidance for contract managers, the new chapter will be ineffective. It would have been more helpful to build checklists, recognize the issues they are likely to face at different points, and advise them on how to manage certain situations.

Negative Import List and its Significance

4.23 The negative list, which includes 101 objects, is extensive. It involves a variety of complex arms and platforms, such as assault rifles, artillery guns, missile corvettes, attack helicopters, fighter and trainer aircraft, and small transport planes, in addition to simple projects like water jet fast attack craft and offshore patrol vessel. 69 weapons and systems are barred from being manufactured beginning in December 2020, 11 in December 2021, four in December 2020, eight in each of 2023 and 2024, and one (long-range land attack cruise missile) in December 2025. The erratic timelines seem to be motivated by the current state of progress of various projects being carried out by the Defence Research and Development Organisation (DRDO), Defence Public Sector Undertakings (DPSUs), Ordnance Factory Board (OFB), and the private sector in general.

4.24 With the negative list in place, the MoD estimates that orders worth Rs four lakh crores (US\$ 53 billion) will be placed on the domestic industry in the next five to seven years. Of the total value, Rs 1,40,000 crore worth of contracts are expected to be placed by the navy, while the army and air force are likely to sign deals worth Rs 1,30,000 crore each. The expected orders are over and above Rs 3.5 lakh crore (US\$ 47 billion) worth of orders already placed by the three armed forces between April 2015 and August 2020.

4.25 The list's significance is threefold. One, the list acknowledges India's ability to develop and manufacture a large variety of complex weapon systems, considering the country's reputation for inefficiency and lack of creativity. Second, the things on the list provide Indian industry with order visibility in terms of the Indian armed forces' potential requirements. If the industry chooses, it can use the details in the negative list to prepare ahead and eventually manufacture in India. Third, and perhaps most importantly, the list was compiled by the newly formed Department of Military Affairs (DMA), which is led by the

Chief of Defence Staff (CDS), rather than the Department of Defence Production (DDP), which is responsible for indigenization and oversees the Indian defence industry.

Defence Production & Export Promotion Policy (DPEPP) 2020

4.26 Self-reliance has been a cornerstone of India's defence growth policy. The latest "ATMA NIRBHAR BHARAT" appeal has improved the momentum for self-sufficiency. Over the years, transparent and streamlined procurement processes, development policies, and "Make in India" initiatives have all aided in increasing demand for Indian goods. The Indian defence industry has expanded to meet a diverse product mix and demand, primarily serving the armed forces. With recent export successes, India is poised to realize its potential as an emerging defence manufacturing base.

4.26.1 Beginning in 2001, the Department of Defence Production (DDP) of the Ministry of Defence has facilitated the establishment of a wide range of production facilities for various defence equipment through Ordnance Factories and Defence Public Sector Undertakings (DPSUs), as well as authorised private sector companies. This has resulted in guns and ammunition, tanks, armoured vehicles, heavy vehicles, fighter aircraft and helicopters, warships, submarines, missiles, weapons, electronic devices, earth moving machinery, special alloys, and special purpose steels.

4.26.2 The Ministry of Defence's research and development arm, the Defence Research and Development Organisation (DRDO), aspires to provide India with cutting-edge defence technologies. Through a strong indigenous technology base, the DRDO has developed and manufactured a large range of cutting-edge weapon

systems, platforms, and facilities to meet the needs of the armed forces. Strategic systems and platforms such as the Agni and Prithvi rockets, the TEJAS light combat aircraft, the Pinaka multi-barrel rocket launcher, the Akash air defence system, a wide range of radars and electronic warfare systems, the Dhanush artillery gun, and the Arjun main battle tank have given India's military might a quantum leap and are generating successful deterrence against our adversaries.

4.26.3 The Indian Armed Forces have made important contributions to the advancement of design and production capabilities in India through their in-house design wings and Directorates of Indigenization.

4.26.4 The size of the Defence Industry, including Aerospace and Naval Shipbuilding Industry, is currently estimated to be about Rs 80,000 Cr (2019-20). While the contribution of Public Sector is estimated to be Rs 63,000 crores, the share of Private Sector has steadily grown to Rs 17,000 crores over the years.

4.26.5 DPSUs such as Hindustan Aeronautics Limited (HAL) in aeronautics, Mazagon Dock Shipbuilders Limited (MDL), Garden Reach Shipbuilders & Engineers Limited (GRSE), Goa Shipyard Limited (GSL) and Hindustan Shipyard Limited (HSL) in naval, Bharat Dynamics Limited (BDL), BEML Ltd, Mishra Dhatu Nigam (MIDHANI) in special metals and alloys, and Ordnance Factory Board Via their own R&D as well as partnership with DRDO labs, the DPSUs have come a long way in terms of product and technology growth.

4.26.6 In the private sector, many engineering majors have diversified and joined the Defence sector. More than 460 licenses have so far been issued to private companies for production of defence equipment.

4.26.7 The defence industry is ably supported by a strong base of over 8,000 MSMEs that provide strength and vibrancy to the defence supply chain.

4.27 Goals and Objectives. The policy has the following goals and objectives:

4.27.1 To achieve a turnover of Rs 1,75,000 Crores (US\$ 25Bn) including export of Rs 35,000 Crore (US\$ 5 Bn) in Aerospace and Defence goods and services by 2025.

4.27.2 To develop a dynamic, robust and competitive Defence industry, including Aerospace and Naval Shipbuilding industry to cater to the needs of Armed forces with quality products.

4.27.3 To reduce dependence on imports and take forward "Make in India" initiatives through domestic design and development.

4.27.4 To promote export of defence products and become part of the global defence value chains.

4.27.5 To create an environment that encourages R&D, rewards innovation, creates Indian IP ownership and promotes a robust and self-reliant defence industry.

4.28 Focus Areas. The focus areas of the policy being:

4.28.1 Procurement Reforms

4.28.2 Indigenization & Support to MSMEs/Start-ups

4.28.3 Optimize Resource Allocation

4.28.4 Investment Promotion, FDI & Ease of Doing Business

4.28.5 Innovation and R&D

4.28.6 DPSUs and OFB

4.28.7 Quality Assurance & Testing Infrastructure

4.28.8 Export Promotion.

4.29 Indigenization and Funding to MSMEs/ Start-ups. The department's indigenization policy aims to establish an industry ecosystem that will indigenize imported components (including alloys and special materials) and sub-assemblies for defence equipment and platforms produced in India. By 2025, 5,000 of these products are projected to be indigenized. The following methods are proposed to achieve this goal:

4.29.1 An indigenization platform with an industry interface will be built for DPSUs/OFBs/Services to provide development support to MSMEs/Start-ups/Industry for import substitution.

4.29.2 To make it simpler for the industry to provide indigenous solutions, the Make-II mechanism will be improved and monitored.

4.29.3 Inter-governmental mechanisms for indigenizing spares and parts for legacy platforms and facilities will be advanced.

4.29.4 Public Procurement Order will be used to give procurement priority to products in the Defence sector that have domestic manufacturing capabilities.

4.29.5 Existing rules allowing start-ups and small businesses to engage in the procurement process will be checked and expanded.

4.29.6 The Department of Defence Production's Defence Investor Cell will assist MSMEs, investors, and suppliers in the defence industry in addressing problems with the federal, state, and local governments.

4.29.7 OFB/DPSUs will be in charge of vendor growth, and the use of the TReDS platform will be required to improve their liquidity and timely payments.

4.29.8 In the case of essential goods and materials that are currently imported, DPSUs/OFB will consider issuing long-term orders as soon as possible to incentivize domestic industry while also allowing for repeat orders. In such situations, the single vendor that emerges should be suitable after proper price discovery and negotiation.

4.29.9 Programs will provide assistance to the sector through regular communications, knowledge exchange, and visits to repair establishments/field depots in order to achieve a greater understanding of the requirements.

4.30 Optimize Resource Allocation. The Department of Defence Production has laid out a target to achieve a turnover of Rs.1,75,000 crores (USD 25 Bn) in Aerospace and Defence Goods & Services by 2025. The share of domestic procurement in overall Defence procurement is about 60 per cent. In order to enhance procurement from domestic industry, it is incumbent that procurement is doubled from the current Rs 70,000 crore to Rs 1,40,000 crore by 2025. In order to achieve this objective, following strategies have been proposed:

4.30.1 To carve out a distinct budget head for domestic capital procurement.

4.30.2 To strive for enhancing allocation for domestic capital procurement at the rate of minimum 15 per cent per annum for the next five years.

4.30.3 Various studies have over the years brought out the need to enhance cost effectiveness and improve efficiency in the use of MoD's resources. Efforts would be made to scrutinize, evaluate and optimize various items of expenditure in the Defence budget.

4.30.4 OFB/DPSUs will be mandated to increase productivity, enhance quality, reduce costs and ensure timely execution of orders by optimizing inventory management, greater vendor outsourcing at all levels, improving skill levels and overall project management.

4.31 Innovation and R&D. Defence Research & Innovation lies at the heart of development of cutting-edge technologies and systems. By harnessing the nationwide R&D capabilities, future requirements of the services could be met and critical gaps in related technologies would get addressed. The following strategies are proposed:

4.31.1 DRDO in consultation with the Services and in collaboration with other scientific and industrial establishments would set up missions in select areas to develop futuristic and critical systems/platforms/materials. An indicative list is as below.

4.31.1.1 Gas Turbine Engines.

4.31.1.2 Hypersonic Missiles.

4.31.1.3 Ballistic & Cruise Missiles.

4.31.1.4 Armoured Vehicles.

4.31.1.5 Submarines.

4.31.1.6 Fifth Generation Fighters.

4.31.1.7 Transport Aircrafts to meet military requirements.

4.31.1.8 Secure communication devices, secure microprocessors and secure routers.

4.31.1.9 Cyber Security Infrastructure.

4.31.1.10 Surveillance Systems.

4.31.1.11 Artificial Intelligence & Robotics including unmanned platforms.

4.31.1.12 Airborne Sensors.

4.31.1.13 Strategic Materials.

4.31.2 The conversion of prototypes into commercially useful products go through a cycle across Technology Readiness Levels (TRLs). A comprehensive reform of the productionisation process would be undertaken to cut down the 'lab to lines' time by roping in production partners at early TRL levels by bringing concurrent engineering practices between research and production agencies. 14 9.3 Systems Engineering approach to derive system specifications for project development would be mandated for capturing the concept, feasibility, requirements, design etc. and detailed in-depth review at each stage would be done through a stage-gate process. 9.4 Competitively funded prototyping would be pursued during the design process to address the multiple challenges of technical feasibility, affordability, producibility and supportability.

DRDO: Policy for ToT

4.32 **Introduction.** The Defence Research and Development Organization (DRDO) is responsible for designing defence technology, programs, and goods for the Indian Armed Forces. The Defence Research and Development Organization (DRDO) develops defence technology through a network of laboratories. Via Development Contracts, Research Boards, the Technology Development Fund (TDF) scheme, Extramural Research, and Grant-in-Aid schemes, these laboratories collaborate with academia and industry on research and development and production. From its R&D and Design and Development activities, the DRDO has created Intellectual Property (IP), Trade Secrets, Patents, and Copyrights. Indian industries receive mature technologies that are ready for development. The related 'know-how' is provided by the DRDO in the form of Technology Transfer Documents (TTD) and handholding support. It also allows industries to add value to the base technology in consultation with the DRDO in order to increase efficiency or economic viability. This is in stark contrast to obtaining technology from international OEMs, where such value addition is often forbidden. As a result, the DRDO makes a major contribution to the Indian Defence Industry's capability enhancement through technology transfer. Some of the DRDO's security systems are also useful in the civilian market. Such technologies are licensed to companies with dual licensing rights for the defence sector/Departments of the Government of India as well as the commercial market. As a result, the Transition of Technology (ToT) of DRDO-developed technologies to Indian industries contributes to technical self-sufficiency, industrial growth, and national development in India.

4.33 **Objective.** The objective of Transfer of Technology (ToT) policy is to disseminate DRDO developed technologies through a framework that ensures seamless transfer of

technology to industries to boost the growth and capabilities of defence manufacturing sector for achieving complete self-reliance.

4.34 Categorisation of Technologies for ToT. DRDO developed technologies are categorised as Category 'A' and Category 'B', as elaborated below: -

4.34.1 Category 'A'. These are the technologies for which Indian Armed Forces/ MHA/ other Govt. agencies (both central & state) are the only end users. Category 'A' technologies are military technologies and are referred to as "MILTECH". Export of Cat 'A' technologies is subjected to approval process of DRDO and MoD, Govt of India. ToT to the industry is done directly by DRDO for all Category 'A' technologies.

4.34.2 Category 'B'. Category 'B' technologies are the Dual use technologies (including spin-off technologies) that are not security sensitive and have commercial potential beyond Defence applications. The ToT of Cat 'B' technologies is given for manufacture and sale in appropriate commercial markets within India and/ or abroad. Therefore, in such cases considerable market-analysis/ research would be carried out for valuation of Technologies on 'what market can bear' concept and captured in Market Research Reports. Bidding process is adopted for ToT of Cat 'B' technologies and bids from the industries become one of the inputs for deciding the ToT Fee. This market analysis, business potential study and bidding are carried out through an expert External Agency(s) which has signed MoU with DRDO. Thus, ToT to the industry is done with the assistance of External Agency for Category 'B' technologies.

Uttar Pradesh Defence and Aerospace Units and Employment Promotion Policy

4.35 Introduction. India's focus on indigenous manufacturing in the defence space is paying off as the Ministry of Defence over the last 2 years unveiled several products manufactured in India. Defence licensing mechanism has been liberalised and made more transparent in India. Therefore, number of industrial licenses granted in the defence sector in recent years has been rising. Between 2014 and 2016, total 119 licenses have been issued, as against 214 licenses issued in 13 years between 2001 and 2014.

4.36 Objectives of the Policy. The policy aims to: -

4.36.1 Make Uttar Pradesh one of the most preferred destinations for Defence & Aerospace manufacturing.

4.36.2 Promote private industrial parks catering to Defence & Aerospace manufacturing sectors.

4.36.3 Bridge the market gaps and connecting the ancillary units in the state to meet the requirements of Defence PSUs.

4.36.4 Promote development of Defence & Aerospace manufacturing clusters along the Defence Corridor.

4.36.5 Develop an export-oriented manufacturing base for defence sector.

4.36.6 Attract Anchor Defence & Aerospace manufacturing projects & Defence Public sector Units (DPSUs)/ OFBs in the State.

4.36.7 Promote ancillarisation and mobilise the MSMEs in the D&A sector.

4.36.8 Promote Research and Development in D&A sector and ensure continuous technology up gradation.

4.36.9 To set up at least two world class testing and R&D facilities along the Defence Corridor in next five years.

4.36.10 Encourage skill development in Defence & Aerospace domain.

4.37 Private Defence & Aerospace Park. Government of Uttar Pradesh will promote Defence & Aerospace Parks in the state, especially in areas with strong ecosystem support. These parks will provide ‘plug-and play’ industrial infrastructure allowing companies to focus on their core business. These parks will have:

4.37.1 Manufacturing area (components, sub-components, sub-assemblies, aerospace parts) and SEZ.

4.37.2 Testing centre.

4.37.3 Hardware/Embedded Technology Centre.

4.37.4 Technology innovation centre.

4.37.5 Housing & Common facility centre.

4.38 Promoting Innovations & R&D: Government of Uttar Pradesh will mobilise the Start-up Fund created under UP Start up Policy 2017 to boost innovations in D&A manufacturing. The State will also partner with lead R&D and innovation centres like IIT-Kanpur, BHU-IIT, etc. in this context. Government of UP will align its R&D and innovation endeavours with Government of India’s iDEX and other such initiatives.

4.39 Ease of Doing Business. Taking forward the vision and mission of State's Industrial Investment and Employment Promotion (IIEP) Policy, 2017, this policy also ensures ease of business in the state.

4.39.1 Single Window. All required approvals and clearances to D&A manufacturing units shall be provided under one roof through single window system of the state directly monitored by the Chief Minister's office.

4.39.2 Lump Sum Payment of incentives. All incentive payments in the form of reimbursement, subsidies, etc. under the policy will be made with a single sanction order and from a single head of account by the nodal agency.

4.39.3 Simplifying procedures. This policy aims to rationalise existing regulatory regime and simplified procedures by supporting self-certification, deemed approval and third party certification.

4.39.4 Labour Permits. Govt of UP will permit D&A industry towards flexible employment conditions, working hours and employment of women in 3- shifts, and hiring of contractual workers, subject to the requisites of respective laws.

4.39.5 Quality Power. Govt of Uttar Pradesh is committed to supply 24X7 reliable, quality power to D&A industry as per provisions in Industrial Investment & Employment Promotion Policy 2017.

4.39.6 Industrial Security. Govt of Uttar Pradesh will provide safe and secure industrial environment in the state. Towards this dedicated police force headed by specialised officer will be deputed at industrial clusters/ areas in regions and integrated police cum fire station will also be established.

Uttar Pradesh Electronics Manufacturing Policy 2020

4.40 Introduction. Uttar Pradesh, the land with ancient history is rich in resources and cultural heritage. It is one of the largest states in India with GDP of more than US\$ 200 billion & has the largest consumer base in the country with around 240 million people. With rapid industrialization & Government spending in Projects like Metro Rail, Expressways and Freight Corridors connecting the West coast to the East coast of India crossing from the state, IT Cities & Parks, Electronic Manufacturing Clusters, Industrial Zones, State wide Optical Fibre Connectivity, Asia's largest under construction International Airport Jewar and India's first proposed Electronics city at Yamuna Expressway in Gautam Budh Nagar, the state has taken up a trajectory towards accelerated growth & developed society

4.41 Vision. To establish Uttar Pradesh as the preferred destination for electronics industry by offering globally competitive infrastructure and favourable policy environment for cultivating Electronics Manufacturing Industry as an important growth driver for Uttar Pradesh through effective use of skilled force, adapting innovation and emerging technologies leading to all-round sustainable ecosystem thereby contributing towards the overall growth of economy of the state & nation.

4.42 Mission. The policy aims to: -

4.42.1 To establish Uttar Pradesh as the preferred destination for electronics industry.

4.42.2 To build a world class ESDM ecosystem in the state.

4.42.3 To nurture MSME enterprises as the growth engine of the economy.

4.42.4 To foster a culture of research, innovation and entrepreneurship.

4.42.5 To create sector-specific high-quality talent pool for the benefit of the industry.

4.43. Target. The policy aims to: -

4.43.1 To attract investment worth INR 40,000 Cr.

4.43.2 To establish three Electronics Manufacturing Clusters (EMC) in the state.

4.43.3 To establish three Center of Excellence (CoE) in the state.

4.43.4 To establish ESDM parks for Domestic/Foreign investors in the state.

4.43.5 To attract investment in semiconductor manufacturing through FAB units.

4.43.6 To provide approx. 4 Lakh (0.4 million) employment opportunities within the state.

4.44 Electronics Manufacturing Cluster (EMC). EMC is a geographical area of certain minimum extent, preferably contiguous, where the focus is on development of basic infrastructure, amenities and other common facilities for the ESDM units. Policy aims to establish three EMCs focusing on mobile manufacturing, consumer durables, Telecom, IT hardware, medical equipment, defence etc. in various parts of the state such as:

4.44.1 Electronic City in Yamuna Expressway Industrial Development Authority (YEIDA) near Jewar airport, Gautam Budh Nagar.

4.44.2 Defence electronics manufacturing cluster in Bundelkhand.

4.44.3 Medical electronics manufacturing cluster in Lucknow-Unnao-Kanpur Zone.

CHAPTER 5

ROLE OF PUBLIC AND PRIVATE SECTOR IN DEFENCE MANUFACTURING

Introduction.

5.1 The East India Company founded the Gun Carriage Agency in Kolkata in 1801 as the first defence manufacturer in India. After two centuries, the defence industrial base has developed into a vast network of DPSUs, OFs, and DRDO labs dedicated to developing and manufacturing military technologies, cultivating an atmosphere conducive to the development of a pool of talented and highly qualified professionals in science and technology. As illustrated in the first industrial policy of the Industry Policy Resolution of 1948, strategic defence development in India has been entrusted to the public sector since independence. The DRDO was established in 1958 to develop strategic, complex, and security-sensitive systems for the armed forces, and some DPSUs were established in the early 1950s to facilitate in-house manufacturing. Despite the policy goal of developing dedicated infrastructure and facilities for defence, India still imports more than 70% of its defence requirements. Due to its reliance on the British and low economic growth rates, India had limited security and infrastructure capabilities after independence. Attempts were made to increase defence production self-sufficiency through licensed defence equipment manufacturing and the establishment of DPSUs such as Bharat Electronics Limited (BEL), Hindustan Aeronautics Limited (HAL), and government-owned shipyards.

5.2 The government became aware of the grave situation after a setback in the Sino-Indian War of 1962, triggering a study of the country's national security setup and indigenous capabilities. As a result, the Ministry of Defence (MoD) formed the Department of Defence

Production and the Department of Defence Research and Development in the early 1960s. As part of the Indo-Soviet Treaty of Peace, Friendship, and Cooperation signed in 1971, increased procurement of military equipment from the former Soviet Union. The breakup of the Soviet Union in 1991 resulted in yet another change in India's defence procurement policy. India moved west in order to pursue business and collaboration opportunities in the defence sector. The 1990s saw economic reforms in the form of Liberalisation, Privatisation, and Globalisation (LPG) policies aimed at attracting foreign investment and fostering the growth of India's domestic industry, with an emphasis on manufacturing. However, the Kargil conflict in 1999 highlighted the country's defence forces' state of equipment obsolescence in operational use. At all levels of the strategic and decision-making community, the need to modernize the nation's armed forces and develop a powerful and efficient defence industry was felt. In 2001, the Ministry of Defence (MoD) drafted a new defence procurement framework and procedure based on the recommendations of the Group of Ministers (GoM) on reforming the national security system.

5.3 The Defence Procurement Protocol DPP-2002 is a set of guidelines aimed at categorizing military acquisition programs into a number of categories in order to expedite modernization, with indigenous materials taking precedence. The DPP's key aim is to make the best use of the budgetary resources available to ensure that the armed forces' approved requirements are met as rapidly as possible, both in terms of capabilities sought and timeframes set. Following this, the Indian government formed the Kelkar Committee in 2004 to recommend procurement reforms that would enable the private sector to play a larger role in defence production. "Strengthen self-reliance in security preparedness," according to the Kelkar Committee's main recommendation. The committee's recommendations focused on

encouraging domestic companies to invest in defence capability growth, implementing an offsets strategy to bring in cutting-edge foreign technology and investment, developing synergies between the private sector, DPSUs, OFs, and DRDO to absorb high-tech technologies, and creating an environment conducive to a quantum leap in defence exports.

5.4 The government's strategy, according to the Ministry of Defence, is to promote indigenization, especially in the field of defence, in order to achieve self-reliance. The government has recently taken a number of new policy measures aimed at encouraging indigenization in defence production and strengthening self-reliance in the defence sector. It is also the Government's constant effort to achieve full synergy between the public and private sectors in order to develop a strategic defence technology advantage and improve the country's defence industrial base. The government's economic liberalization in 1991 resulted in a high degree of deregulation, allowing private enterprise to develop more quickly. As a result, the private sector has experienced tremendous growth, with many Indian companies becoming global players. Given the capital-intensive nature of the defence industry sector, as well as the need to infuse foreign technology and additional capital, including Foreign Direct Investment (FDI), the government decided in May 2001 to open the defence industry to Indian private sector participation up to 100%, with FDI permitted up to 26% - both subject to licensing. All defence-related products were moved from the Reserved Category to the Licensed Category because of this policy change. As a result, after receiving an Industrial Licence under the Industries (Development & Regulation) Act, 1951, the private sector can now produce all forms of defence equipment.

Existing Defence Industrial Base in India

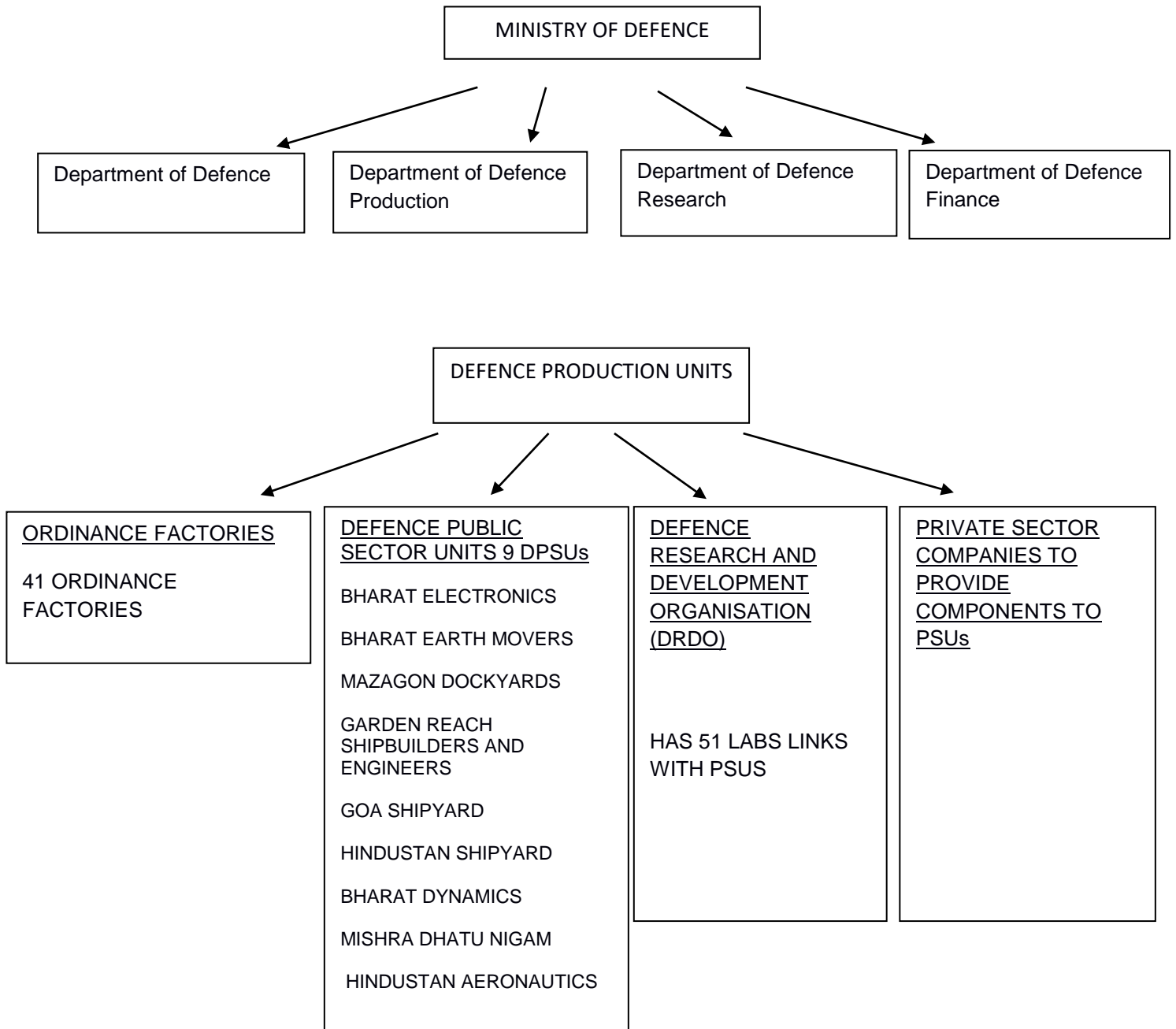


Figure 5.1: Defence Industrial Base in India

5.5 India has one of the largest defence industrial complexes in the developing world. At present, it consists of 41 Ordnance Factories (OFs), nine Defence Public Sector Undertakings

(DPSUs), and an emerging private sector. In addition, there are 50-odd defence research and development (R&D) laboratories under the umbrella Defence Research and Development Organisation (DRDO) which is responsible for designing and developing armaments for the armed forces. The Indian industry as a whole produces a wide range of items, ranging from small arms and ammunition to fighter aircraft, frigates, submarines, tanks, radars, and other defence-related items. However, most of India's arms production is undertaken by state-owned enterprises (DPSUs and OFs) which are not only established players in the armament sector but had exclusive rights for defence manufacturing till 2001 when the industry was opened to the private sector. With 1,80,044 employees (81,130 in DPSUs and 98,914 in OFs).

Ordnance Factories

5.6 The Ordnance Factories Organisation is India's biggest and oldest government-run defence manufacturing enterprise. The organization's origin can be traced back to British rule in India, when the Gun Carriage Agency (now known as the Gun & Shell Factory) opened its doors in Cossipore, Kolkata, in 1801. The number of factories has increased over time, with the bulk of expansion occurring after 1962. In contrast to the five factories that were built between 1949 and 1962, the war with China and the subsequent need for self-reliance in defence production resulted in the establishment of 16 new factories. Two more factories are being built in addition to the 39 factories that are already operational in 24 different locations across India. The 40th factory will be built in Nalanda, Bihar, to manufacture Bimodular charges, and the 41st will be built in Korwa, Uttar Pradesh, to produce new generation

carbines. Based on the key products/technologies used the current OFs are divided into the following five operating divisions (Appx 'A'): -

5.6.1 Factories of Ammunition and Explosives (A&E).

5.6.2 Weapons, Vehicles, and Equipment (WV&E)—10 Factories
5.6.2 Weapons, Vehicles, and Equipment (WV&E)—10 Factories

5.6.3 Materials and Components (M&C)—9 Factories
5.6.3 Materials and Components (M&C)—9 Factories

5.6.4 Factories for Armoured Vehicles (AV).

5.6.5 Factories of the Ordnance Equipment Group (OEF)—5 Factories

Product Range of OFs

1.	Weapon Items	Small Arms (Rifles, Pistols, Carbines, Machine Guns), Tank Guns, Anti-Tank Guns, Field Howitzers, Artillery Guns, Mortars, Air Defence Guns, and Rocket Launchers
2.	Ammunition Items	Ammunitions for all the above weapon systems, Rockets, Missile Warheads, Mortar Bombs, Pyrotechnique (Smoke, illuminating, Signal), Grenades and Bombs for Air Force, Naval Ammunition, Propellant and Fuses
3.	Armoured and Transport Vehicles	MBT Arjun, Tank T-72 'Ajeya', Tank T-90 Bhishma', Infantry Combat Vehicles, Armoured Ambulance, Bullet Proof and Mine Proof Vehicles, Special

		Transport Vehicles and Variants
4.	Troop comfort Items	Parachutes for the Army and Air Force, High Altitude and Combat Clothing, Tents of Various Types, Uniforms and Clothing Items, Floats for Light Assault Bridges
5.	Opto electronics	Optical Instruments and Opto-Electronic Devices, Fire Control Instruments for Armoured Vehicles, Infantry and Artillery Systems
6.	Others	Special Aluminium alloys for the aviation and space industry, Field Cables, Water Bowser, etc

Management of Ordnance Factories

5.7 The management of OFs can be classified into three groups. The Department of Defence Production (DDP) of the Ministry of Defence (MoD), which is the organization's administrative head, is at the top. The DDP, as a governing authority, makes significant decisions about vendor growth, product improvement/development, and commercial interests of the OFs. The Ordnance Factory Board (OFB), which was formed in 1979 in response to the recommendations of the MoD's Rajadhyaksha Committee, is at the middle level. OFB is led by a director general who is also the chairman of the board, as per the 1979 reorganization. He is backed up by nine other members with the rank of additional director general. Five members are in charge of each operating section, which consists of a group of

factories. The OFB is in charge of executive functions, such as establishing policies and procedures for factory operations, tracking buyer orders, and setting annual production targets. It is also in charge of the organization's total spending. Factory operations are handled at the lowest level by a general manager or senior general manager, who is responsible for the day-to-day operations of the factory under his supervision.

5.8 The above management system, on the other hand, has prevented the centuries-old organization from graduating into an autonomous entity and growing on its own. Since the MoD is in charge of major policy decisions, which are often postponed and often politically motivated, the OFB's autonomy in operating the company is reduced to simply following the MoD's orders. The Defence Public Sector Undertakings (DPSUs) are more autonomous than ordnance factories, with powers to establish joint ventures and strategic partnerships, invest in modernisation projects, conduct research and development (R&D), and collaborate with international partners for technical know-how. These powers allow DPSUs to seek out opportunities, tap into potential markets, and develop independently. Since these powers are vested in the MoD in the case of OFB, the organization is compelled to have its own independent perspective.

Range and Depth of Ordnance Factories' Production

5.9 Since the founding of the first plant, the OF organization has grown into a vast industrial empire of nearly 1,000 main items, including tanks, infantry fighting vehicles (ICVs), artillery cannons, and rocket launchers, among others. These items are made in five product/technology-based operating divisions that are dispersed around the factories. Despite

having a diverse range of products, the OFs are insufficient to meet the needs of the armed forces, forcing the government to rely on direct import from other countries. In addition to direct imports, some of the goods are authorised for production or assembly from semi-knocked down units (SKDs) and completely knocked down units (CKDs) with technical assistance from the importing countries. Russian technology is used in the manufacture of OFs tanks (T-72 and T-90 origins) and the IFV Sarath, for example. Any of the OFs' ammunition is also thought to be contingent on Russian technical assistance. Aside from Russia, OFs have/had technical cooperation with other nations, such as the United Kingdom for the production of the Vijayanta tank and Poland for the development of ARVs. It's worth noting that OF production through the license or SKD/CKD routes is intended to enable factories to not only use existing capability and meet the operational needs of the armed forces, but also to boost India's defence production self-reliance by absorbing the technical know-how/why and production process. However, the company has not been very successful in this area after years of producing the same object. For example, nearly 25 years after T-72 tank development began, the ordnance factory still relies on Russia for some critical components.

5.10 The lack of a sophisticated defence R&D base in India, and specifically within the organization, is to blame for the difference in the range and depth of OF production. 10 Historically, factories were not supposed to do much research and development. They depend on foreign partners or the Defence Research and Development Organisation for core technology, product design, and prototype construction (DRDO). The organization has effectively disassociated itself from the dynamics of R&D work as a result of poor infrastructure and low R&D spending (a fraction of overall expenditure), resulting in problems assimilating developments and turning them into production. According to a

member of the review committee that submitted its report on Redefining DRDO in 2008, those production agencies with well-developed in-house R&D and are associated right from the early stages of R&D have better production results than those with low in-house R&D and are focused on detailed engineering drawings and documentations. He also states that, despite being designated as designated production centres, ordnance factories lack an operational structure for interacting with the DRDO during the development process. This has resulted in not only delays in the production of products following the successful implementation of prototypes, but it has also made them dependent on DRDO for enhancements and product improvement—activities that they should be able to execute on their own, based on their own production experience and user input. The factories' low R&D base has also hindered their ability to establish well-crafted Transfer of Technology (ToT) documents for contracting with international suppliers, according to a former MoD minister.

Pricing of OFB Products

5.11 The OFs work on a “no-profit, no-loss” basis. To put it another way, the goods are sold to the armed forces at a rate based purely on the real cost of production, which includes inventory and labour costs as well as operating costs. ¹⁴ However, many people assume that the cost-plus pricing approach is inefficient. The armed forces have been outspoken in their criticism of OFB goods, arguing that they are overpriced, impacting their budget and modernization plans. To keep costs under control, the MoD's finance division has devised a method to assess and fix the price of major products supplied to the defence forces over the last few years. The method is focused on real production costs from the previous two years,

cost forecasts for the pricing year, and estimated costs for the following year. The framework also allows contact between the OFB, customers, and the MoD's finance division, allowing them to arrive at appropriate product price figures after factoring in cost elements and analyzing cost escalation reasons. The system's benefit is that it puts pressure on the OFB to aim for efficiency once the rates are set in stone. If the final issue price differs from the agreed price, the OFB is responsible for covering the difference. The new method, on the other hand, is dependent on detailed costing and timely reporting at the time of price determination. According to a former secretary of Defence Finance, the mechanism, despite all of its benefits, is hampered in its ability to function optimally due to delays in finalizing and publishing cost assessments during price negotiations. The system is rendered useless as a result of this, as well as the lack of benchmarking against material sourcing costs and efficiency gains over time.

5.12 Aside from the aforementioned factors, there are two additional factors that lead to the high price of OFB goods. The first is concerned with labour and material utilization productivity. Officials familiar with factory operations say that the company has a very high input consumption rate as a result of a lack of process development and labour force skill upgradation. The second aspect has to do with the "surge capability" that factories are required to have in order to meet increased production demands during a crisis. Surge power comes at a low cost in terms of overhead expenses. The only way to cut costs on this account is to make better use of labour, plants, machinery, and shops.

Quality of OFB Products

5.13 The OFB, like all other defence companies around the world, is constantly judged on

the quality of its products. The OFB, unlike most other producers, is not solely responsible for the product's quality. The DDP's administrative oversight applies to the Directorate General of Quality Assurance (DGQA), which is in charge of ensuring the quality of factory supplies. 20 DGQA's primary duty in offering quality assurance, however, has not been commensurate with its role as a second-party quality assurer, as many expert committees have pointed out. 21 Instead, the body plays a significant role in the production process, which dilutes the OFB's primary obligation for quality. According to OFB officials, “the factories were slack because they knew DGQA was going to search the stores in any case.” The Ministry of Defence has recently asked the OFB to move toward self-certification, which is a widely accepted global norm, in order to hold them more strictly accountable. Despite the fact that OFB has started self-certifying its products, the goods are currently limited to low-tech items like clothing and general stores. At this time, there is no timeline for covering the entire product range. The MoD should include a comprehensive timeline for self-certification of all items supplied, including those overhauled by them, in coordination with the OFB.

Defence Public Sector Undertakings

5.14 There are nine DPSUs in India. Unlike the OFs, which are run by agencies, the DPSUs are corporate bodies with more financial and organizational flexibility. DPSUs are often bigger, and they work in high-tech fields including aerospace, electronics, and warships.

5.15 Hindustan Aeronautics Limited (HAL) is a company based in India (HAL). HAL is the largest of all the DPSUs, accounting for more than half of all DPSU production and sales. It was established in 1964 by the merger of Hindustan Aircraft Limited and Aeronautics India Limited, and it has grown into a large aeronautics enterprise with five complexes: the Design Complex (for the design and development of fixed wing aircraft); the Bangalore Complex (for the production, repair, and overhaul of fixed wing aircraft/engines of Indian and Western origin); and the Hyderabad Complex (for the production, repair, and overhaul of fixed wing aircraft/engines of Indian and Western origin) (for the production, repair of accessories and avionics). These complexes are further subdivided into 19 production units and 10 research and development centres spread across eight Indian cities. In addition, HAL has founded 11 joint venture (JV) companies in partnership with major Indian and foreign corporations. Despite the JVs' poor results, HAL as a company has an outstanding product track record, having developed 15 types of aircraft and helicopters in-house and 14 types under license. The SU-30MKI, HAWK Advanced Jet Trainer (AJT), Advanced Light Helicopter (ALH), Dornier-228, Pilotless Target Aircraft (PTA), and limited series development of Light Combat Aircraft (LCA) and Intermediate Jet Trainer are among the major manufacturing programs (IJT).

5.16 Bharat Electronics Ltd is a company based in India (BEL). BEL is the premier defence electronics corporation, with nine production units and 31 manufacturing divisions spread across seven states and was established in Bangalore by the Ministry of Defence in 1954. Since its inception as a manufacturer of transceivers for the Indian army's radio communication equipment, the company has grown to produce 350 products, including high-tech items including radars, sonars, communication equipment, electronic warfare equipment,

opto electronics, tank electronics, and components, among others. BEL is one of the public sector companies that has recently been recognized for ground-breaking technologies and innovative goods. The Battlefield Surveillance System, the Artillery Combat Command & Control System, the ATM-based Integrated Ship-borne Data Network, Frequency Hopping Radios, Secured Hand-held VHF/ UHF Radios, and the improved Electronic Voting Machine were among the items that received the SCOPE (Standing Conference of Public Enterprises) award.

5.17 BEML. BEML was established in 1964 and began manufacturing rail coaches and assembling space parts at its Bangalore facility the following year. The business caters to the core needs of the civil industry (mining, steel, cement, and power plants), defence services (trucks, diesel engines, and earth movers), and railways across three product segments: Mining & Construction Equipment, Defence Equipment & Aggregates, and Railway Rolling Stock. BEML's core business focus has shifted to the civilian sector in recent years, especially railways and metro trains.

5.18 Mazagon Dock Limited is a company based in Mazagon, India (MDL). MDL is the MoD's leading defence shipyard, capable of building warships up to 6500 dead weight tons (DWT) and merchant ships up to 27000 DWT. The shipyard has evolved into a frontline warship manufacturer, with a product range that includes destroyers, frigates, corvettes, and submarines, since its incorporation as a defence PSU in 1960. It is India's only shipyard, and one of the few in the world, to have built a submarine. The shipyard's infrastructure consists of three dry docks, four slipways, and three wet basins, and employs 8090 people, including

1060 officers and 6038 industrial workers. With the completion of the ongoing modernisation programme, which involves an expenditure of Rs 1495 crore, its shipbuilding capability is expected to increase in the coming years. Modular construction technology will be infused, a new wet basin will be constructed, and an additional cradle shop for submarine development will be built as part of the modernization programme. Three P15A (Destroyer) Class ships, four P15B class ships, and six Scorpene class submarines are among the major ships currently under construction by MDL.

5.19 Garden Meet Shipbuilders and Engineers (5.19). (GRSE). The Ministry of Defence purchased GRSE in 1960 with the primary goal of building a second line of frigate construction. However, only three frigates (P-16A class) have been built so far, and they were delivered to the navy between 2000 and 2005. Corvettes, fleet tankers, fast attack craft, and patrol ships are among the other ships constructed by GRSE. The government approved the construction of four anti-submarine warfare (ASW) Corvettes (P28 class) at a cost of Rs 3051 crore in 2003, making it the company's most high-profile shipbuilding order. The navy has also awarded the shipyard a Rs 2100 crore contract for the construction of eight Landing Utility Craft (LUC). GRSE is currently undergoing a rigorous modernization program. The shipyard is investing Rs 606 crore in infrastructure upgrades that will enable it to cut shipbuilding build times in half and double its shipbuilding capability.

5.20 Goa Shipyard Ltd. is a company based in Goa, India (GSL). GSL is the smallest shipyard under the Ministry of Defence, and it specializes in medium-sized warships for the navy, coast guard, and other government agencies. The shipyard was a small barge repair

facility built by the Portuguese in 1957. It was leased to MDL, which operated the shipyard until 1967, after Goa was liberated in the early part of the following decade. GSL will build ships with a length of 105 meters, a DWT of 3000 tons, and a draught of 4.5 meters. Quick Patrol Vessels, Survey Vessels, Sail Training Ships, Missile Crafts, and Offshore Patrol Vessels are among the company's offerings. GSL, like other defence shipyards, is undergoing a modernisation program with the aim of doubling its shipbuilding capacity. The modernisation programme, which is being implemented in four stages, is expected to cost Rs 792 crore.

5.21 Bharat Dynamics Ltd is a company based in India (BDL). In 1970, BDL was split from the DRDO and formed as a separate DPSU. It manufactures strategic and offensive missiles, as well as underwater and aerial weapons, either under license or using DRDO technologies. The Milan (France) and Konkurs (Russia) anti-tank guided missiles are among its approved products (ATGM). In the early 1980s, the company rose to prominence with the introduction of India's Integrated Guided Missile Program (IGMP). Under the scheme, BDL was the designated development agency. The Indian armed forces have received Prithvi missiles with ranges of 150 km and 250 km, as well as Agni I and II missiles with ranges of 700 km and more than 2000 km. Aside from the above programs, BDL is also working on the K-15 submarine-launched ballistic missile (SLBM) and the ASTRA beyond visual air-to-air missile for the DRDO.

5.22 Mishra Dhatu Nigam Ltd (MIDHANI). MIDHANI was founded as a PSU in 1973 with the goal of achieving self-sufficiency in special steels, super alloys, and titanium alloys, which are critical components of not only defence but also space and atomic energy programs. MIDHANI is in charge of indigenizing innovations and goods for projects such as

the T-72, MBT Arjun, Kaveri engine (for Light Combat Aircraft), nuclear submarines, and MiG fighters in the defence sector. Defence, space, and atomic sectors accounted for 84% of total supplies in 2010-11.

5.23 Hindustan Shipyard Ltd (HSL). In February 2010, HSL, one of the public sector's oldest and largest shipyards, was moved to the MoD from the Ministry of Shipping. The shipyard has a degree of expertise in warship construction, having completed 163 ships and repaired nearly 1850 ships of different types. It has designed and refitted submarines for the Indian navy, as well as Offshore Patrol Vessels and Inshore Patrol Vessels. As of March 31, 2009, when the shipyard was purchased by the MoD, it was losing Rs 987 crore in financial losses. The Ministry of Defence has proposed a financial restructuring plan for the shipyard worth Rs 1192 crore. 19 In consultation with the navy and the DRDO, the MoD's department of defence development has also prepared a massive plan to modernize the shipyard so that it can construct advanced vessels such as landing platform decks, traditional and strategic submarines. In the commercial sector, it is currently constructing six vessels for Good Earth Maritime Ltd, each weighing 53,000 DWT (its largest ship to date).

Defence Research and Development Organisation (DRDO)

5.24 The Defence Research and Development Organisation (DRDO), which started as an inspection agency in 1958, has grown into a large organization tasked with designing and developing cutting-edge weapon systems for the Indian military. The company employs over 33,000 people in 52 laboratories and institutions around the world, including 7,255 scientists

and 13,370 technicians (Appx 'B'). Aeronautics, armaments, missiles, fighting vehicles, advanced computing and networking, communications, opto-electronics, military engineering systems, life sciences, advanced materials, composites, underwater sensors/weapons, and warships are just a few of the innovations being developed by these laboratories. Out of the 50-plus labs, five are dedicated to missile systems, twelve to computer systems, three to materials science, six to aeronautical systems, four to combat vehicles and engineering, ten to life sciences, and three to naval systems. The Aeronautical Development Agency (ADA) and the Society for Integrated Technology Applications and Research (STITAR) are two of the DRDO's societies (SITAR). SITAR's primary responsibility is to design "digital components and devices needed for various projects such as high-performance computing," while ADA's primary responsibility is to "undertake the design and development of advanced technology aircraft."

Contribution of DRDO

5.25 Despite having a limited budget for defence research and development, the DRDO has been fairly involved in creating several technologies and products for the military. Any of the items has been inducted or is in the process of being inducted. Radars, electronic warfare equipment, sonars, torpedoes, battle vehicles, bridging systems, combat aircraft, sensors, nuclear, biological, and chemical (NBC) technology, parachutes, combat free fall systems, propellants and explosives, detonators, and communication systems are only a few examples. Despite these accomplishments, many of DRDO's flagship projects, including those approved by India's highest security decision-making body, the Cabinet Committee on Security (CCS), have faced delays and cost overruns. Changes in size, ab-initio production of state-of-the-art technology, technical/ logistical difficulties, test facility growth, non-availability of critical

components/equipment/materials, rejection of innovations by technologically advanced countries, prolonged trials, and increases in the cost of materials and manpower are all common causes of delays and cost revisions. Regardless of these factors, there are voices, including from higher political authorities, urging the DRDO to speed up projects and complete them on time.

5.26 The success story of the naval DRDO-based construction of the TEJAS aircraft carrier variant stands out as a shining example; the Navy took control of the project and saw it through to completion. The lead operation main variant of the IAF, on the other hand, has been moving slowly due to a lack of ownership by the IAF of the project and a practice of waiting for the DRDO to deliver the aircraft before assessing it. As a consequence, a study of output quantity has a negative effect on economies of scale. The TEJAS has finally been approved, and HAL has been given permission to begin production for the IAF, including possible exports.

5.27 The indigenously built 5.27 Arjun tank has also proved to be a game changer, having been successfully incorporated into the Indian army. The Integrated Guided Missile Development Program, which spun off from the ISRO's space program, was the DRDO's first reputable design and development – cum production project.

5.28 The reasons for some of the projects not fructifying as perceived by the DRDO are: -

5.28.1 Poor planning

5.28.2 Over optimistic guidelines.

5.28.3 Lack of coordination with armed forces, that has led to cost and time overruns of major projects.

5.28.4 Lack of accountability, being both the supplier and evaluator.

5.28.5 Lack of proper appreciation of own capabilities has stalled many procurement proposals from the armed forces.

5.29 Restructuring of DRDO. The Rama Rao committee in 2008 recommended that DRDO reduce the number of laboratories by placing them under other government agencies and confine itself to eight or ten critical areas. A high level committee under the defence secretary, was appointed to oversee the implementation, including shedding 11 DRDO laboratories and the remaining laboratories clustered into defence technology stream of naval, aero , ground combat , weapon and electronic warfare. The official version is that the recommendations of the Rama Rao committee within the powers of DRDO have been implemented by December 2015, while the others are in process. The official website of the DRDO however, continue to show all the 50 laboratories. To further reform process, DRDO has been delegated with greater financial powers to enhance its efficiency and effectiveness. This is in line with the Indian government effort to set right what the Prime Minister in 2014 observed and asked the DRDO to leave aside it's "chalta hai" attitude.

Private Sector

5.30 In a landmark decision in May 2001, the Indian government opened up the defence manufacturing market to the private sector, which had previously been reserved for state-owned entities such as DPSUs and OFs. The decision was announced in Press Note No. 4 (2001 Series), and specific instructions were given in Press Note No. 2 (2001 Series) (2002 Series). The private sector, for example, was given permission to manufacture any defence

object, with foreign direct investment (FDI) of up to 26% permitted. However, industrial licencing and security clearance were needed for each of these provisions. Following the 2001 ruling, there has been a noticeable shift in the private sector's attitude toward defence manufacturing. This is evident on at least two levels. The first is an expression of interest in producing defence-related objects. By October 2011, the ministry of commerce's department of industrial policy and promotion (DIPP) had released 205 Letters of Intent/Industrial Licenses (LoI/IL) to various private entities, with a projected investment of Rs 11,889 crore and employment opportunities for 39,129 citizens. More specifically, these letters of intent/intent to manufacture include a wide variety of defence goods, including armoured and fighting vehicles, radars, electronic warfare devices, warships, submarines, avionics, military aircraft, protection and ballistic products, and armaments and ammunition, among others.

5.31 It's also worth noting that, since the defence industry was liberalized, the private sector has had some success, not just in the domestic market, but also internationally. The private sector's biggest win came in May 2011, when Pipavav Defence and Offshore Engineering Company (formerly Pipavav Shipyard) won a highly competitive naval order worth Rs 2,975 crore to construct five naval offshore patrol vessels (NOPV) for the Indian navy. Pipavav was up against GSL, a state-owned shipyard that has experience constructing similar vessels and is currently working on a naval order for four NOPVs, the first of which is expected to be delivered in January 2013. ⁸⁶ In early April 2013, a consortium of two private firms – L&T and Ashok Leyland – emerged as the lowest bidder in a Rs 100 crore tender for refurbished rocket launchers installed on specialized trucks for the army, repeating the naval performance. Other players competed in the tender, including a team made up of Tatra, BEML, and BEL, which lost, as well as a team made up of the Tata group of companies,

which also lost (Tata Motors and Tata Power SED). The tender is noteworthy because it could signal the end of a decades-long monopoly on the notorious Tatra trucks, which are licensed manufactured by the state-owned BEML and are the mainstay of the Indian armed forces as all-terrain vehicles and weapons system mobility platforms. Three more tenders for as many as 1594 specialized vehicles, including 6- and 8-wheel drive high mobility trucks, are being bid on by major private truck manufacturers (Tata Motors, Ashok Leyland, and L&T). If they are successful in securing these contracts, India's reliance on external sources for military trucks will come to an end.

5.32 Among all the major domestic orders bagged by the Indian private sector, the contract won by the Tata Powers Strategic Electronic Division (Tata Power SED) in early 2011 for the modernisation of 30 Indian air force airbases, is the most significant on several counts. Valued at Rs 1094 crore, the contract is the second largest defence contract (after Pipavav's NOPV order) to be awarded to any Indian private entity. More importantly, Tata won the contract against not only established domestic players like BEL but also international companies, including the Italian giant Selex Sistemi Integrati (a subsidiary of Finmeccanica) who lost the bid by a narrow margin.

5.33 In 2012, Pipavav received a large export order worth Rs. 1192 crore from an unnamed West African country for the supply of two Offshore Patrol Vessels, marking the Indian private sector's first major success in the international arms market. The export order is expected to increase to Rs. 2504 crore, with the prospect of two more warships being delivered as part of the deal. Samtel Avionics and Defence Systems, a private defence

electronics firm, followed the private shipyards' export success in September 2012 by signing a Rs. 500 crore contract with Curtiss-Wright Controls Defence Solutions in the United Kingdom for the supply of high-definition, durable liquid crystal cockpit displays. 88 The establishment of numerous joint ventures and the signing of memorandums of understanding (MoUs) with a variety of major global defence companies demonstrate the private sector's serious involvement in the defence industry. Furthermore, several corporations have gone so far as to acquire international defence-related businesses. The joint venture (JV) company founded by India's Mahindra Group and the UK's largest defence company, BAE Systems, is a well-known example of such a collaboration. The JV, which started out with a staff of 50-60 people, was created with the aim of producing a variety of military vehicles. In terms of international acquisitions, the Mahindra Group bought a majority stake in two Australian defence firms, Aerostaff Australia and Gippsland Aeronautics, in December 2009, signalling its entrance into the defence and aerospace industry.

5.34 The government is of the firm opinion that the Indian private sector, which has made substantial progress since economic liberalization, can be used to improve the domestic industrial base. It is proposed that the DDP investigate the problem further in consultation with all parties involved in order to optimize the Indian private sector's industrial and technical capabilities. Measures to level the playing field for private enterprise, for example, were to be studied urgently. To encourage private sector investment in the defence industry, the task force recommended that the defence export strategy be rationalized immediately. The expert group was persuaded that a proactive export policy would not only build jobs but would also help the broader defence industrial cause achieve economies of scale. Such exports could be used selectively to enhance India's relations with specific countries.

Role of SMSEs' in Defence production

5.35 The Ministry of Defence set up a Committee of Experts under the chairmanship of Dhirendra Singh in May 2015 to evolve a policy framework for 'Make in India' and to suggest the requisite amendments in DPP 2013. The committee submitted its report in which it mentioned that almost 80 percent of component, aggregates and assemblies of complex weapon systems and aircraft are made by the MSMEs, which are part of the supply chains. The report also mentioned that there are nearly 6,000 MSMEs across the country supplying components and subassemblies to the DPSUs, Ordnance Factories (OFs), DRDO and private industries. The global defence industry, dominated by a few Original Equipment Manufacturers (OEMs), works in close coordination with the SMEs and their prime contractors. The reason why OEMs/prime contractors prefer to work with the SMEs is because of their innovative capabilities in niche manufacturing, greater flexibility, lower overhead costs and ability to learn and absorb new technologies. The OEMs require that the SMEs should perform, maintain continuity of supplies and innovate.

5.36 The MSMEs face certain distinct challenges because of their very nature. They face stiff competition from two sources: the bigger and more established players in the market, and imports. These make it necessary for the MSMEs to innovate and either introduce a product or a service to fill the void created by the bigger players or reduce the costs and streamline the processes to enable them to be on a more level playing field against the bigger players.

5.37 In the defence industry, prospects for start-ups include not only equipment production, but also technical support and integration services in areas such as information

technology, servicing, repair, and overhaul, connectivity, and navigation, among others. SMEs will be part of the global supply chain as they build the capacity to produce defence equipment, even though exports are a small part of the defence industry's earnings. Because of their versatility, diversity, and low-cost inputs, SMEs are critical for the Indian defence market. The 'Make in India' initiative is expected to help SMEs become competitive manufacturing units. Large companies have partnered up with small businesses to ensure the continuous development of cutting-edge technology. In light of this new growth, SMEs must get to know their customers, understand their needs, earn their confidence, and demonstrate a strong commitment to building a long-term business partnership in order to be fully integrated into the supply chain. Such initiatives by SMEs, in combination with the government's policy to improve SMEs' position in the Indian defence industry, including involvement in defence R&D, are crucial if India is to become one of the world's most important defence markets.

5.38 Simplification of licensing has led to a large number of components, parts, sub-systems, testing equipment, production equipment being excluded from the purview of industrial licensing on the Defence Products List, thus, these are available to the SMEs. The government has also increased funding for prototype development from 80 to 90 percent, with 20 percent of the cost to be paid in advance. The SMEs have the first right to develop prototypes for projects worth up to Rs. 10 crore. In other words, designated projects would be offered to big industry players only when the SMEs are not interested in taking them up.

5.39 In August 2015, services [(R&D), Maintenance, Repair and Overhaul (MRO) and technology transfer] were reinstated as eligible avenues to discharge offsets under the defence offset policy, which can help the SMEs in a significant way. In the discharge of offset obligations, a multiplier of 1.50 has been permitted in cases to where the MSMEs are Indian

Offset Partners (IOPs). To aid R&D, the DRDO has set up three centres of excellence: The Centre of Propulsion Technology (CoPT), Indian Institute for Technology (IIT), Mumbai; Jagdish Chandra Bose Centre for Advanced Technology (JCBCAT), Jadavpur University, Kolkata; and Joint Advanced Technology Centre (JATC), IIT, Delhi, in 2016. The SMEs can accrue benefits by associating with these centres. The Government of India, under Skill India initiative, has selected 8 IITs to upgrade their training infrastructure. The OFB/DPSUs are sparing equipment in working condition for the Skill India efforts. Moreover, the OFB/DPSUs have stepped up training under the Apprenticeship Act from 2.5 percent to 10 percent of the strength. All these Skill India initiatives are going to ensure the supply of a trained workforce to the SMEs.

5.40 The public procurement policy seeks a mandatory 20 percent share for the MSMEs in all government and public sector unit purchases over a period of three years. The Ministry of MSMEs has set up an Intellectual Property (IP) cell which provides a range of IP related services such as prior art search, validity search, patent landscape, studies on technology development, etc. The implementation of a proper intellectual rights regime will help the SMEs gain access to newer markets, avoid wasteful investment in R&D and marketing, negotiate licensing, franchising or other IP-based contractual agreements and increase market value to lead to other potential benefits. A design clinic, an initiative by the Ministry of MSMEs, will help the MSMEs develop product, process and business expertise through design intervention at multiple levels of interaction. This model brings design exposure to the doorstep of industry clusters for design awareness, improvement, evaluation, analysis and design-related intervention. While there are a lot of policies, the outcome of the policies would depend on the SMEs availing of the benefit of these policies and the policymakers fine tuning the policies to address the implementation issues.

Measures to Enhance Indigenisation in Defence Production

5.41 Involvement of Industry in the Defence Acquisition Process. Domestic industry must be involved in the acquisition process from the outset if greater self-reliance is to be achieved. Industry should be encouraged to propose a variety of options to address a capability gap during the finalization stage of the long-term defence capability plan (covering a 15-year period). Prior consultation with industry will alert planners to what might be made available domestically and what will need to be purchased from outside sources in the future to thwart a potential danger. A broad-based cost benefit analysis of different choices may also be used to make informed decisions, including those on life cycle costs. If an indigenous approach is found to be feasible and cost-effective, a capability plan can be developed to give domestic industry a chance, resulting in greater self-reliance.

5.42 Involvement of Industry in Formulation of Qualitative Requirements. The industry's involvement during the preparation of Qualitative Requirements (QR) would be a good step to enhance coordination between the industry and the end users. It has been pointed out that QRs which constitute the starting point of India's defence procurement process are often formulated by aggregating the best features of several weapon systems available in the global market. Consequently, the requirements are often projected beyond minimum capability requirements of the armed forces, and even beyond the industrial capability of global players. The domestic industry hardly gets a chance to participate in the process of the acquisition of weapons with such ambitious QRs, even though they have the capability to meet the minimum requirements. As in the capability plan, the industry could be invited to make

suggestions based on domestic industrial capabilities to meet the minimum inescapable requirements of the armed forces. Informed decisions can thus be taken, based on the interaction with domestic industry, in order to give it a chance.

5.43. The Private Sector Should be Encouraged to Become Tier-I Players. The government should also take other measures to support it, including providing government support for taking over foreign defence firms.

5.44 Re-designation of Department of Defence Production. The existing Allocation of Business Rules of the Department of Defence Production (DDP) were not consistent with its responsibilities which have been expanded with the entry of private sector since 2001. The private sector has an important role to play in defence production, its interests should also be protected by the DDP which is often found to favour state-owned enterprises over the private sector.

5.45 Creation of a Defence Technology Commission (DTC) headed by the defence minister.

5.46 Creation of a Board of Research for Advanced Defence Sciences (BRADS), to function on the lines of the highly acclaimed Defence Advanced Research Projects Agency (DARPA) in the USA.

5.47 Preparation of a 15-year long-term plan forming the basis of an acquisition programme by the Armed Forces.

5.48 Sharing of the long-term capital acquisition plans of the armed forces with the domestic industry.

5.49 Identification of entry points for the private sector in the acquisition process.

5.50 Identification of Raksha Udyog Ratnas (RUR). Identification of Indian industries of proven excellence, which are capable of contributing to defence production, depending upon their technical, managerial and financial strength. Such industries will be named as ‘Raksha Udyog Ratnas (RURs)’ and encouraged to contribute in defence production and assume the role of main system integrators of large weapon systems and producers of platforms required by the Defence Forces.

5.51 Policy framework to promote the participation of small and medium enterprises (SMEs) in defence production.

5.52 Setting up a dedicated and professional agency to undertake defence acquisition.

5.53 Defence R&D opportunities both for the DRDO and the industry.

5.54 All the ordnance factories should be corporatised under a single corporation. The corporation should be accorded Nav Ratna status. The OFB’s biggest bane, has been its limited autonomy. Being an attached office of the MoD, major decisions pertaining to finance, human resource, research and development (R&D), technology tie-ups and modernisation of plants and machineries are taken outside the organisation. The highly bureaucratic decision-making process of the external agencies responsible for the OFB’s functioning and wellbeing, and their propensity to adhere to the rules and regulations rather than the outcomes, has made the organisation risk-averse with little incentive to think out of the box.

5.55 DPSUs should explore the possibility of mergers and acquisitions in order to achieve economies of scale and remain globally competitive.

5.56 ISRO is the most successful example of how Indian industry participates in hi-tech area. First, they made available their own in-house technology to Indian industry. Second,

they gave long-term commitments to Indian industry. Third, throughout the whole process, they hold the hands and guide them to what they want. So, there is holding of hands between the buyer and the producer. So, they work as a team. Consequently, we have this now an Indian space industry.

5.57 Strategic Defence Industry Fund (SDIF) should be created on the lines of North-East Development Fund where non-lapsable pool of resources be utilized exclusively for the 'Make' category of products of Indian Industry."

5.58 For the R&D model, we should look at the US model, which is a perfect example of PPP. They explicitly define that we want shoes to be developed for war with Kuwait. Specifications are given by the Air Force that we want an aircraft of so and so capabilities. Then, they go to the people and say to them their project possibilities and project estimates, the duration of time, etc. Then the Defence Procurement Committee goes and listens to them. They talk to them and then decide as to who should manufacture the goods. The whole money is paid by the US Defence to these contractors.

5.59 Presently all technology developed by DRDO goes for productionisation to DPSUs (Pinaka, the only exception). Once the RURs are in place, it is imperative that private sector also becomes recipient of these technologies as Prime Contractor and thus lead the Design to Engineering effort and subsequent life cycle support leading to obsolescence management and upgrades.

5.60 DRDO should concentrate on projects requiring sophisticated technology of strategic, complex and security sensitive nature. Outsourcing of Research and Development work of high technology to private sector should be on the lines of parallel development for which the cost should be shared. A minimum order quantity to sustain the financial viability of

development within the time schedule should be spelt out to encourage private sector participation.

5.61 The end user needs to be a stakeholder in the complete developmental process that involves research design, simulations, prototype evaluation, industrial production and trials, and critical feedback and necessary course corrections throughout the project duration. This stakeholder approach by the Services in developmental projects by DRDO lies at the core of enhancing coordination between the two. Deputing service officers with relevant experience to various DRDO offices and labs as part of the project will enhance this interaction. Additionally, deputing various developers from DRDO to combat units to imbibe and capture the essence of Service requirements will enhance their understanding and lead to a focussed approach on the developmental projects by virtue of immersive and interactive environment made available to them.

CHAPTER 6

STATUS UPDATE UP DEFENCE CORRIDOR AND RECOMMENDATIONS

6.1 After opening up private investment and liberalizing foreign direct investment (FDI) in defence production, the Indian government has announced the setting up of two defence industrial corridors in the country. In the Union Budget 2018-19, the finance minister made the announcement of establishing the two Defence Industrial Corridors. The first Defence Production Corridor is planned to be established in Tamil Nadu and the second one will be set up in Uttar Pradesh . A defence corridor refers to a route or a path along which domestic productions of defence equipment by public sector, private sector and MSMEs are lined up to enhance the operational capability of the defence forces. Corridors can assist in adoption of Lean Manufacturing to reduce the waste at various stages of the supply chain by adoption of Kaizen, TQM and Six Sigma etc. Necessary mechanism to access the Consultants on easy terms can be coordinated. The operational capability of the Industry can be enhanced by complimentary investment from the Government by using the resources from SME exchange.

6.2 The stated aim of setting up the two Defence Industrial Corridors is “To transform India into a global design and manufacturing hub”. The whole exercise is intended to be driven by demand in 25 key sectors of the industry of which, manufacture of military hardware was identified as one of the most important segments. The Defence Industrial Corridors are expected to meet the requirements of the Indian Armed Forces as well as demands of sophisticated military hardware from the global market. With manufacturing for the defence sector expected to be a major commitment, apart from other specialities, the Defence Industrial Corridors will be expected to set up specialised facilities in precision-centred, aero component manufacturing.

6.3 The UP defence industrial corridor was announced on the occasion of the Uttar Pradesh Investors Summit 2018. At the summit, PM Modi has said: “of one of the two defence industrial corridors mentioned in the budget, one is proposed in the Bundelkhand region of the state which will bring an investment of Rs. 20,000 crore and generate employment avenues for 2.5 lakh people.” The government has decided to extend the Uttar Pradesh’s defence corridor to Agra, Allahabad, Lucknow, Kanpur, Jhansi and Chitrakoot. Uttar Pradesh Defence Industrial Corridor (UP DIC) is an aspirational project that intends to reduce foreign dependency of Indian Aerospace & Defence Sector. It took off to an encouraging start with the announcement of investments worth over Rs. 3700 crores in Defence production at the Meet organized at Aligarh on 11Aug2018.



Figure 6.1: UP Defence Corridor Alignment

6.4 The Uttar Pradesh Expressway Industrial Development Authority (UPEIDA), the nodal agency for the defence corridor along with industrial development authorities has set a land acquisition target of more than 25,000 acres of land dedicated for the corridors. Over 3,595 acres of land has been identified for acquisition in Jhansi, Kanpur, Chitrakoot and Aligarh of which 2,824 acres of land acquired till date. Several public and private companies including foreign Original Equipment Manufacturers (OEMs) have come forward for acquiring land to build facilities.

Advantages of Uttar Pradesh as Defence Hub

6.5 Uttar Pradesh is the fourth largest state in the country and the third largest economy within the country.

6.6 Uttar Pradesh is the largest exporter in the country with 18% year on year growth.

6.7 Uttar Pradesh with a population of more than 200 million has the highest number of available workforce.

6.8 Uttar Pradesh is among the top five manufacturing states in the country.

6.9 Uttar Pradesh has a strong ancillary base. The state ranks first in terms of number of MSME in the country and ranks second in EODB. The state has huge number of repairing/ servicing, engineering and spare parts manufacturing industry.

6.10 Uttar Pradesh has 53 Universities, 4345 Colleges and 168 polytechniques which are well poised to meet the requirements of trained manpower required by the defence industry

6.11 Uttar Pradesh is home to prominent PSUs. The state has an extensive network of DPSUs and Ordnance Factories as under: -

6.11.1 Ordnance Factory, Kanpur.

6.11.2 Small Arms Factory, Kanpur.

6.11.3 Field Gun Factory, Kanpur.

6.11.4 Ordnance Equipment Factory, Kanpur.

6.11.5 Ordnance Parachute Factory, Kanpur.

6.11.6 Ordnance Equipment Factory, Tundla.

6.11.7 Ordnance Factory, Korwa.

6.11.8 Ordnance Factory, Muradnagar, Ghaziabad.

6.11.9 Ordnance Clothing Factory, Shahjahanpur.

6.11.10 HAL Transport Aircraft Division, Kanpur.

6.11.11 HAL Accessories Division Lucknow.

6.11.12 HAL Avionics Division Korwa.

6.11.13 Bharat Electronics Ltd, Ghaziabad.

6.11.14 Naini Aerospace Ltd – HAL.

6.12 Uttar Pradesh has a vibrant R&D and Innovation Base. The state has prominent academic institutes like IIT-Kanpur, IIT-BHU etc, Key R&D institutes viz. DRDO, ASERDC-HAL, etc and Prominent Forensics Science Laboratories

6.13 Uttar Pradesh has an excellent road infrastructure which would assist in the the development of the defence corridor and movement of goods. The defence corridor lies along the Golden Quadrilateral connecting Delhi – Kolkata supported by networks of expressways. The prominent expressways being: -

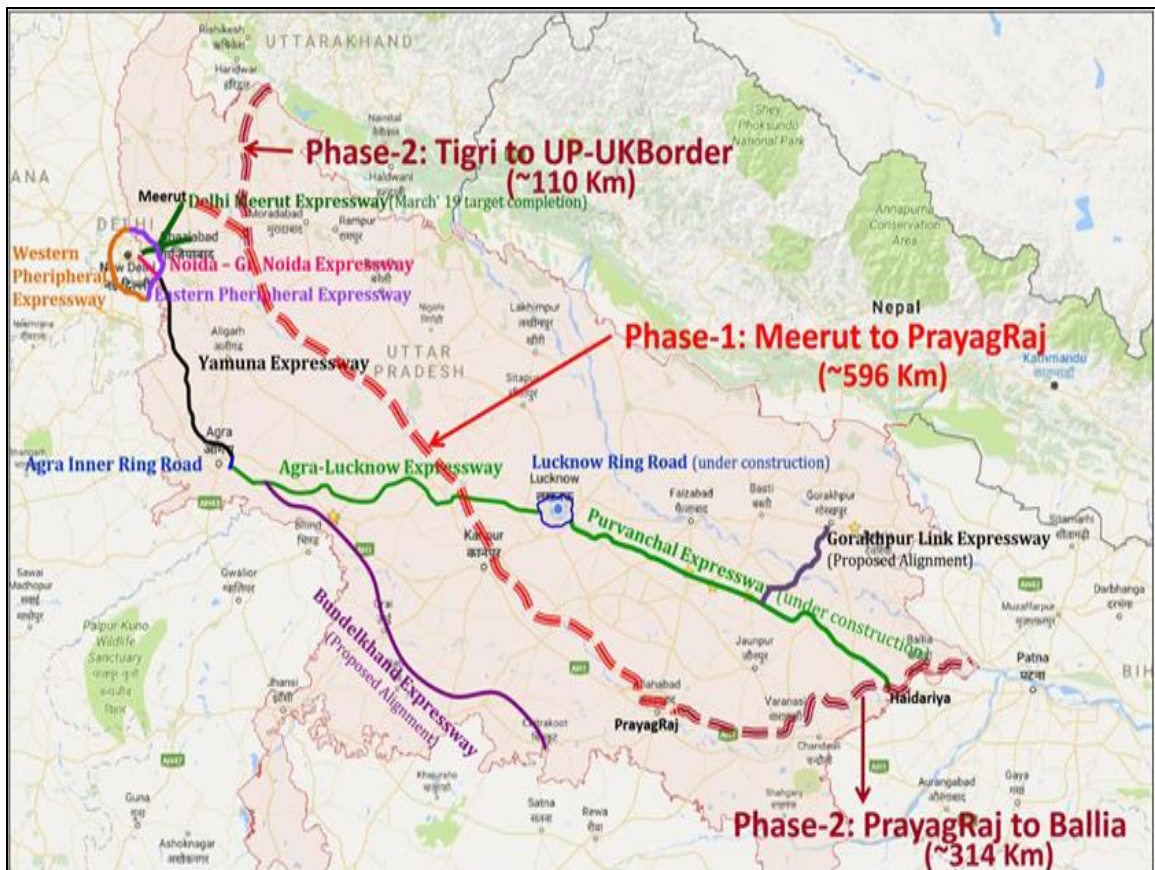


Figure 6.2: Alignment of various Expressways

6.13.1 Yamuna Expressway. Yamuna Expressway Project between Greater Noida and Agra, it is 165 KM long Access Controlled six lane (extendable to eight lanes) concrete pavement expressway. The Expressway cuts in half the travel time from New Delhi to Agra, the city that is home to India's top tourist attraction, the Taj Mahal. The Expressway opens up avenue for industrial and urban development of the region.

6.13.2 Agra – Lucknow Expressway. Agra-Lucknow Expressway is a 302.222 Km long 6 Lane (Expandable to 08 lanes) Access Controlled (Greenfield) Expressway with 08-lane wide structures for future expansion of the expressway to 08 lanes. The expressway starts at Agra inner ring road, passes through Firozabad, Mainpuri, Etawah, Auraiya, Kannauj, Kanpur Nagar, Hardoi, Unnao distt. and ends on SH-40 in Lucknow. It has facilitated a high-speed corridor, connecting state capital Lucknow to Agra in western Uttar Pradesh and further to the National Capital, New Delhi through Yamuna Expressway. The travel time between Agra and Lucknow has reduced considerably to 03 hrs and further to New Delhi via Yamuna Expressway to 5 ½ hrs.

6.13.3 Purvanchal Expressway. Total length of a fully access-controlled 06 lane expressway is 340.824 KM. Project Cost – Rs. 22,494.66 crore. With the Construction of Purvanchal Expressway, accelerated convenient mode of Transportation shall be available between the Eastern boundary of the State and the National Capital via State capital through other similar Expressways in the State viz. 'Agra to Lucknow Expressway' and 'Yamuna Expressway'. The areas covered by this Expressway would be benefited in Social & Economical way. The agriculture, commerce, tourism and other industrial development will also get a fillip.

6.13.4 Bundelkhand Expressway. This expressway will be of 04 lanes (Expandable up to 06 lanes) with 06 lanes wider structures. Width of ROW (Right Of Way) of the project is 110 Meters; a service road of 3.75 M width will be constructed at one side of the expressway in a staggered form so that residents of nearby villages of the project area may get a smooth transportation facility. Total length of the expressway is 296.070 KM. With the construction of the expressway, Bundelkhand area will be

linked with a fast and smooth traffic corridor through the Agra-Lucknow expressway and Yamuna expressway.

6.13.5 Gorakhpur Link Expressway. Total length of fully access controlled 04 lanes expressway is 91.352 KM. Approved project cost is Rs. 5876.67 Crore. In order to convey and carry the cultural and commercial values from Gorakhpur to Azamgarh and vice-versa, government has decided to construct this Link Expressway. The Gorakhpur Link Expressway will provide faster connectivity and better commuter experience as well as help in getting the population of affected areas closer.

6.13.6 Ganga Expressway. This expressway will be 594 KM long with 06 lanes (expandable up to 08 lanes) and all the structures will be constructed of 08 lane width. Width of ROW (Right of Way) of the expressway is proposed as 120M, service road of 3.75 M width will be constructed at one side of the expressway in the staggered form so that residents of nearby villages of the project area may get smooth transportation facility.

Milestones Achieved

6.14 Provision of land bank as per requirement of investors with the basic infrastructure as under:

6.14.1 Roads.

6.14.2 Electricity.

6.14.3 Water.

6.14.4 Security wall.

6.14.5 Integrated police cum fire stations.

6.14.6 Commercial banks.

6.15 Uttar Pradesh Defence and Aerospace Unit and Employment Promotion Policy (First Amendment) 2019 has been published by Government of Uttar Pradesh with the objective of attracting investments in U.P. Defence Industrial Corridor.

6.16 Guideline/Procedure for Allotment of Industrial Plots in Defence Corridor has been published for seamless land allotment procedures.

6.17 Uttar Pradesh Electronics Manufacturing Policy 2020 has been promulgated.

6.18 MoUs have been signed between UPEIDA and various companies to establish manufacturing units at the nodes for U.P. Defence Industrial Corridor (Appx 'C') .

6.19 MoU signed between UPEIDA and Indian Navy on 13 Aug 2020 to facilitate identifying problem areas, finding solutions and manufacturing through Indian Industry.

6.20 Centre of excellence related with defence industrial corridor being established with IIT Kanpur and IIT BHU.

6.21 DRDO has been incorporated as technical partner.

6.22 Hand holding of industry in all aspects.

6.23 Assisting MSME of non defence background to turn to defence manufacturing.

Provision of common facility centre for prototyping, incubation, startups and skilling at Lucknow.

6.24 Creation of defence testing infrastructure at nodes initiated by MoD.

6.25 Creation of land bank at all the six nodes. Land bank of of 3800 Ha (Approx) was to be created of which 1350 Ha has already been acquired by the state government. Details of land bank at Appx .

6.26 Committee has been formed to analyse Human Resource requirements, devise/modify syllabus at all it is and engineering colleges.

Analysis of Work At The Six Nodes

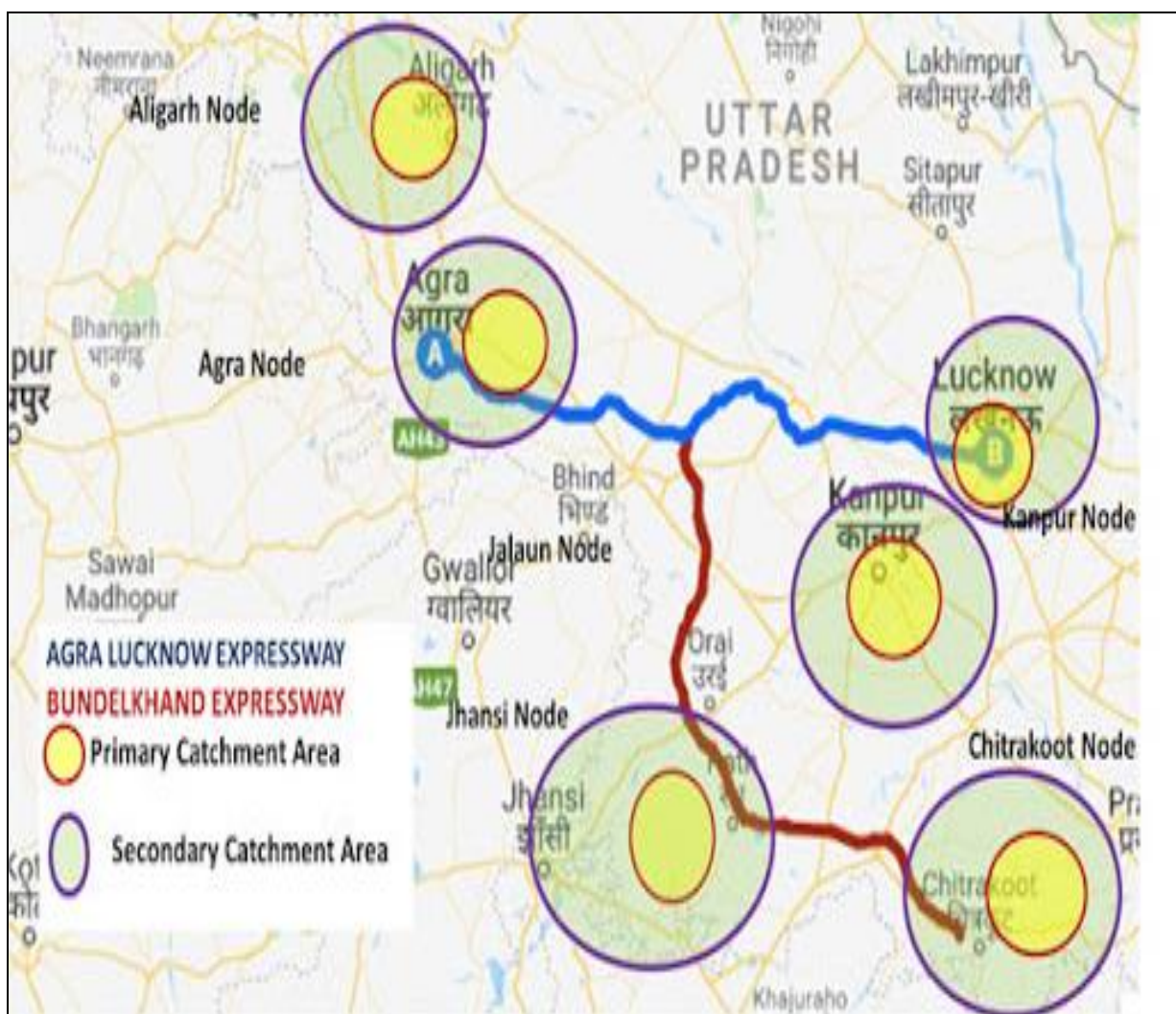


Figure 6.3: Proposed nodes of the UP Defence Corridor

6.27 Aligarh. Aligarh is a District of Uttar Pradesh, India. The city is located about 90 miles southeast of New Delhi. It is also commissioner HQ for all four Districts Aligarh itself, Hathras, Kasganj and Etah. It is mostly known as a university town where the famous Aligarh Muslim University is located. The district has excellent connectivity by rail and road. The NH34, Yamuna expressway and the Agra – Lucknow expressway providing connectivity to Delhi and Lucknow. The proposed airport at Jewar would enhance the air connectivity since it would be only 60 KM from the defence corridor. The major industries in the district are agricultural product processing, manufacturing, locks and brassware. The district has existing MSME clusters of repairing and servicing, metalbased, engineering units and electrical machinery. Agro based and textiles.

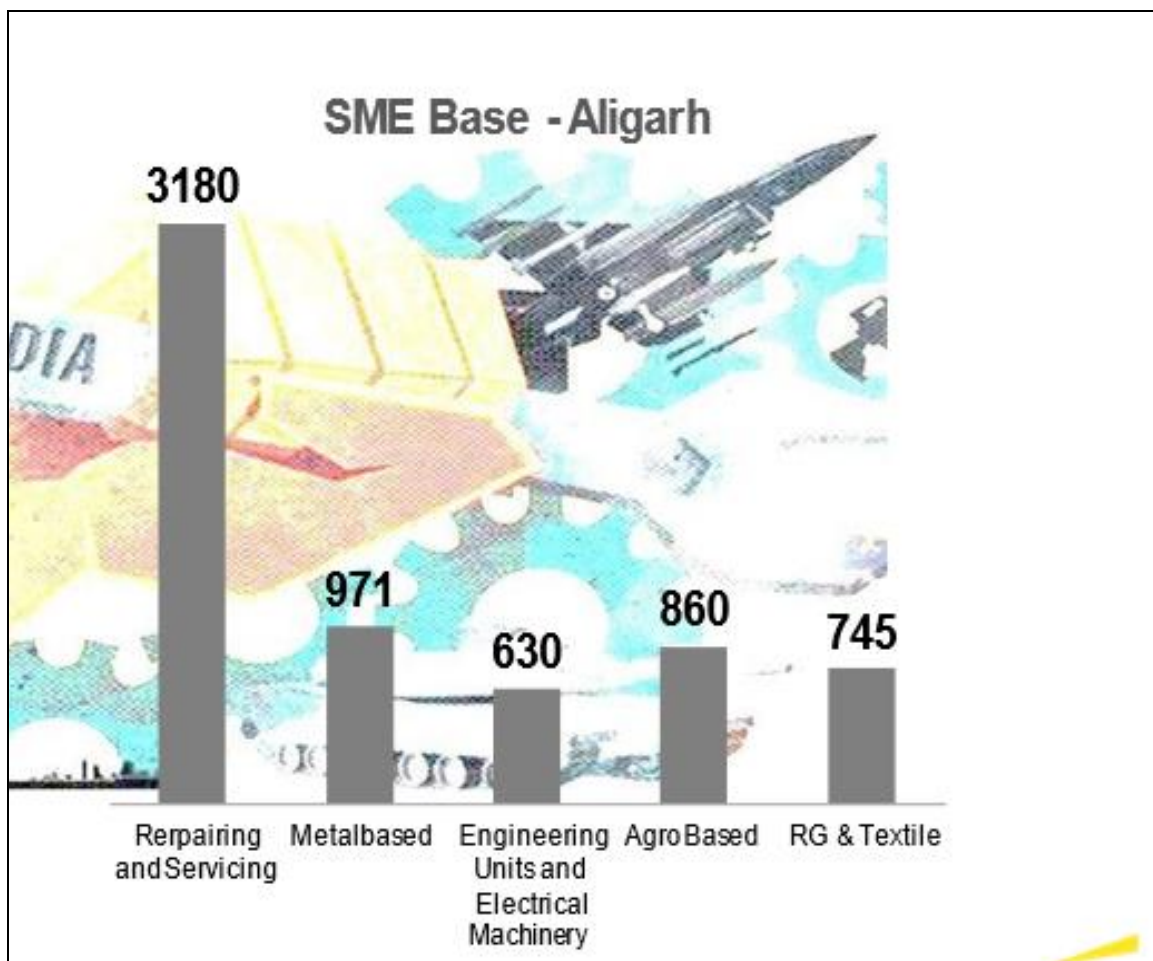


Figure 6.4: MSME base at Aligarh

6.28 Proposed land bank for the defence corridor is 55 Ha which has been acquired by the state and allotted to the industry. The complete land bank created by the state government has been exhausted.

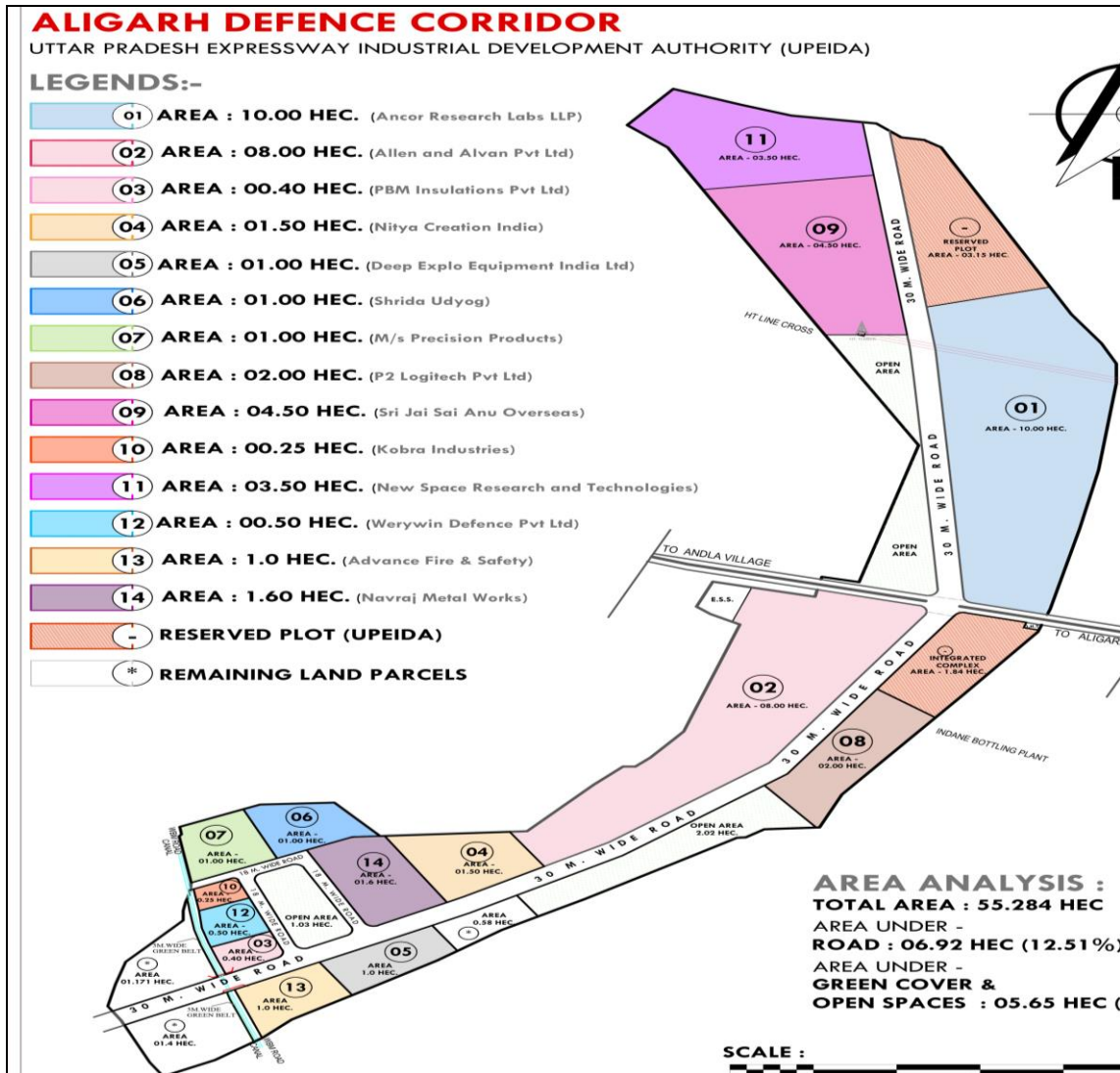


Figure 6.5: Land Bank at Aligarh Node

6.29 Kanpur. Kanpur is a major industrial town of Uttar Pradesh. This town is situated on the south bank of river Ganga, located 80 km west of Lucknow, the state capital. It is also known as the industrial capital of the state. It is called the Manchester of India. It has excellent rail and road connectivity to rest of the country. The NH 2, NH 27, Agra –

Lucknow expressway and the GT road provide the road connectivity to the node. An expressway connecting Kanpur to the state capital Lucknow is under construction. Kanpur airport which is expanding and the International airport at Lucknow which is 80 KM away provide good air connectivity. Major industries being Leather and Leather products, Handloom, Textile, Spices and Aromatics. Major exportable items are Leather products, machine parts, automobile parts, plastic items,handicraft and artificial jewellery. Kanpur has a cluster of Ordnance factories and HAL which provide an existing base for developing the defence node. The node has the potential to be developed as an defence textile hub or as R & D and testing hub in collobration with IIT Kanpur. The MSME base includes Repairing and Servicing, Leather based, Engineering units and Electrical machinery and agro based companies.

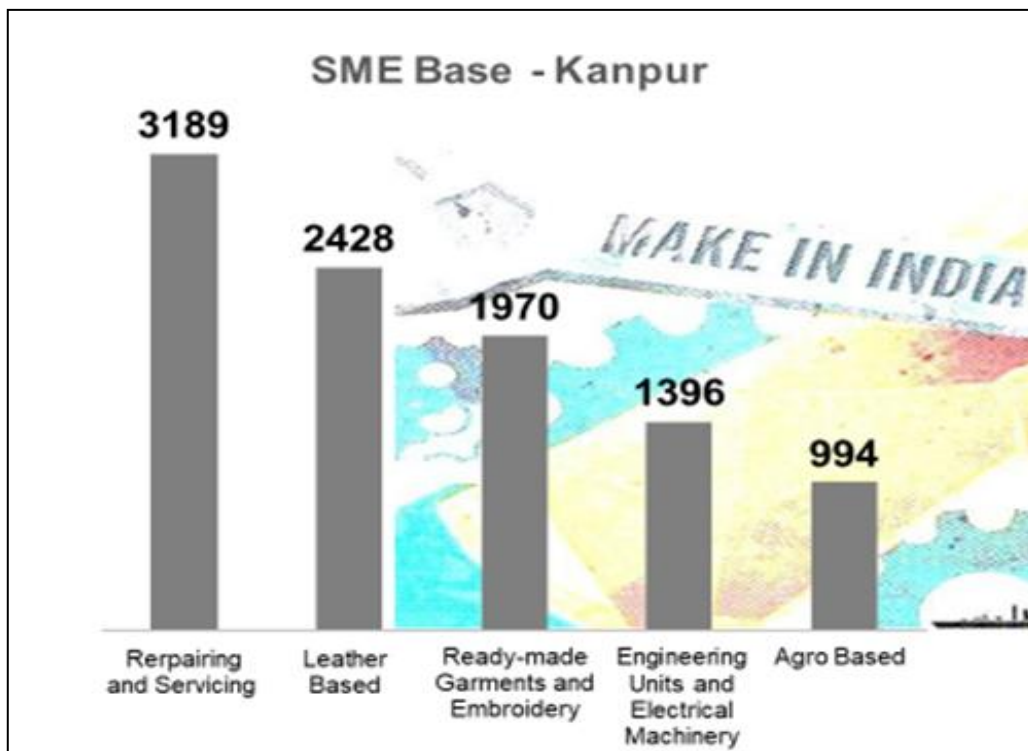


Figure 6.6: MSME base in Kanpur

The node at Kanpur has a land bank of 217 Ha for setting up the defence industries. Majority of the land has been acquired and the basic amenities like water and electricity have been provided. The area is being fenced as per the terms of the land allotment.

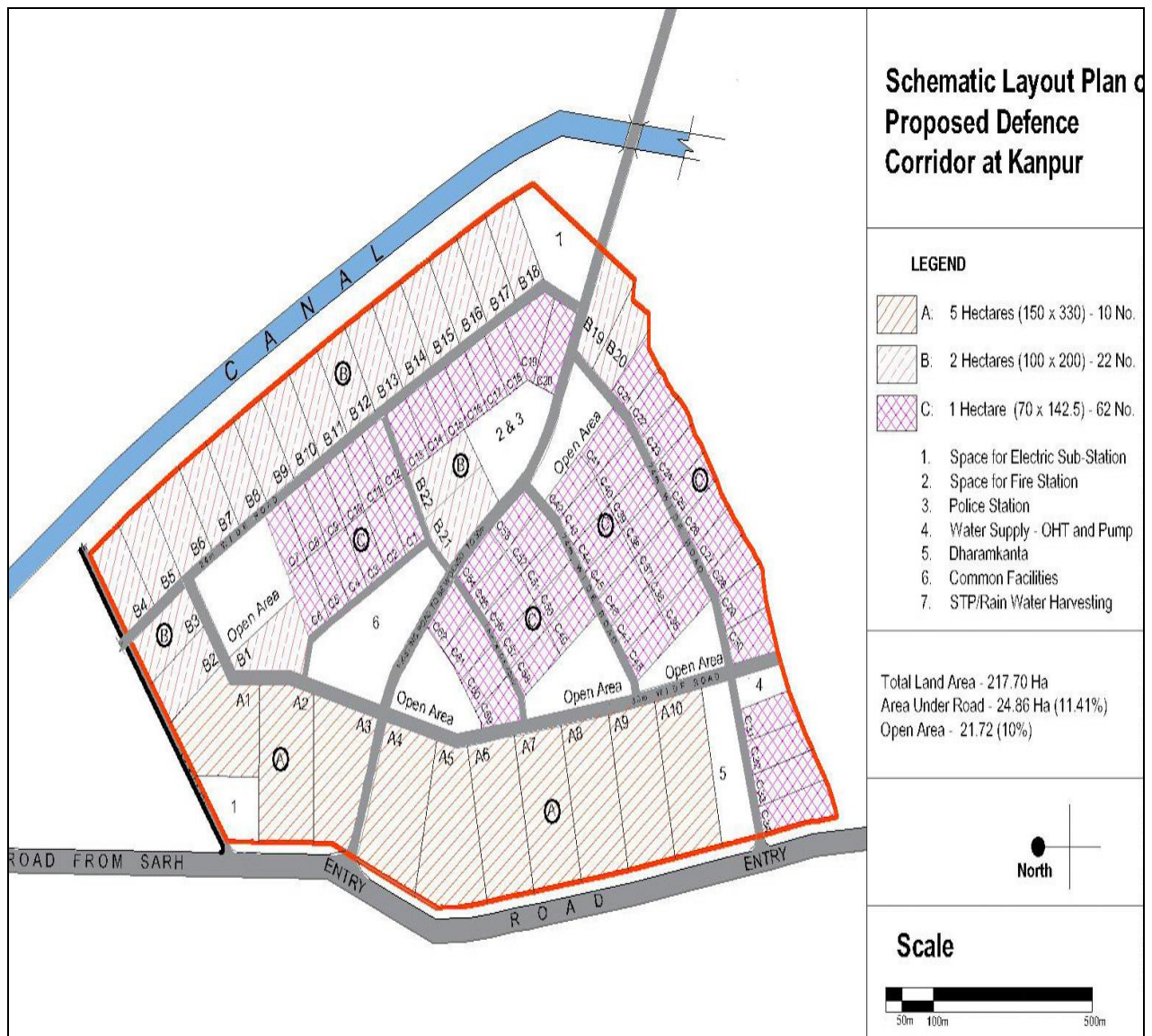


Figure 6.7: Land Bank at Kanpur

6.30 Agra. Agra is a city on the banks of the river Yamuna. It is 378 kilometres west of the state capital, Lucknow, 206 kilometres south of the national capital New Delhi. Agra is one of the most populous cities in Uttar Pradesh. Agra is the city of the famous tourist attraction Taj Mahal. Primarily the Economy of the Agra district is agriculture based while the economy base of Agra city is Small

Scale Industries, Commerce and Trade. About 40% of the total economy of Agra depend on industry (Directly or Indirectly). Over 7200 Small Scale Industrial Units are spread all over the district. Agra city is famous for the Leather Goods, Handicrafts, Zari Zardozi, Marble and Stone carving inlay work. The major exportable items are Leather Shoes and Leather products. The node has good road and rail connectivity with the major expressways passing through Agra. The MSME base includes Textile and Apparel, Engineering goods, Metal and Mineral based and Agro based.

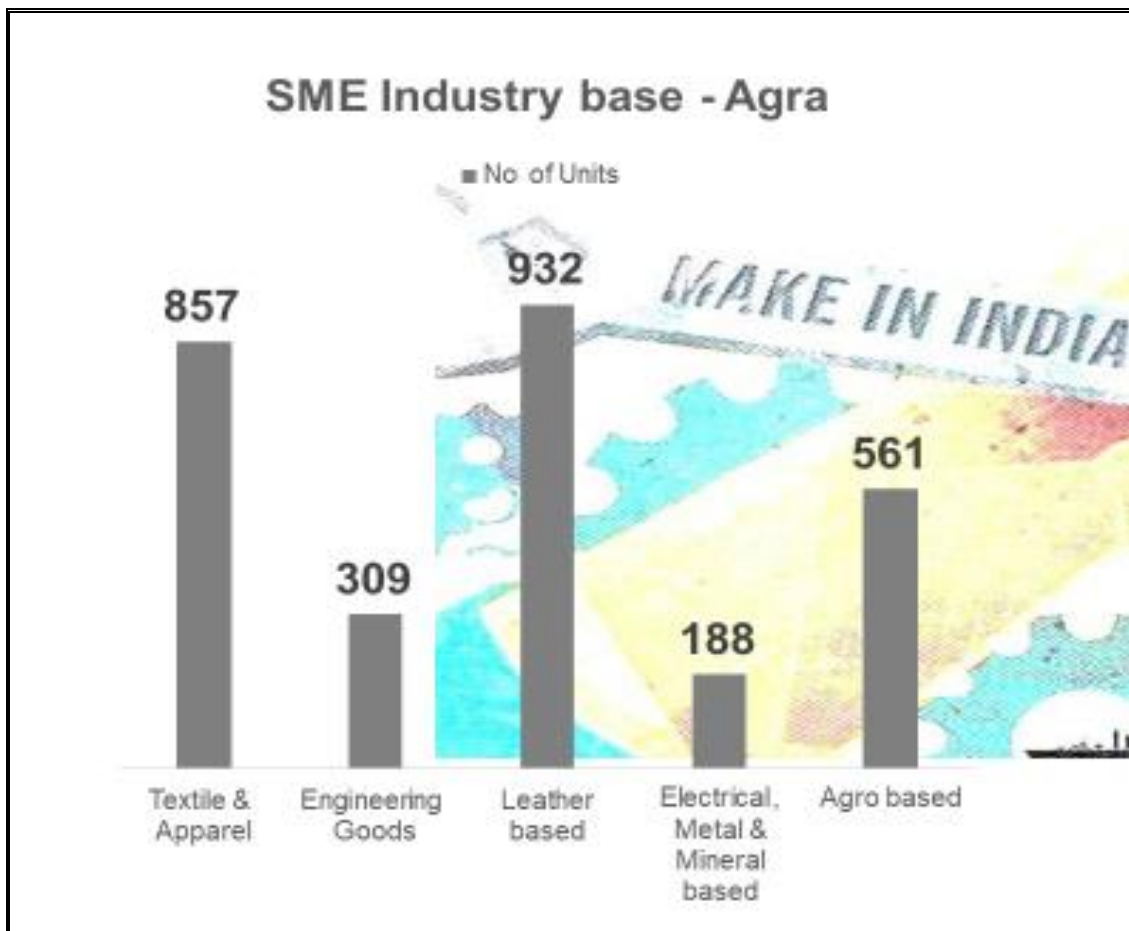


Figure 6.8: MSME base in Agra

6.31 Lucknow. Lucknow is the capital city of Uttar Pradesh. It has good rail, road and air connectivity. It has been listed as the 17th-fastest growing city in India. The major industries in the Lucknow urban agglomeration include aeronautics, automotive, machine tools, distillery chemicals, furniture and Chikan embroidery. Lucknow is among the top cities

of India by GDP. Lucknow is also a centre for research and development as home to the R&D centres of the National Milk Grid of the National Dairy Development Board , the Central Institute of Medical and Aromatic Plants, the National Handloom Development Corporation and U.P. Export Corporation. The economy is growing with contributions from the fields of IT, manufacturing and processing and medical/biotechnology. Major export items are marble products, handicrafts, art pieces, gems, jewellery, textiles, electronics, software products, computers, hardware products, apparel, brass products, silk, leather goods, glass items and chemicals. The district is home to DPSU (HAL). MSME base includes Textile and Apparel, Repair and Servicing, Agro based, Mineral based and Engineering and Metal based.

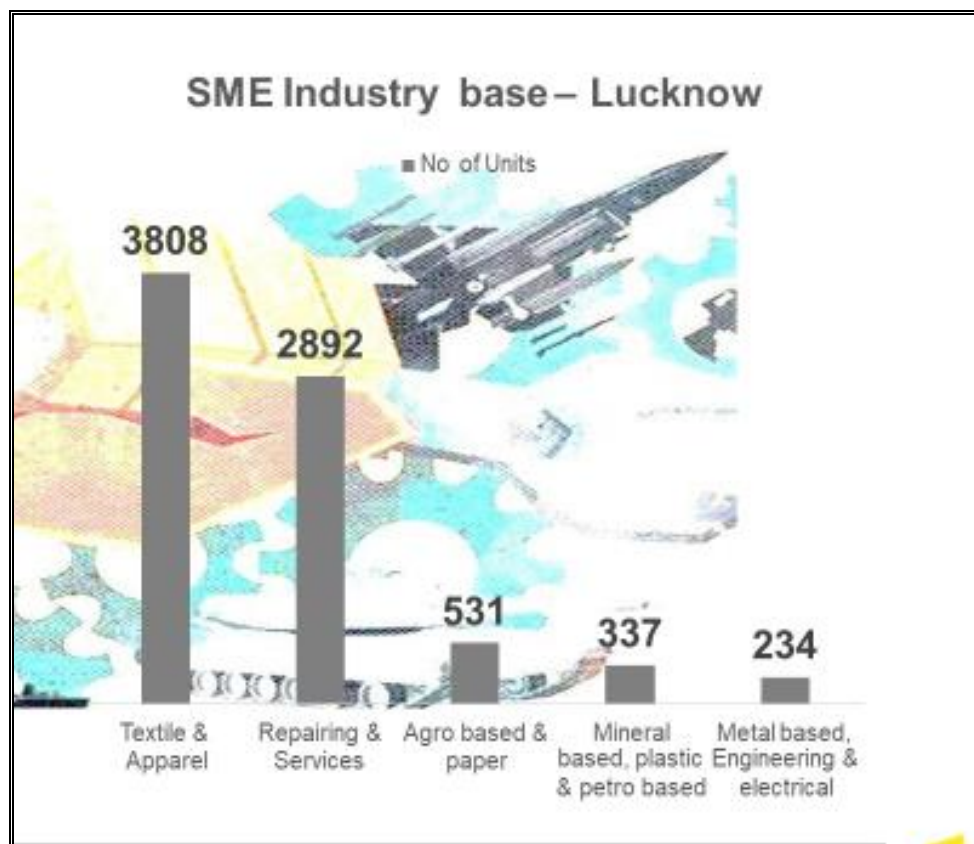


Figure 6.9: MSME base in Lucknow

6.32 Jhansi. Jhansi lies in the region of Bundelkhand on the banks of the Pahuj River. Also called the Gateway to Bundelkhand. Jhansi is well connected to all other major towns in Uttar Pradesh by road and railway networks. The National Highways Development Project has supported development of Jhansi by developing large number of highways and expressway. Srinagar to Kanyakumari north–south corridor passes closely to Jhansi as does the east–west corridor. The Jhansi node is planned to be the biggest of the six nodes with a land bank of approx 3000 Ha for the defence Industrial base. MSME base includes Textile and Apparel, Engineering goods, Agro and Food based, Metal and Minerals based and Wood based.

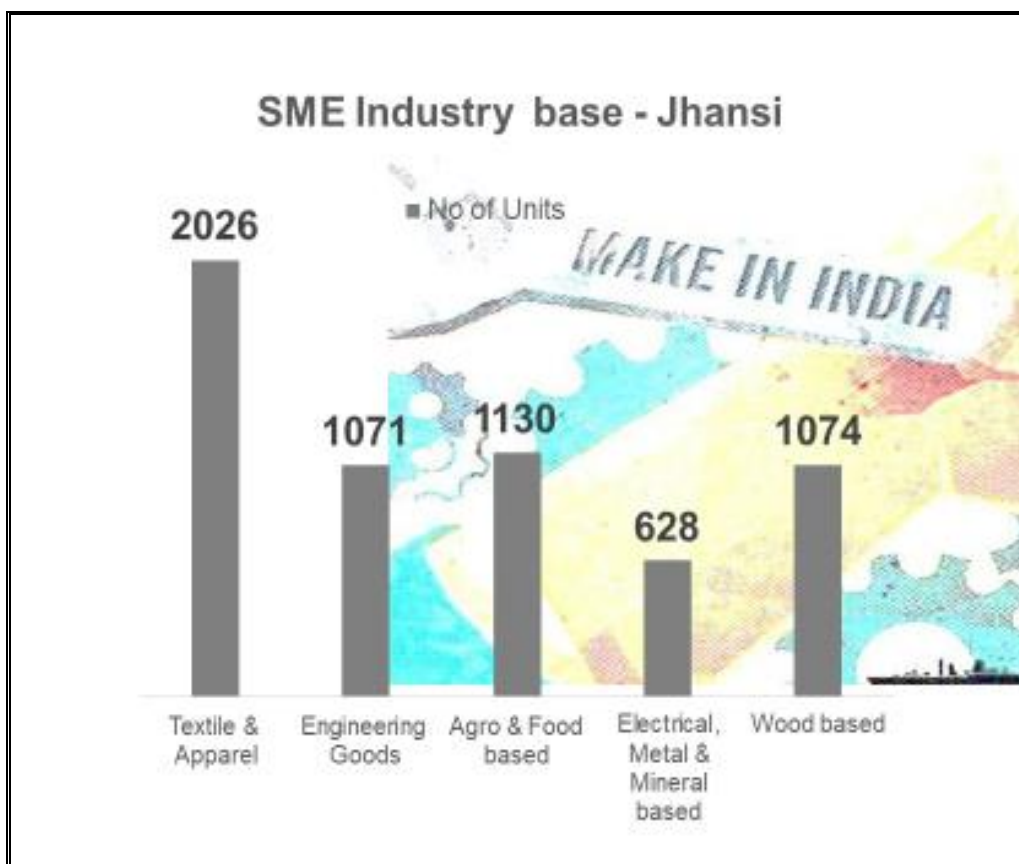


Figure 6.10: MSME base Jhansi

6.33 Chitrakoot. Chitrakoot, “the hills of many wonders” is located in the Banda district of Uttar Pradesh. The district has good road connectivity with NH 35 and the Bundelkhand expressway. The major industries in the region are wooden craft, cotton, metals and Agro based. Major exportable item is wooden craft. MSME base includes Agro based, Repair and servicing, Metal based, wooden based and Readymade garments.

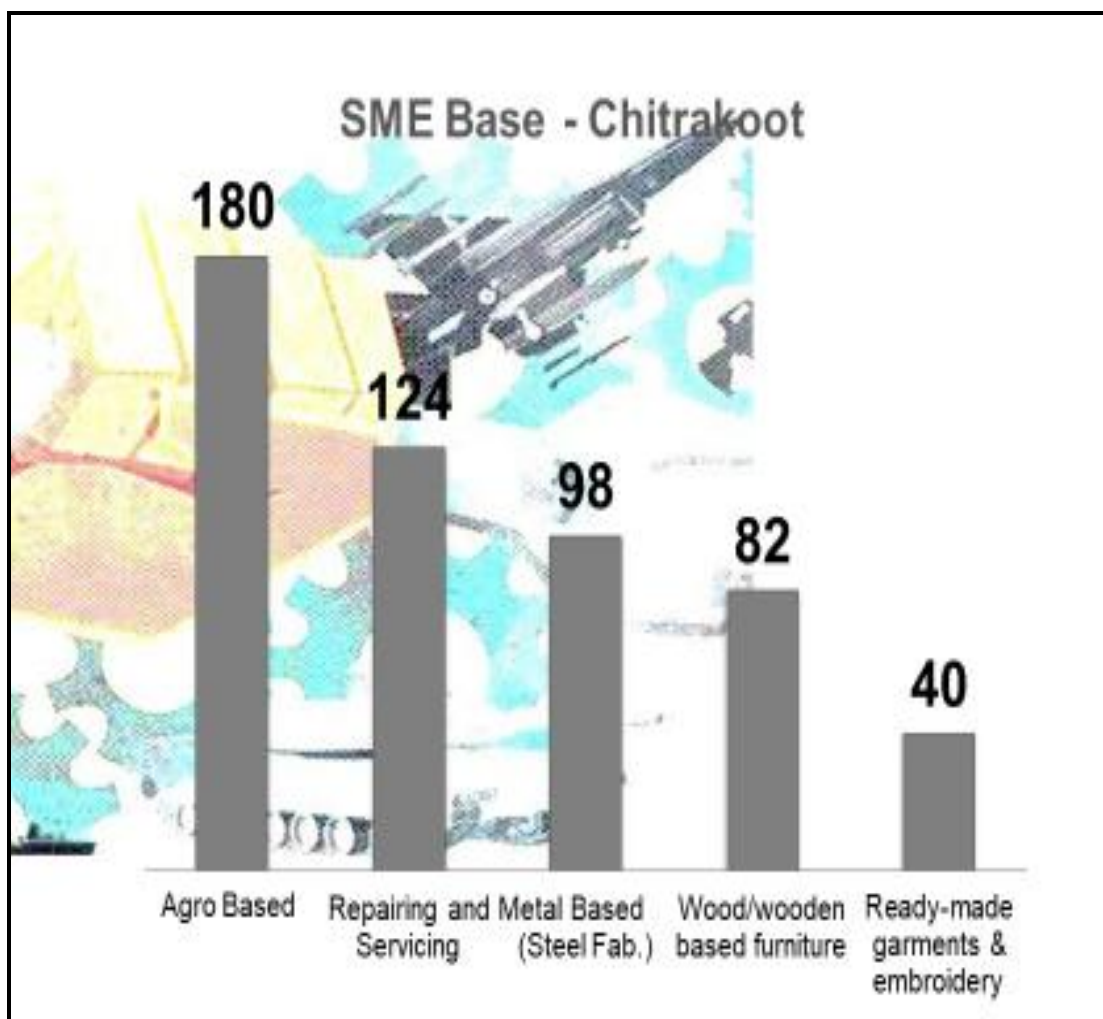


Figure 6.11: MSME base in Chitrakoot

RECOMMENDATIONS

Recommendations for Establishing Defence Industrial Base

- 6.34 Based on the interaction with the industry (Appx 'D') and research carried out the major recommendations are given in succeeding paras.
- 6.35 Use of MoD's buying power to structure the Indian defence industry in terms of size, structure, behaviour, performance and ownership.
- 6.36 Explore privatisation of services viz, housing, real estate management, etc.
- 6.37 Encourage foreign investment in Indian defence sector, explore collaborative development and R&D between Indian and Foreign companies.
- 6.38 Identify areas of defence science and technology, essential to maintain national sovereignty, provide maximum leverage in strategic terms and provide maximum technology benefits.
- 6.39 Explore the option for privatizing, corporatizing, consolidation of the OFs and DPSUs and declare unneeded plants as excess.
- 6.40 Govt R&D to be lean and focussed. Need more synergy amongst research institutions, universities and private players. Greater resource allocation for R&D is inescapable.
- 6.41 MoD should formalize and publish a "Defence Industrial and Technology strategy".
- 6.42 Transparency in defence production.
- 6.43 Entire defence production as well as procurement is through an open and transparent competitive bidding, thus making entire process transparent.

6.44 Need for greater degree of trust and transparency between govt and private industry in their dealings.

6.45 Creation of an organisation like DARPA to get the best out of the industry and the scientific community for defence of the nation.

Recommendations for Indiginization of Defence Production

6.46 Involvement of Industry in the Defence Acquisition Process. The involvement of domestic industry in the acquisition process from the earliest stage is a necessary condition for greater self reliance. The entry point for industry should be at the finalisation stage of the long-term defence capability plan (covering a 15-year period) when it can be invited to suggest a range of options to meet a capability gap. Prior consultation with industry will sensitise planners regarding what could be made available domestically, and what needs to be bought from outside to thwart a likely threat in the future. Informed decisions, including regarding life cycle costs, can also be taken based on a broad-based cost benefit analysis of various options. If an indigenous solution is found feasible and cost effective, the capability plan can accordingly be prepared to give an opportunity to domestic industry, which will lead to greater self-reliance.

6.47 Involvement of Industry in Formulation of Qualitative Requirements. The industry's involvement during the preparation of Qualitative Requirements (QR) would be a good step to enhance coordination between the industry and the end users. It has been pointed out that QRs— which constitute the starting point of India's defence procurement process—are often formulated by aggregating the best features of several weapon systems available in the global market. Consequently, the requirements are often projected beyond minimum capability requirements of the armed forces, and even beyond the industrial capability of global players.

The domestic industry hardly gets a chance to participate in the process of the acquisition of weapons with such ambitious QRs, even though they have the capability to meet the minimum requirements. As in the capability plan, the industry could be invited to make suggestions based on domestic industrial capabilities to meet the minimum inescapable requirements of the armed forces. Informed decisions can thus be taken, based on the interaction with domestic industry, in order to give it a chance.

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6.51 Creation of a Board of Research for Advanced Defence Sciences (BRADS), to function on the lines of the highly acclaimed Defence Advanced Research Projects Agency (DARPA) in the USA.

6.52 Preparation of a 15-year long-term plan forming the basis of an acquisition programme by the Armed Forces.

- 6.53 Sharing of the long-term capital acquisition plans of the armed forces with the domestic industry.
- 6.54 Identification of entry points for the private sector in the acquisition process.
- 6.55 Identification of Raksha Udyog Ratnas (RUR). Identification of Indian industries of proven excellence, which are capable of contributing in defence production, depending upon their technical, managerial and financial strength. Such industries will be named as ‘Raksha Udyog Ratnas (RURs)’ and encouraged to contribute in defence production and assume the role of main system integrators of large weapon systems and producers of platforms required by the Defence Forces.
- 6.56 Policy framework to promote the participation of small and medium enterprises (SMEs) in defence production.
- 6.57 Setting up a dedicated and professional agency to undertake defence acquisition.
- 6.58 Defence R&D opportunities both for the DRDO and the industry.
- 6.59 All the ordnance factories should be corporatised under a single corporation. The corporation should be accorded Nav Ratna status. The OFB’s biggest bane, has been its limited autonomy. Being an attached office of the MoD, major decisions pertaining to finance, human resource, research and development (R&D), technology tie-ups and modernisation of plants and machineries are taken outside the organisation. The highly bureaucratic decision-making process of the external agencies responsible for the OFB’s functioning and wellbeing, and their propensity to adhere to the rules and regulations rather than the outcomes, has made the organisation risk-averse with little incentive to think out of the box.

6.60 DPSUs should explore the possibility of mergers and acquisitions in order to achieve economies of scale and remain globally competitive.

6.61 ISRO is the most successful example of how Indian industry participates in hi-tech area. First, they made available their own in-house technology to Indian industry. Second, they gave long-term commitments to Indian industry. Third, throughout the whole process, they hold the hands and guide them to what they want. So, there is holding of hands between the buyer and the producer. So, they work as a team. Consequently, we have this now an Indian space industry.

6.62 Strategic Defence Industry Fund (SDIF) should be created on the lines of North-East Development Fund where non-lapsable pool of resources be utilized exclusively for the 'Make' category of products of Indian Industry."

6.63 For the R&D model, we should look at the US model, which is a perfect example of PPP. They explicitly define that we want shoes to be developed for war with Kuwait. Specifications are given by the Air Force that we want an aircraft of so and so capabilities. Then, they go to the people and say to them their project possibilities and project estimates, the duration of time, etc. Then the Defence Procurement Committee goes and listens to them. They talk to them and then decide as to who should manufacture the goods. The whole money is paid by the US Defence to these contractors.

6.64 Presently all technology developed by DRDO goes for productionisation to DPSUs (Pinaka, the only exception). Once the RURs are in place, it is imperative that private sector also becomes recipient of these technologies as Prime Contractor and thus lead the Design to Engineering effort and subsequent life cycle support leading to obsolescence management and upgrades.

6.65 DRDO should concentrate on projects requiring sophisticated technology of strategic, complex and security sensitive nature. Outsourcing of Research and Development work of high technology to private sector should be on the lines of parallel development for which the cost should be shared. A minimum order quantity to sustain the financial viability of development within the time schedule should be spelt out to encourage private sector participation.

6.66 The end user needs to be a stakeholder in the complete developmental process that involves research design, simulations, prototype evaluation, industrial production and trials, and critical feedback and necessary course corrections throughout the project duration. This stakeholder approach by the Services in developmental projects by DRDO lies at the core of enhancing coordination between the two. Deputing service officers with relevant experience to various DRDO offices and labs as part of the project will enhance this interaction. Additionally, deputing various developers from DRDO to combat units to imbibe and capture the essence of Service requirements will enhance their understanding and lead to a focussed approach on the developmental projects by virtue of immersive and interactive environment made available to them.

Recommendations for Developing UP Defence Corridor

6.67 Defence Ecosystem. It is essential to develop an ecosystem in the proposed defence corridor for any major military hardware like aircrafts, helicopters, ships and tanks. To develop a major equipment like aircraft would require OEMs who are the system integrators, followed by tier -I suppliers who be providing assemblies like fuselage, engines, wings etc to

the OEM, followed by tier – II suppliers who provide sub-assemblies to the tier -I suppliers and lastly are the tier – III suppliers who provide small components to the tier – II suppliers. An aircraft can have about half million parts being supplied by 2000 companies.

6.68 Central government needs to laydown a policy for development of both the defence corridors. There should be clarity with regards to the defence equipment that can be produced in the respective defence corridors. This will enable development of a complete ecosystem for production of a particular equipment resulting in economy of effort and better utilisation of resources. Presently both the defence corridors are promoting same kind of equipment to be manufactured in their corridor. As part of the TN corridor Chennai is proposed to be developed as an aerospace hub also the UP government has taken out a detailed policy for development of aerospace industry in the UP Defence corridor.

6.69 Central government to formulate policy guidelines to ensure that big ticket investments in the defence industry as part of the strategic partner programme for the next five years should be restricted to these defence corridors. In absence of any policy large number of states are attracting investments by defence industry. This would result in haphazard development of defence industrial base in the country and the proposed defence corridors would not develop as desired.

6.70 UP government to develop each of the six nodes as centres of excellence for a particular defence product. This will enable a complete ecosystem for production of that equipment to be developed in close vicinity. At present in the absence of this thought process land is being allotted to any industry that is approaching the government. A case in point is Aligarh where all the land parcels have been allotted to companies involved in varied products starting from small arms, ammunition, aerospace, drones and textile units.

6.71 The offset policy needs to be tweaked to give a higher multiplier factor for industries that will be set up in the defence corridor as part of offset. This will provide incentive to the foreign vendors to invest in the defence corridors.

6.72 UP government is providing incentive in procurement of land to the defence industry for investing in the defence corridor. However, land cost is less than 5% of the total investment in setting up a defence and aerospace unit. This could be a reason for no major defence and aerospace company investing till date in the defence corridor.

6.73 The proposed nodes are being confined to a small geographical area. The Lucknow node is planned to be developed in an area of 200 Ha for which contiguous land is proposed to be acquired. Land acquisition today has its own challenges and time penalty. There are large number of PSU in and around Lucknow which have either closed or are on the verge of closing like Scooter India Ltd in Lucknow and ITI at Rai Bareilly. These PSU have huge land banks that can be optimally utilised.

6.74 Based on the response received to the questionnaire circulated to the industry and the existing defence industrial infrastructure in the country the following can be developed as part of the UP defence corridor: -

6.74.1 Maintenance Repair and Overall Hub. With the boom in the aviation industry both military and civil, there is tremendous opportunity for developing MRO facilities. With South India emerging as a Hub for production of aircrafts and helicopters the UP Defence Corridor could become the Hub for MRO for these aviation assets. Presently, the MRO industry is still in its nascent stages. With good policy incentives by the centre and state governments, world class MRO facilities can be set up at the Jhansi node where adequate landbank is available.

6.74.2 Electronics Hub. There is a requirement for developing an electronics hub to cater for communication equipment and radars for the Defence forces. Presently 65% of the requirement of the defence forces is being imported. The existing MSME base in and around Aligarh and Agra can be utilised to set up this hub. The electronics technology is dual use and can supplement the requirements in the civilian field. UP Government has proposed an electronic city around the upcoming Jewar Airport which could be done away with and all the resources of the state be pooled to develop the proposed nodes at Agra and Aligarh into an electronics hub. This sector has the added advantage of training and employing women.

6.74.3 Textile Hub. The total active strength of the defence forces and paramilitary personnel in the country is approximately 39 Lacs. These troops need to be provided uniforms and various kinds of special clothing like Winter clothing for Siachen glacier, super high altitude areas in Kargil and high altitude areas and also clothing for troops deployed in deserts, sea and jungles. The existing textile hub in and around Kanpur can be developed to cater for the clothing requirements of the defence forces and paramilitary.

6.74.4 Small Arms and Ammunition. The existing infrastructure at Korwa in Amethi where AK- 203 series of rifles are being manufactured and the Ordnance factories in Kanpur can be utilised to develop a small arms hub. The ammunition hub can be developed utilising the land banks of the Sick PSUs like Scooter India and ITI Rai Bareilly.

6.74.5 Defence Testing Infrastructure. MoD has announced the setting up of Defence testing Infrastructure in the country. The proposed infrastructure could be developed as part of the Jhansi node which has an existing firing range for Artillery and tanks.

6.74.6 Combat Medical Products. The medical hub to cater for both Defence and Civilian use can be developed in and around Lucknow. Presently, there is very little focus on Combat medical products which has huge potential both for domestic use and export in the coming years.

6.74.7 Human Resource Development. The Defence Industry require special skill sets among the workforce that is employed in these units. UP Defence Corridor could take the lead in setting up Institutions to cater for the specific requirements of the Defence Industry in collaboration with Institutes of excellence like IIT, Kanpur and IIT, BHU.

6.75 Job Creation. Defence industry the world over is employing large number of work force. The US defence and aerospace industry employs almost 25 Lac people which is 2% of the total US labour force and 18% of the manufacturing labour force. In India the DPSUs employ 1.8 Lac people and generate revenue of 45,500 cr (approx 6 billion dollars). Thus, for every one billion dollars' worth of investment in indigenous defence industry we can generate 25,000 jobs.

6.76 Naval Utility Helicopter which is planned to be developed as part of the strategic partnership programme could be set up in the UP defence corridor. This will enable development of a complete ecosystem involving OEM, tier -I, tier -II and tier -III companies which has the potential of generating thousands of jobs.

6.77 The Defence PSUs like HAL, various OFBs and BEL, can be incentivised for sourcing locally within UP. The incentive can be in the form of input subsidies like electricity, lower registration of land and direct cash benefit which will allow local companies to use their own capital growth or expansion.

6.78 The cost of import and logistics is high as raw material is specific too industry. The government may explore establishing import-export warehouses from which MSMEs can procure these materials in “as required basis” and free their working capital. Delivery companies charge a premium for the delivery of these materials to UP as the demand is very limited.

6.79 Small steps like allowing High quality Arbitration and Adjudication Mechanisms, Industrial Courts to resolve contractual issues in fast track mode, CEO of the Special Purpose Vehicle, empowered to give the construction Permit in the cluster; effectively strengthening single window system through IT integration would go a long way in addressing the pending burning issues to improve rank in ‘Ease of Doing Business’.

6.80 Government can assist the SMEs to adopt innovative information and communication technologies on a large scale like Software as a Service (SaaS) and Infrastructure as a Service (IaaS) to achieve cost-effective, improved versions of existing products on pay to use service.

6.81 There is a need to set up a Design bureau in line with Russia, where continuum synergy is maintained between scientific institutes, design bureaus, and in-house industrial research units. Scientific institutes are the main source of new ideas for products and processes in Russia, involved in fundamental research. Design bureaus were differentiated as those that designed structures or designed new products and processes, which begin their work after receiving the initial research and development phase from scientific institutes. Design bureaus transmit working drawings and other technical documents for prototype testing or directly to the end-user production facility to an experimental factory. The large-scale system integrators like OFB and DPSUs can set up their design bureaus, assisting SMEs to develop new products.

6.82 In the next decade-and-a-half (by 2030), India would require nearly 1,000 helicopters for its defence and paramilitary forces. The civilian market for helicopters, both in the government and private sectors, is likely to absorb nearly 2,000 helicopters. This is a huge potential that can be exploited by the Indian industries, both private and public, provided they move aggressively with technically oriented strategies to create appropriate competencies.

6.83 Payment Terms. Private sector in India is paid by the Defence Accounts Department of MoD, while foreign companies are paid through irrevocable Letter of Credit system. This payment method should be extended to the private sector in India to reduce delays and bring in greater certainty.

6.84 Grant of 'Infrastructure' Status. Grant of "Infrastructure" status to the defence industry under the Harmonised Master List of Infrastructure Sub-Sectors. This will entail financial incentives and tax benefits for the defence sector. Shipbuilding and ship-repair have already been included in the Master List. Raising external commercial borrowing is not permitted to the sector.

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Appx A

(Refers to para 5.6 chapter 5)

ORDINANCE FACTORIES

Headquarters

1. Armoured Vehicles Hqrs. (AVHQ)
2. Ordnance Equipment Factories Hqrs. Kanpur (OEFHQ)
3. Ordnance Factory Board (OFBHQ)
4. Ordnance Factory Board, Mumbai Office (OFBMO)
5. Ordnance Factories Board, New Delhi Office (OFBND0)
6. Ordnance Factories Recruitment Center (OFRC)

Factories

1. Ammunition Factory Kirkee (AFK)
2. Cordite Factory Aravankadu (CFA)
3. Engine Factory Avadi (EFA)
4. Field Gun Factory Kanpur (FGK)
5. Gun Carriage Factory Jabalpur (GCF)
6. Grey Iron Foundry Jabalpur (GIF)
7. Gun & Shell Factory Cossipore (GSF)
8. Heavy Alloy Penetrator Project, Tiruchirapalli (HAPP)

9. High Explosive Factory Kirkee (HEF)
10. Heavy Vehicle Factory, Avadi (HVF)
11. Machine Tool Prototype Factory Ambarnath (MPF)
12. Metal & Steel Factory (MSF)
13. Ordnance Clothing Factory Avadi (OCFAV)
14. Ordnance Cable Factory Chandigarh (OCFC)
15. Ordnance Clothing Factory Shahjahanpur (OCFS)
16. Ordnance Equipment Factory Kanpur (OEFC)
17. Ordnance Equipement Factory Hazratpur (OEFHZ)
18. Ordnance Factory Ambarnath (OFA)
19. Ordnance Factory Ambajhari (OFAJ)
20. Ordnance Factory Bhandara (OFBA)
21. Ordnance Factory Bhusawal (OFBH)
22. Ordnance Factory Bolangir (OFBOL)
23. Ordnance Factory Kanpur (OFC)
24. Ordnance Factory Chanda (OFCH)
25. Ordnance Factory Dum Dum (OFDC)
26. Ordnance Factory Dehu Road (OFDR)

27. Ordnance Factory Dehradun (OFDUN)
28. Ordnance Factory Itarsi (OFI)
29. Ordnance Factory Khamaria (OFK)
30. Ordnance Factory Katni (OFKAT)
31. Ordnance Factory Muradnagar (OFM)
32. Ordnance Factory Project Nalanda (OFN)
33. Ordnance Factory Project, Korwa (OFPKR)
34. Ordnance Factory Project Medak (OFPM)
35. Ordnance Factory Tiruchirapalli (OFT)
36. Ordnance Factory Varangaon (OFV)
37. Opo-Electronic Factory Dehradun (OLF)
38. Ordnance Parachute Factory Kanpur (OPF)
39. Rifle Factory Ishapore (RFI)
40. Small Arms Factory Kanpur (SAF)
41. Vehicle Factory Jabalpur (VFJ)

Ordnance Factories Institute of Learning

1. NADP (NADP)
2. Ordnance Factory Institute of Learning, Ambajhari (OFILAJ)

3. Ordnance Factory Institute of Learning, Ambarnath (OFILAM)
4. Ordnance Factory Institute of Learning, Avadi (OFILAV)
5. Ordnance Factory Institute of Learning, Dehradun (OFILDD)
6. Ordnance Factory Institute of Learning, Ichapore (OFILIS)
7. Ordnance Factory Institute of Learning, Khamaria (OFILKH)
8. Ordnance Factory Institute of Learning, Kanpur (OFILKN)
9. Ordnance Factory Institute of Learning, Medak (OFILMK)

Appx B

(Refers to para 5.24 chapter 5)

DRDO LABS

Sl. No.	Laboratories/Establishments/Units	Location	Area of Research
<u>Cluster Laboratories/Establishments</u>			
1	Advanced Numerical Research & Analysis Group (ANURAG)	Hyderabad	Computational System
2	Advanced Systems Laboratory (ASL)	Hyderabad	Missiles & Strategic Systems
3	Aerial Delivery Research & Development Establishment (ADRDE)	Agra	Parachutes & Aerial Systems
4	Aeronautical Development Establishment (ADE)	Bengaluru	Aeronautics
5	Armaments Research & Development Establishment (ARDE)	Pune	Armaments
6	Centre for Air Borne System (CABS)	Bengaluru	Air-Borne Systems
7	Centre for Artificial Intelligence & Robotics (CAIR)	Bengaluru	Artificial Intelligence & Robotics
8	Centre for Fire, Explosives & Environment Safety (CFEES)	Delhi	Explosives
9	Centre for High Energy Systems and Sciences (CHESS)	Hyderabad	High Energy Weapons
10	Combat Vehicles Research & Development Establishment (CVRDE)	Chennai	Combat Vehicles
11	Defence Avionics Research Establishment	Bengaluru	Avionics

	(DARE)		
12	Defence Bio-engineering & Electro-medical Laboratory (DEBEL)	Bengaluru	Bio-engineering
13	Defence Electronics Applications Laboratory (DEAL)	Dehradun	Electronics & Communication Systems
14	Defence Food Research Laboratory (DFRL)	Mysore	Food Research
15	Defence Institute of Bio-Energy Research (DIBER)	Haldwani	Bio-Energy
16	Defence Institute of High Altitude Research (DIHAR)	Leh	High Altitude Agro-animal Research
17	Defence Institute of Physiology & Allied Sciences (DIPAS)	Delhi	Physiology
18	Defence Institute of Psychological Research (DIPR)	Delhi	Psychological Research
19	Defence Laboratory (DL)	Jodhpur	Camouflaging and Isotopes
20	Defence Electronics Research Laboratory (DLRL)	Hyderabad	Electronic Warfare
21	Defence Materials & Stores Research & Development Establishment (DMSRDE)	Kanpur	Textiles, Polymers & Composites
22	Defence Metallurgical Research Laboratory (DMRL)	Hyderabad	Metallurgy
23	Defence Research & Development Establishment (DRDE)	Gwalior	Chemical & Biological Warfare
24	Defence Research & Development Laboratory (DRDL)	Hyderabad	Missile & Strategic Systems
25	Defence Research Laboratory (DRL)	Tezpur	Health & Hygiene
26	Defence Terrain Research Laboratory (DTRL)	Delhi	Terrain Research

27	Gas Turbine Research Establishment (GTRE)	Bengaluru	Gas Turbine
28	High Energy Materials Research Laboratory (HEMRL)	Pune	High Energy Materials
29	Institute of Nuclear Medicines & Allied Sciences (INMAS)	Delhi	Nuclear Medicine
30	Instruments Research & Development Establishment (IRDE)	Dehradun	Electronics & Optical Systems
31	Integarted Test Range (ITR)	Balasore	Missile Testing
32	Joint Cypher Bureau (JCB)	Delhi	Cypher Systems
33	Laser Science & Technology Centre (LASTEC)	Delhi	Laser Technology
34	Electronics & Radar Development Establishment (LRDE)	Bengaluru	Radars
35	Microwave Tube Research & Development Centre (MTRDC)	Bengaluru	Microwave Devices
36	Naval Materials Research Laboratory (NMRL)	Ambernath	Naval Materials
37	Naval Physical & Oceanographic Laboratory (NPOL)	Kochi	Sonar Systems
38	Naval Science & Technological Laboratory (NSTL)	Visakhapatnam	Underwater Weapons
39	Proof and Experimental Establishment (PXE)	Balasore	Armament Testing
40	Research Centre Imarat (RCI)	Hyderabad	Missile & Strategic Systems
41	Research & Development Establishment (Engrs) (R&DE[E])	Pune	Engineering Systems & Weapon Platforms
42	Scientific Analysis Group (SAG)	Delhi	Cryptology
43	Snow and Avalanche Study Establishment (SASE)	Chandigarh	Snow and Avalanche

44	Solid State Physics Laboratory (SSPL)	Delhi	Solid- State/ Semiconductor Materials
45	Terminal Ballistics Research Laboratory (TBRL)	Chandigarh	Ballistics
46	Vehicles Research & Development Establishment (VRDE)	Ahmednagar	Wheeled Vehicles
<u>HR Institutions</u>			
1	Centre for Personnel Talent Management (CEPTAM)	Delhi	Talent Management
2	Institute of Technology Management (ITM)	Mussoorie	Technology Management
3	Recruitment and Assessment Centre (RAC)	Delhi	Human Resource
<u>Other Institutions</u>			
1	Advanced Centre for Energetic Materials (ACEM)	Nasik	High Energy Materials
2	Centre for Advanced Systems (CAS)	Hyderabad	Advanced Systems
3	Centre for Military Air-worthiness & Certification (CEMILAC)	Bengaluru	Airworthiness & Certification
4	Defence Scientific Information & Documentation Centre (DESIDOC)	Delhi	Information System and Documentation
5	DRDO Integration Centre (DIC)	Panagarh	Systems Integration
6	Institute for Systems Studies & Analyses (ISSA)	Delhi	Systems Analysis
7	Mobile Systems Complex (MSC)	Pune	Missile Systems
8	SF Complex (SFC)	Jagdalpur	Propellant

<u>Centres of Excellence</u>				
1	DRDO Bhartiya University (DRDO-BU), Centre of Excellence	Coimbatore	Life Sciences	
2	Advanced Centre for Research in High Energy Materials (ACRHEM)	Hyderabad	High Energy Materials	
3	Centre of Excellence in Cryptology	Kolkata	Cryptology	
4	Centre of Millimetre Wave Semiconductor Devices and Systems	Kolkata	Millimetre Wave and Semiconductor	
5	Advanced Centre for Excellence on Composite Materials (ACECM)	Bengaluru	Composite Materials	
6	Research and Innovation Centre (RIC)	Chennai	Sensors & MEMS	
7	Centre of Propulsion Technology (CoPT)	Mumbai	Propulsion Technology	
8	Jagdish Chandra Bose Centre for Advanced Technology (JCBCAT)	Jadavpur	Strategic Systems	
9	Joint Advanced Technology Centre (JATC)	Delhi	Photonic Technologies, Plasmonic and Quantum Photonics	

Appx 'C'

(Refers to para 6.18 chapter 6)

MOU STATUS OF UP DEFENCE CORRIDOR

SN o	Name of the company	Product	Tentative Location	Point of Contact
1	Titan Aviation & Aerospace India Ltd (TAAIL)	Maintenance, Repair & Overhaul (MRO), Simulators, Manufacturing of components & engine air frames	Jhansi 6000acres	Mr. K Giri Kumar, Chairman & MDMob No. +91-9949018808
2	Ancor Research LabsLLP	High precision comprehensive manufacturing testing complex for Defence & Aerospace Systemsfor example design and development of drones, swarms and AUVs, Electronic Warfare systems	Aligarh 25 acres	Mr. Anupam Prasad, PartnerMob No. +91- 7838598510
3	Sri Hans Energy Systems (P) Ltd	Smart technology for securing of Weapons	Kanpur 5-10 acre	Mr. Gaurav Pilia, Director Mob No. +91-9453042482

4	Tata Technologies Ltd	Common Facility Center	Lucknow/Kanpur 15-20 acre	Mr. Harsh Vardhan Gune, Project Consultant Mob No. - +91-712-2294922
5	Dimensions NXG Private Ltd	Smart Augmented Reality display connected to military helmet for tank navigation	-	Mr. Pankaj Raut, Co-founder Mob No. +91-9819367939
6	MSK Business Solutions India Pvt Ltd	Joint venture with Russian OEM JSC Kret- Avionics, Radar	Agra/ Greater Noida 5 acres	Mr. K P Puri, Director Mob No. +91-9810409210
7	P2 Logitech Pvt Ltd	Joint venture with Russian OEM M/s AEC (Aero Equipment Corporation) avionics, radars, electronic warfare systems & communication equipment	Agra/ Kanpur 5 acres	Mr. K P Puri, Director Mob No. +91-9810409210
8	SpiceJet Technic Private Ltd	Niche technology services in product, process and integration- MRO, Precision manufacturing, Advanced Engineering & Development Center	NCR/ Greater Noida 20	Mr. Ashutosh Thapliyal, Chief Technical Officer (CTO) Mob No. +91-9811538077
9	Osho Corp Global Pvt Ltd	Multiple Defence industrial licenses- weapons & ammunition, avionics	Aligarh 60 acre	Mr. Ashutosh Khate, CEO Mob No. 09873 666094
10	HAL- IIT Kanpur- UPEIDA	-	-	Prof Manindra Agrawal, Dy Director IIT Kanpur Mob No. +91-512-2597242

11	BDL- IIT Kanpur- UPEIDA	UAV development	Lucknow/ Agra5 acres	Prof Manindra Agrawal, Dy Director IIT Kanpur Mob No. +91-512-2597242
12	Viitor Cloud Technolo gies	A start up in Defence software	-	Mr. Rohit Purohit, CEO Mob No. 9920035399
13	Syndicate Innovations International Ltd	Manufacture rifles, revolvers, pistols andammunition	-	Mr. Ashok Rai, Director Mob No. +91-9910554080
14	Triveni Engineering & Industries Ltd	Approved OEM for propulsion gearboxes, auxiliary power Gas Turbines Generators, steam turbines andturbo auxiliaries, turbo and motor driven pumps and fin stabilisers with the Indian Navy, Indian Coast Guard and the Director General of Quality Assurance(DGQA).	Aligarh	Mr. Salil Baijal, VC (Corporate Affairs) Mob No. +91-9935554530
15	National Small Industries CorporationLtd	Promoting establishment of MSMEs in UP DefenceIndustrial Corridor (UP DIC) and skill training	-	Shri Vijayendra, IAS Chairman & MD NSIC Mob No. +91-9810033506
16	STUMMPS Schuele and SOMMPA Ltd	Manufacture ammunition, cases of cartridges andexplosives	Jhansi/Chitrak oot 100 acres	Mr. Vivek Krishnan, CEO Mob No. +91-9739009810

17	Central Railside Warehousing Corp Ltd	CRWC intends to develop state of the art logistics infrastructure in the UP-Defence Corridor	All nodes 1.5 acres	Mr. Vijay Prakash, GM Mob No. +91- 9810115567
18	DRDO	As knowledge partner for transfer of technology	-	Dr. S Guruprasad, DG (Production Coordination & Services Interaction) Mob No. +91-
19	Texmaco Defence Systems Pvt Ltd	Approaching OEMs for setting up of manufacturing of multiple types of Wheels and Brake Assemblies, Hydraulic Aggregates to be installed on various Aircrafts (fighters and transport) & Helicopters	Lucknow/Ka npur2 acres	Mr. Tribhuvan Shankar Darbari, MD & CEO (owner) Mobile No: 8447350484, 9810559492
20	Ladhani Group	Exploring tie-up with foreign OEMs	-	Mr. R K Gupta, GM-Technical Mob No. +91-8601878078
21	PBM Insulations Pvt Ltd	Manufacture of Insulation Mats	-	Mr. Prashant Goel, Mob No. +91-9837077795
22	Nitya Creation India	Setting up of new manufacturing unit for Precision Engineering products to feed Defence & Aviation sector	Aligarh 1.2 hectares	Mr. Navneet K Varshney, Partner Mob No. +91-9897711029
23	Allen and Alvan Pvt Ltd	Setting up of Drone & Safety manufacturing unit	Aligarh 25 acres	Mr. Dhanjit Vadra, MD Mob No. +91-9837027270

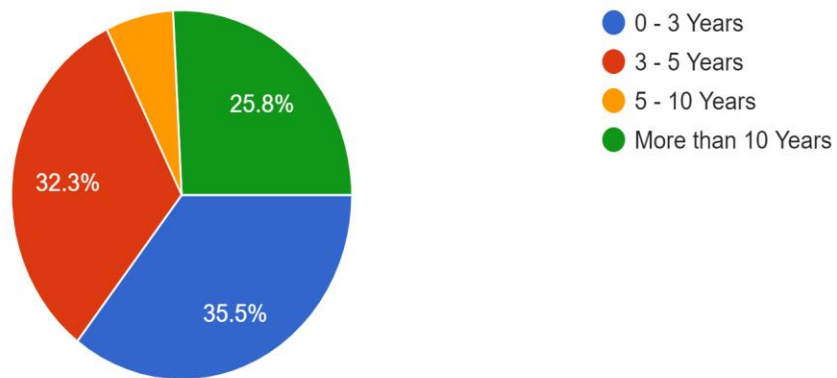
Appx 'D'

(Refers to para 6.34 chapter 6)

FEEDBACK FROM INDUSTRY

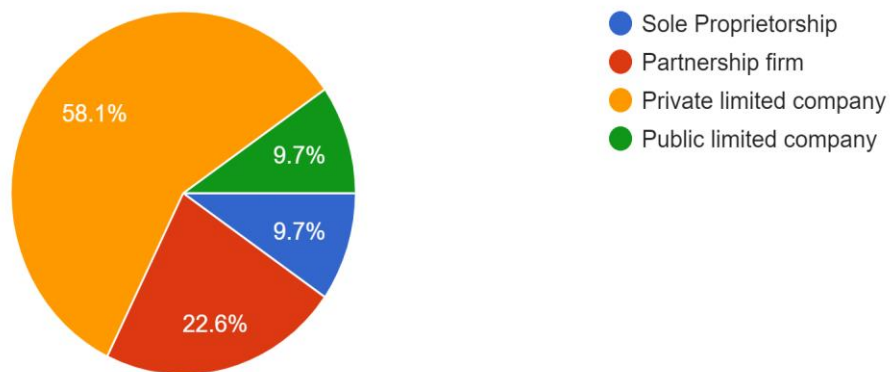
The firm has been in the business of defence production for the last.

31 responses



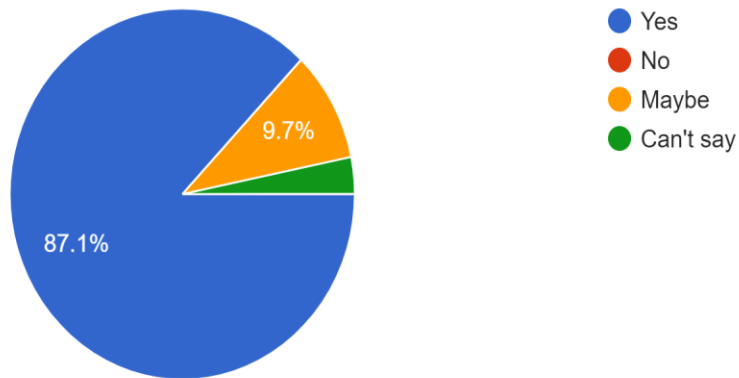
Type of ownership of the firm.

31 responses



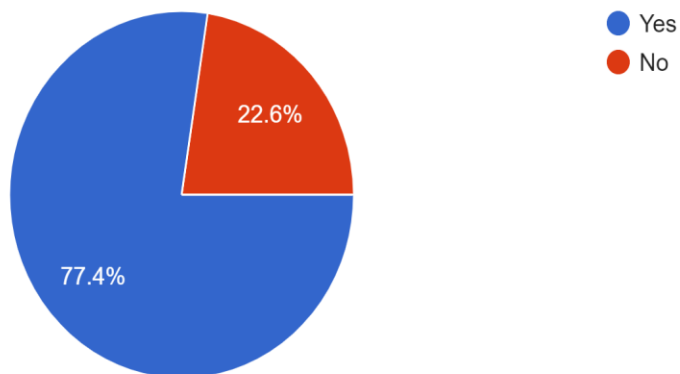
Based on your experience in defence production do you feel DAP 2020 would encourage participation of private players in Defence Production.

31 responses



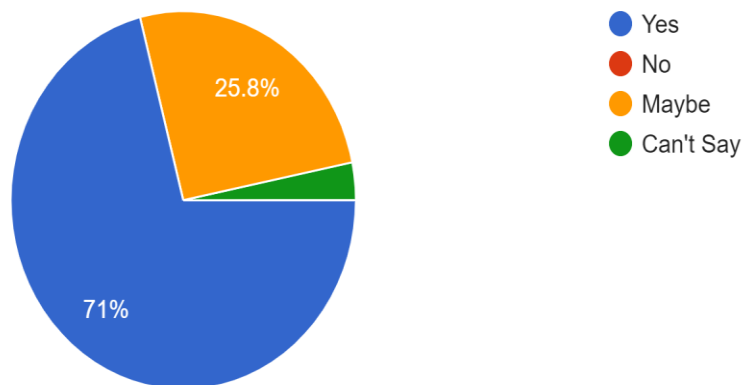
Has your firm provided defence related equipment to the Indian Armed Forces/ CAPFs/ DPSUs

31 responses



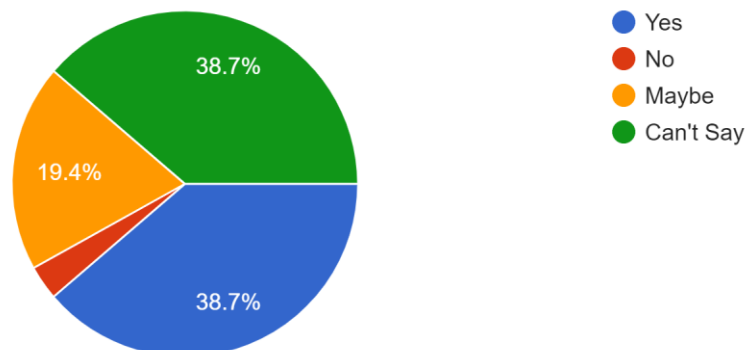
Government decision to establish the UP Defence corridor would provide a good ecosystem for private industry to setup defence production units.

31 responses

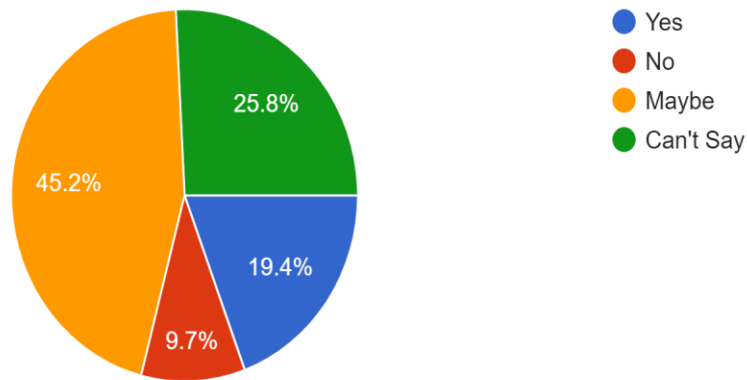


Are the incentives being provided by the UP government attractive for the private players to invest in the UP Defence corridor.

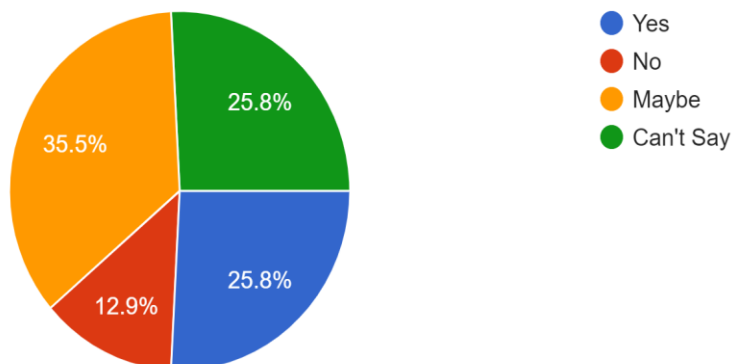
31 responses



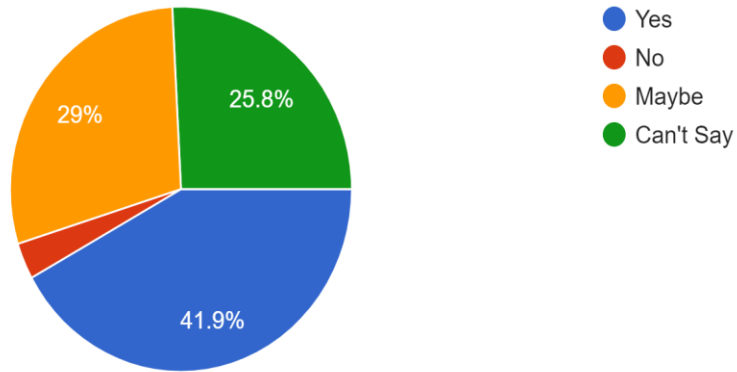
Based on the existing infrastructure, defence industrial setup and the technical manpower available in the proposed UP Defence corridor the ...ustry to be developed is the "Aerospace" Industry.
31 responses



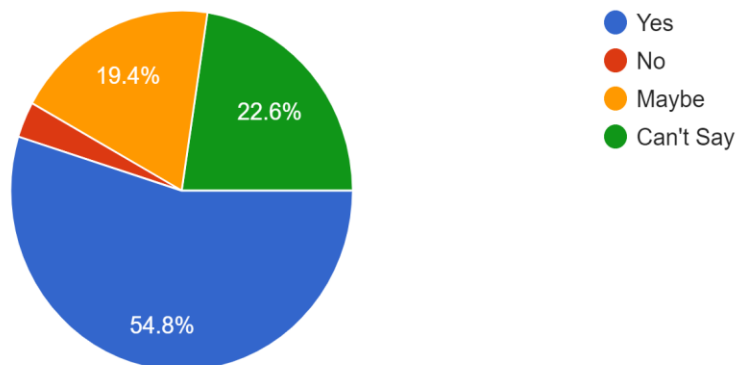
Based on the existing infrastructure, defence industrial setup and the technical manpower available in the proposed UP Defence corridor the...loped is the "Communication and Radar" Industry.
31 responses



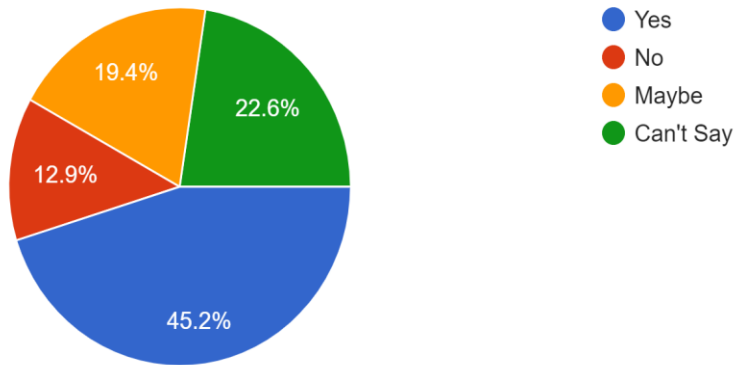
Based on the existing infrastructure, defence industrial setup and the technical manpower available in the proposed UP Defence corridor the... be developed is the "Ammunition and Explosives".
31 responses



Based on the existing infrastructure, defence industrial setup and the technical manpower available in the proposed UP Defence corridor the ...stry to be developed is the "Small Arms" Industry.
31 responses



Based on the existing infrastructure, defence industrial setup and the technical manpower available in the proposed UP Defence corridor the ...s the "Maintenance Repair and Overhaul" Industry.
31 responses



Is Your Firm Planning to invest in the UP Defence Corridor
29 responses

