

BCG

THE BOSTON CONSULTING GROUP



Confederation of Indian Industry



Creating a Vibrant Domestic Defence Manufacturing Sector

The Boston Consulting Group (BCG) is a global management consulting firm and the world's leading advisor on business strategy. We partner with clients from the private, public, and not-for-profit sectors in all regions to identify their highest-value opportunities, address their most critical challenges, and transform their enterprises. Our customized approach combines deep insight into the dynamics of companies and markets with close collaboration at all levels of the client organization. This ensures that our clients achieve sustainable competitive advantage, build more capable organizations, and secure lasting results. Founded in 1963, BCG is a private company with 75 offices in 42 countries. For more information, please visit bcg.com.

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the growth of industry in India, partnering industry and government alike through advisory and consultative processes.

CII is a non-government, not-for-profit, industry led and industry managed organization, playing a proactive role in India's development process. Founded over 115 years ago, it is India's premier business association, with a direct membership of over 8,100 organizations from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 90,000 companies from around 400 national and regional sectoral associations.

CII catalyses change by working closely with government on policy issues, enhancing efficiency, competitiveness and expanding business opportunities for industry through a range of specialised services and global linkages. It also provides a platform for sectoral consensus building and networking. Major emphasis is laid on projecting a positive image of business, assisting industry to identify and execute corporate citizenship programmes. Partnerships with over 120 NGOs across the country carry forward our initiatives in integrated and inclusive development, which include health, education, livelihood, diversity management, skill development and water, to name a few.

With 64 offices and 7 Centres of Excellence in India, and 8 overseas offices in Australia, China, France, Germany, Singapore, South Africa, UK, and USA, as well as institutional partnerships with 223 counterpart organizations in 90 countries, CII serves as a reference point for Indian industry and the international business community.



THE BOSTON CONSULTING GROUP



Confederation of Indian Industry

Creating a Vibrant Domestic Defence Manufacturing Sector

Arindam Bhattacharya

Navneet Vasishth

March 2012

bcg.com

© The Boston Consulting Group, Inc. 2012. All rights reserved.

For information or permission to reprint:

Please contact BCG at:

E-mail: bcg-info@bcg.com

Fax: +91 22 6749 7001, attention BCG/Permissions

Mail: BCG/Permissions

The Boston Consulting Group (India) Private Limited

Nariman Bhavan

14th Floor

Nariman Point

Mumbai 400 021

India

Please contact CII at:

E-mail: ciico@cii.in • Website: www.cii.in

Fax: +91 11 2462 6149, attention CII/Permissions

Tel: +91 11 24629994 – 7

Mail: The Mantosh Sondhi Centre

23, Institutional Area

Lodi Road

New Delhi–110 003

India

CII Membership Helpline: +91 11 435 46244 / +91 99104 46244

CII Helpline Toll free No: 1800–103–1244



Contents

Foreword	5
Executive Summary	8
Indian Defence Sector Spending Set for Rise in the Future	12
Growth Potential in 12 th plan	13
Land Systems	13
Naval Systems	15
Electronics Systems	16
Aerospace	16
Domestic Industry Structure Inadequate to Meet Demands	17
Need to Create a Vibrant Local Manufacturing Sector in Defence	21
Build Domestic Depth in Key Technologies	24
Tap Export Potential	24
Progressive Policies Initiated but Implementation Remains a Challenge	25
Defence Procurement Procedure	25
Defence Production Policy	26
Proposed Liberalization of the Foreign Direct Investment (FDI) Policy	26
Overview of Key Implementation Challenges	27
No clear Accountability for Building Local Capabilities	27
Ambiguities and Inherent Contradictions in Policy	28
Continued Disadvantage of Private Sector due to Procedural Issues	28
Several Lessons can be Learnt from International Examples	30
Existence of a Dedicated Body to Enable Structured Interaction Between Government and Private Players	30
Outline of Critical Technologies, Focus Research Areas Released by the Government and Select Vendors Appointed in these Areas	31
End-to-End Incentive Plan by Government for Private Industry Involvement, Encompassing R&D Support, Risk Coverage of Capital Investments, and Production Planning Support	33
Dedicated Procurement Arm Functioning as a Single Point Reference for Procurement Policy and Contractual Frameworks	34
Dedicated Team to Support Building of the Local Defence Ecosystems	35

Six Point Program to Create a Vibrant Domestic Defence Industrial Base	38
1. Set-up a National Defence Manufacturing Commission	38
2. Make / Buy and Make (Indian) to be Mandatory for Flagship Large Programs with Appropriate Financial Models	40
3. Implement a “Domestic Champion (RUR)” Program and Build Private Sector Capabilities	41
4. Increase the Limit for Foreign Direct Investment	41
5. Streamline the Defence Procurement Infrastructure	42
6. Create Enabling Infrastructure for Capability Building	42
Appendix 1 — Successful Indian Examples	44
Nuclear and Aerospace Sectors	44
Defence Services and DRDO	45
Joint-Ventures in the Defence Space	46
Appendix 2 — Country Profiles	47
USA Defence Industry	47
UK Defence Industry	48
South Africa Defence Industry	50
Australia Defence Industry	52
Turkey Defence Industry	54
Appendix 3 — CII Roadmap Based on Defence Procurement Procedure 2011	56
Bibliography	61

Foreword

Arindam Bhattacharya



The Indian manufacturing industry has been a significant contributor to India's GDP and has displayed impressive growth in the last ten years. However, the sector's 16 per-

cent share in GDP is among the lowest compared to other the rapidly growing developing economies and recently released National Manufacturing Policy has articulated an aspirational objective to increase this share to 25 per cent over next ten years.

A vibrant domestic defence manufacturing sector can be a vital peg to help realize this vision. The Defence Production Policy 2011 has reiterated the strategic and economic importance of self-reliance in the area of defence. Developing a strong defence manufacturing sector enhances security as it reduces reliance on foreign suppliers, provides opportunity to create IP and domestic technologies and capabilities which often have significant civil applications, provide a platform to tap export markets. Most importantly it has a potential to create over one million jobs.

Defence spending in India has grown at about 17 percent during 2007–10, and with this India has emerged as the largest arms importer in the world. By 2014, it is expected that India would become the third largest defence spender after the US and China. Despite this huge market, the current policies and structure of the industry has constrained the domestic defence production with only 30 percent of the demand being met internally. The participation of private sector is even lower at about 10 percent that too mostly from Tier II or III suppliers.

This joint CII–BCG report sets an aspiration of building a vibrant and dynamic defence manufacturing sector in the country. The report looks at best practices across defence manufacturing countries to understand key success factors, different ecosystem management and regulatory approaches used and examines these for their relevance in the Indian context. It also examines potential roadblocks, explores the opportunities, and sets out key imperatives for all stakeholders for meeting these aspirations.

Arindam Bhattacharya
Managing Director
The Boston Consulting Group

Foreword

Ajai Chowdhry



India is being viewed upon as one of the world's most lucrative markets for military products. Equipment spending by Ministry of Defence has increased at 15–20 percent over the last five years,

and is expected to continue growing at least in the mid-term. With several large equipment and modernization programs in the pipeline, analysts are projecting an overall spend of USD 80–100 billion in the next 5 years. The union budget 2011–12, increased the defence allocation to INR 1,64,415.49. Of this INR 69,198.81 crore has been earmarked for capital expenditure which suggests an increase of 15.33 percent.

India has nine Defence Public Sector Undertakings (DPSUs) and thirty-nine Ordnance Factories. With an employee base of ~1.8 lakh people, the size of the military-industrial workforce is similar to countries like UK and France which are among the largest producers of defence related products in the world. In spite of this large set-up, production output has remained insufficient to meet the growing needs.

In spite of the proactive stance of the Government, with regard to private sector participation in defence manufacturing, doing business in India continues to be a highly complex and daunting task for companies. Several challenges remain in implementation which will need to be addressed if this policy shift is to become successful. The majority of equipment contracts have in the past been awarded to foreign corporations. Due to heavy restrictions placed on it, the domestic private sector has not been able to compete effectively in this space. In all, Indian private

players contributed to ~10 percent of total turnover in the defence in 2009 mainly as Tier II or III suppliers.

It is imperative that India should leverage private industry as a strategic defence asset and help it to become a full partner in its growth and modernization plans. The increased push for private participation will enable domestic companies to build critical capabilities in areas that were heretofore excluded for them. The multiplier advantages that could accrue in a host of related sectors such as communications, manufacturing, automotive etc, could be enormous. World over, advancements in military technology have eventually filtered down to other sectors, giving companies a host of competitive advantages.

The strategic advantages of creating a vibrant defence domestic sector will go a long way in accelerating India's manufacturing capability. If a vibrant domestic sector is not created, our procurements will only help create/maintain jobs in other countries and not utilize the opportunity to create the same in India and also save and earn valuable foreign exchange. If India is to achieve its strategic objective of 70–80 percent domestic supply in defence then the indigenous production would need to expand by an average of 30 percent a year. Even with a doubling of current levels of efficiency to about INR 30 lakh per employee per year (presently 15 lakh a year), this will still result in the creation of 1.2 lakh new jobs. Additionally several jobs will be created in-directly through sub-contractors, vendors and other allied agencies. Even using the lower limit multiplier of 3, would result in 3.5 lakh indirect jobs. So a total of 0.5 million jobs could be created in the next five years alone. With a smaller increase in efficiency, the workforce required to meet the targets would be even higher. For a 25 percent efficiency gain, the industry would need an overall one

million additional people. In all, there is a potential for increasing the defence related workforce by 0.5–1 million people within 5 years.

In addition to the growth in ‘job quantity’, increased defence sector exposure is likely to have a larger overall impact on ‘job quality’ as well. The level of technical sophistication and precision in defence is definitely very high. Moreover, defence now makes extensive use of sunrise sectors like robotics, biochemicals, carbon nanotechnology etc. Exposure at an employee level will bring benefits to the industry as a whole.

The Confederation of Indian Industry (CII) remains committed to ensure larger participation of private sectors in the defence manufacturing sector with an aim to achieve self reliance and indigenization in Defence

Production. CII National Defence Council has been and will continue to play the thought leadership role on behalf of the entire Indian Defence Industry. The council is working relentlessly to take up the issues pertaining to the policy and procedures at appropriate levels.

It is with this objective that CII in partnership with The Boston Consulting Group (BCG) is publishing this report to bring to the notice of the stakeholders, the anomalies that exist and continue in the defence sector. The Study also suggests a way ahead towards achieving self reliance and indigenization in Defence Production.

Ajai Chowdhry
Chairman
CII Defence Council



Executive Summary

India has emerged as a key global power driven by the impressive economic growth backed by its longstanding moral leadership on core humanitarian and geopolitical issues. Strong defence capabilities would help the nation in safeguarding the prosperity generated over last couple of decades and also protect key economic interests like trade routes, safety etc going forward. Focus on developing a strong domestic capability in defence would be a great economic growth impetus and also help in skilled job creation in manufacturing, a key need and priority for the nation.

India has been rapidly enhancing its spending on defence. India has already emerged as the largest arms importer in the world. It is expected that India would become the third largest defence spender after the US and China by 2014. Equipment spending by Ministry of Defence has increased by 15–20 percent over the last five years, and is expected to continue growing at least in the mid-term. With several large equipment and modernization programs in the pipeline, analysts are projecting an overall spend of USD 80–100 billion in the next five years. This makes India one of the world's most lucrative markets for military products, and defence suppliers are gearing up to compete. There is an urgent need to leverage India's defence buying clout while negotiating with global OEMs. India should leverage this buying power to ensure that adequate technology transfer takes place during all major projects either to the local partner or national agencies.

The recently released Defence Production Policy 2011 reiterates the strategic and economic importance of selfreliance in the area of defence. In accordance with this policy, Government has, since independence, invested heavily in defence manufacturing and maintenance.

India has nine Defence Public Sector Units (DPSUs) and thirty-nine Ordnance Factories (OFs) which accounted for an annual sale of INR 28,000 crore in 2009. The turnover of the Defence Public Sector Units (DPSU) and Ordnance Factory Board (OFB) was INR 38,622 crore (USD 8.46 billion) in 2010–11. With an employee base of ~1.8 lakh people, the size of the military–industrial workforce is similar to countries like UK and France which are among the largest producers of defence related products in the world.

In spite of this large set-up, production output has remained insufficient to meet the growing needs. India meets 30 percent of its requirements internally, and has negligible exports. UK, with a similar workforce engaged in defence production is a major exporter in addition to meeting 70 percent of requirements domestically. Estimated output per employee for DPSUs and Ordnance Factories comes to 15 lakh per year. In contrast, the annual Survey of Industries, conducted by Ministry of Finance reveals an output of 20–40 lakh per employee per year for a range of manufacturing sectors within India. The majority of equipment contracts have in the past been awarded to foreign corporations. Due to heavy restrictions placed on it, the domestic private sector has not been able to compete effectively in this space. In all, Indian private players contributed to ~10 percent of total turnover in the defence in 2009 mainly as Tier II or III suppliers. This dependence on foreign sources has created several inefficiencies in the procurement of defence equipment. Some of the major issues highlighted by various task forces and reports are described below:

- ◇ Lack of local IP development in critical defence areas and over-reliance on developed nations for critical technology posing a potential national security threat

- ◇ Involvement of foreign policy considerations in equipment purchase leading to protracted negotiations, inefficiencies and extensive time and cost over-runs in most major programs.
- ◇ Fertile playing ground for middlemen, and inability of Government to effectively control or curtail them due to involvement of persons from different nationalities.
- ◇ Delayed entry of private industry into defence production and continued lack of a level playing field for domestic private players.

The strategic advantages of creating a vibrant domestic sector have been pointed out in several reports and studies. If a vibrant domestic sector is not created, our procurements will only help create / maintain jobs in other countries and not utilize the opportunity to create the same in India and also save and earn valuable foreign exchange.

Government of India has set the target for meeting 70 percent of India's defence needs internally in the next 5 years. This would need the local industry to more than double in size resulting in the creation of ~1.2 lakh new jobs. Jobs created in—directly through sub—contractors and other allied agencies bring potential workforce increase to 5 to 10 lakh. Additionally, domestic companies will be exposed to technology and R&D in an area that was heretofore excluded to them. Enormous multiplier advantages could accrue in a host of related sectors. There is also a great potential for profitable exports which could also be tapped by domestic manufacturers. A successful example of a rapidly developing defence sector is in Turkey. Over the last decade or so Turkey has increased its defence exports from USD 100 million to almost a billion dollars. This was a 10x increase in ten years.

Realizing the criticality of this issue, the Government of India released the Defence Procurement Procedure in 2001. 100 percent private equity was allowed licensed production of defence equipment. Since then, there has been a continuous endeavour to improve on the procedures. The Ministry of Defence has been proactive in taking feedback from industry participants towards making the current policy environment more industry friendly. Frequent revisions of the Defence Procurement

Procedure are a clear reflection of the Ministry of Defence's willingness to streamline the procurement process. However, several gaps remain which continue to hinder effective private participation in defence manufacturing.

The defence ecosystem is complex and highly regulated. Manufacturers are dependent on Government for technology inputs as well as sales both within and outside the country. Any increase in private sector production is therefore predicated on support from Government on these fronts. Moreover, the complexity of procedure is much higher in defence than any other sector. New entrants need some level of initiation and hand—holding in order to compete with legacy players. Keeping this in mind, we have proposed a six—pronged agenda to enable advancement of the defence eco—system in the country.

Set-up a National Defence Manufacturing Commission

Government should set-up a national defence manufacturing council under the aegis of the Prime Minister's Office. This body will ensure that domestic manufacturing gets due focus and support from the different Governmental agencies in achieving its goals. The mandate of this body should be to ensure achievement of following goals:

- ◇ Progressive increase share of domestic procurement from 30 to 75 percent in next 10 years
- ◇ Ensure that 8–10 largest weapons programs in the country have a targeted large percentage of locally manufactured content
- ◇ Build local IP in critical defence areas
- ◇ Promote and track civilian applications of technologies and material developed during defence research
- ◇ Support local defence manufacturers in building export capabilities
- ◇ Enable creation of one million new direct and indirect jobs in the defence manufacturing space
- ◇ Monitor implementation of Government's offset policy in letter and spirit for large contracts

Pass an Executive Order with Decision to Use Make / Buy and Make (Indian) Mandatory for Flagship Large Programs with Appropriate Financial Models

The Government should enforce Make or Buy and Make (Indian) classification for all flagship defence contracts and mandate that the prime contractor be an Indian entity. To ensure that technology gaps are overcome, this entity can be a JV between a local entity and relevant global vendors. Eventually more and more projects, even the smaller ones, should also be brought under Make.

Lastly, the Government needs to decide the right financial model for Indian entities working with the Government on these flagship programs. Both Cost plus and Auction model are viable options

Implement a “Domestic Champion (RUR)” Program and Build Private Sector Capabilities

Ministry of Defence had earlier announced formation of Raksha Udyog Ratnas (RURs) for India Defence Industry, which was later abandoned. If industry champions can be identified, based on their managerial and technical capabilities, they would be the key drivers towards raising indigenous defence technological base and world-class manufacturing capabilities in India. The accreditation can be a rolling process that is opened for changes (additions and deletions) on a regular basis.

A rolling process allows the defence department to have a supplier base reflecting the true strengths of domestic manufacturing and technology sector where new emerging manufacturing powerhouses as well as local technology owners get a chance to participate. At the same time, if firms don't live up to mandate, this accreditation can be revoked or suspended based on predefined criteria and due process.

Streamline the Defence Procurement Infrastructure

Defence procurement processes use a variety of systems and processes. Specifically there is need to streamline at the level of offset implementation, DPSU and OFB procurement, and Ministry of Defence centered capital procurement.

Right now, each unit of the public defence manufacturing units use independent processes and procedures for procurement. This creates a very high level of inefficiency. Also oversight of the processes is more difficult due to the level of fragmentation. Offset facilitation also needs significant ramp-up in terms of a more professional project based approach and single window dealings. Ministry of Defence capital procurement, while significantly changed over the past year, needs to become even more streamlined and efficient.

Procurement systems and infrastructure for DPSU and OFB should be centralized into a single agency which will manage different aspects of the procurement process. This system will create a centralized list of defence vendors, become a watering hole for all private vendors who wish to participate in the defence procurement process, and provide guidance to new entrant in the system.

Additionally, it will provide standardized contractual frameworks and clauses that can be accessed by the multiple contracting agencies. This will help to reduce contract variation and complexity and promote a common understanding of contract requirements across the system.

The offset facilitation process should be enhanced through a more professional and specialized approach. Moreover, there is a need for greater role clarity between DoFA, DDP and Ministry of Defence in this area.

Increase the FDI Limit for Foreign Participation

The current upper cap of 26 percent on FDI in defence production needs to be relaxed to 49 percent to ensure adequate participation of interested parties but on case to case basis. Specific technology transfer should be specified and export to friendly foreign countries should be allowed. Post-contract technology should reside in the JV / country.

Create Enabling Infrastructure for Capability Building

Mechanisms to provide access to critical technologies available with research agencies or obtained through TOT arrangements are a key lever in enhancing

capabilities of the sector. A royalty / fee model can easily be developed allowing private sector to commercialize these technologies.

A program dedicated to skill up-gradation of defence manufacturing workforce focussing on both short term actions to plug existing skill gaps and long term initiatives is required to ensure projected skill requirements are developed in the eco-system over a period of time.

Support structure for up-gradation of defence manufacturing facilities (SME specific) is a critical need for deeper capability building. Government should set-up an “Innovation Fund” of 1,000 crore for SMEs in Defence sector. Activities should be primarily around helping SMEs achieve manufacturing certifications like ISO and in establishment of licensed defence units.

Indian Defence Sector Spending Set for Rise in the Future

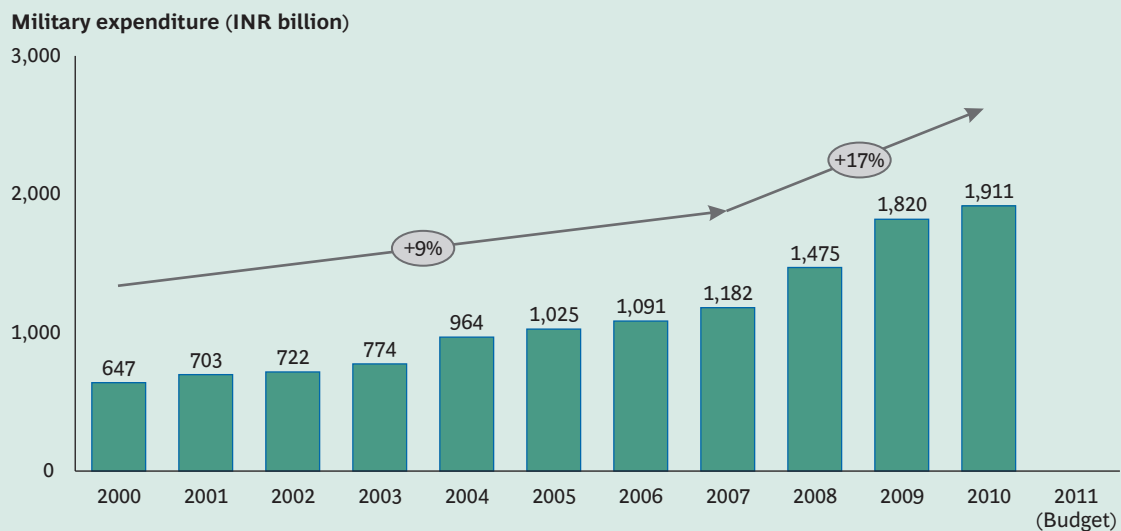
When it comes to defence related developments, India has found itself located inside a veritable Pandora's box. The sub-continental region and its borders have seen an alarming increase in conflict situations. Towards the West, Pakistan and Afghanistan are grappling with internal conflict and the increasing hold of terror groups. In addition, internal security threats in parts of central and eastern parts of India continue to be a major cause for worry for India's para-military forces.

Faced with this increasingly unstable regional political situation, India has been rapidly enhancing its spending

on defence. There was a period of a long lull in defence related spends in India in the decade of the 90s. After the Kargil war, the establishment quickly realized the perils of continued hesitation and initiated several changes. However, acquisition procedures, and philosophy, had by this time become so complex, that in spite of every body's good intentions, progress has been slower than expected. As a result, India is looking at aging fleets in all three services, and urgent need of modernizing weapon systems, and related paraphernalia.

Defence budgets have risen at about 17 percent y-o-y since 2007 (as shown in Exhibit 1). The ratio of capital

Exhibit 1. Defence expenditure over the last decade



Source: SIPRI; BCG analysis.

expenditure within the overall defence spend is also going up from about 40 percent in FY '08 to 47 percent in the last financial year. With several very large equipment purchase programs already in the pipeline, this ratio will certainly rise further. Compared to world average growth rate in military spend of about 4 percent¹, this makes India one of the world's most lucrative markets for military products.

In total, over the next 5 to 6 years, India is expected to spend more than 80 billion USD on equipment purchases (as shown in Table 1). For the Air Force these include a variety of aircraft; Advanced fighters, Multi-role and light combat aircraft and Basic trainers. The navy is also planning investments in Nuclear and Diesel electric submarines, Naval helicopters, a new fleet of destroyers and frigates as well as several long range maritime aircraft. The army has already begun a program for equipment up-gradation and artillery rationalization. It has also planned several purchases of long range gun systems with multi-terrain capabilities.

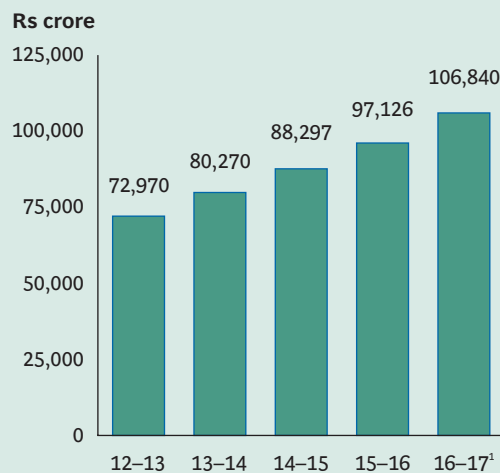
As per the 13th Finance Commission Report the Defence Capital Budget is set to grow at a CAGR of 10 percent per annum during 2010–15. Presuming the same rate of growth for the balance plan period, the total Defence Capital budget allocation during the 12th Plan is likely to be INR 4,45,500 crore (as shown in Exhibit 2). The capital acquisitions budget ranges between of 75 to 85 percent of the total capital expenditure and is likely to be around INR 3,56,400 crore.

The Table 2 describes some of the major programs that are already in the pipeline for the next 2–3 years. In addition to this, another 40–50 billion USD of capital expenditure is foreseen over a five year period. This includes a plan for multi-agency and centralized modernization which will involve purchase of surveillance radars, integrated observation equipment, both short and long range missile systems and a range of non-weapon paraphernalia of use for defence forces.

Growth Potential in 12th plan

In view of the overall need to modernize its defensive capabilities, India's armed forces are expected to increase their purchases of new equipment and technology for the coming years.

Exhibit 2. Projected defence capital expenditure



Source: Indian 13th Finance Commission Report, Dec 2009; BCG analysis.
¹Projections.

Since the introduction of offsets, contracts worth INR 14,146.22 crore have been concluded so far. [Source: Ministry of Defence] Thus, there are now tremendous opportunities available which will spur the growth of the indigenous defence industry, including the private sector, in the next plan period.

Land Systems

In the 11th plan the average capital expenditure in Land Systems was 21 percent of the total capital expenditure. Major investments are planned in BDL and OFB in the 12th plan. Assuming the capital expenditure in Land Systems being maintained at the same proportion of 21

1. "SIPRI Military Expenditure Database 2011, <http://milexdata.sipri.org>". SIPRI military expenditure data include all current and capital expenditure on: (a) the armed forces, including peacekeeping forces; (b) defence ministries and other Government agencies engaged in defence projects; (c) paramilitary forces, when judged to be trained and equipped for military operations; and (d) military space activities. Such expenditures should include: (a) military and civil personnel, including retirement pensions of military personnel and social services for personnel; (b) operations and maintenance; (c) procurement; (d) military research and development; and (e) military aid (in the military expenditure of the donor country). Civil defence and current expenditures on previous military activities, such as veterans' benefits, demobilization, and conversion and weapon destruction are excluded.

Table 1. Projected expenditure by each Service Division (USD million)

	2010–11	2011–12	2012–13	2013–14	2014–15	Total 2011–15
Capital Expenditure (INR Crore)	60,306	66,337	72,971	80,268	88,295	368,177
Army (53%)	31,961	35,158	38,673	42,544	46,795	195,135
Navy (16%)	9,651	10,612	11,675	12,843	14,131	58,907
Air Force (31%)	18,694	20,567	22,623	24,885	27,369	114,134

Sources: Indian 13th Finance Commission Report, December 2009; Union budget(s) and Economic survey 2003–2011; and Deloitte Analysis of allocations by Service Division.

Table 2. Capital investments already in the pipeline for next 2–3 years

Proposals	Quantity (Nos.)	Cost (USD million)
MiG–29 upgrade	67	677
Medium light helicopter	172	286
Additional operation capability – UAV	7	71
VVIP helicopter	12	167
Multi Role Combat Aircraft (MRCA)	126	9,333
ASW helicopter	N.A.	391
155 artillery field gun	140	667
KA 28 upgrade	N.A.	100
Short range Quick Reaction Surface to Air Missiles (QRSAM)	78	1,400
Advanced MRMR planes	6	320
Transportable radars	N.A.	1,200
AFV protection and counter measure system	N.A.	270
Tracked howitzers	100	2,000
EL/M–2083 Aerostat air search radars	9	2,700
Air defence system	N.A.	1,000
T–90s EW system	1,657	N.A.
C 130Js Transport aircraft	6	1,100
Naval multi role helicopters	16	1,000
Light combat aircraft engine	99	600
Combat helicopters	22	550
Airborne early warning and control systems	N.A.	400
Ultra light howitzers	145	667
Wheeled howitzers	185	1,000
Diesel electric submarines	6	6,200
Total value	2,853	32,099

Sources: BCG analysis.

percent of the overall capital expenditure in defence budget, the volume of the same is expected to be INR 93,554 crore in the 12th plan.

Streamlining of India’s defence procurement policy offers a unique opportunity for Indian companies to provide services for the armed forces. Indian Army’s acquisition plan in next 10 to 15 years includes the following:

- ◇ Ultra light howitzers
- ◇ Towed and wheeled 155mm guns
- ◇ Self-propelled tracked and wheeled guns 155 mm artillery guns
- ◇ Mounted gun systems and Air defence guns
- ◇ III Gen anti-tank guided missiles
- ◇ Surface to air missiles with different ranges
- ◇ Futuristic infantry combat vehicle
- ◇ Smart ammunition
- ◇ Artillery rockets
- ◇ Assault rifles and close quarter battle carbine
- ◇ Battle field surveillance and weapon locating radars
- ◇ Night vision equipments

The critical technologies to be acquired in land systems are:

- ◇ Battlefield transparency or intelligence, surveillance and reconnaissance technologies
- ◇ Command, control, communication and computer technologies (C4I technologies)
- ◇ Precision strike technologies for destruction of targets beyond visual range
- ◇ Robotic military vehicles / tactical unmanned vehicles

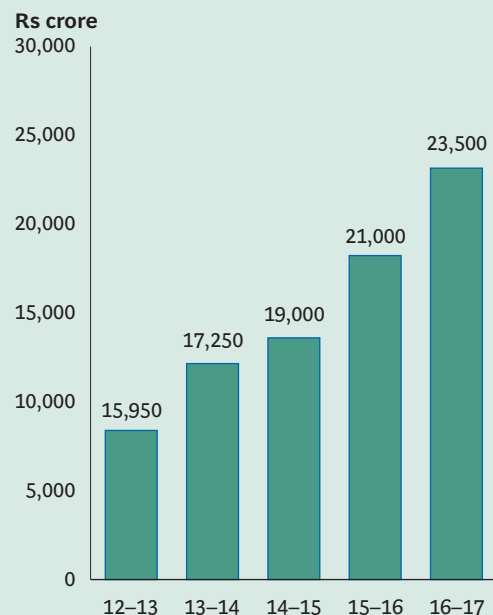
- ◇ Advanced materials
- ◇ Future main battle tanks
- ◇ Directed energy weapons

Naval Systems

To keep its long term maritime interest in focus, Indian Navy has embarked upon an acquisition programme to enhance its capacities substantially for both surface and sub-surface combatants (as shown in Exhibit 3). This is to consolidate its position in the Indian Ocean and beyond in alignment with its redefined strategic interests in structured manner. The long term perspective programme is to acquire indigenous capability in design, development and construction of ships and submarines.

As per Indian Navy’s vision, it expects to become a well equipped maritime force which will include aircraft carriers and various types of combatants including submarines. In alignment with MCPP, currently there are 48 vessels are on order, out of which 43 are placed in Indian shipyards. Apart from indigenous development, 3

Exhibit 3. Warship turnover 12th plan — 2012–2017



Sources: 12th plan, GoI publications, BCG analysis.

warships are being built along with refitting and refurbishment of aircraft carrier at Russian shipyards. In addition, Indian Coast Guard has also undertaken a massive plan to upgrade its capabilities to protect India's coast line in more effective manner. In the aftermath of recent Mumbai terrorist attack, 9 more coast guard stations are being added to existing 30.

Electronics Systems

The Defence Electronics sector is likely to see a high growth during the 12th Plan period (as shown in Exhibit 4). While the Navy and IAF are likely to contribute about 15 percent each, the bulk of the demand (about 70 percent) will come from the Army. Network centric systems, radars, communication systems, electronic warfare and electro optic equipment will be in demand.

The major products and systems planned for induction by Indian Ministry of Defence during 12th plan are — battlefield management systems, future infantry soldier as a system, long range surveillance radars, weapon locating radars, mountain radars, tactical communication systems, software defined radios, EW systems for different

terrains, unmanned aerial vehicles and aerostats, electronic warfare suites for fighter aircrafts, long range electro optical surveillance systems, thermal imager based sights for tanks and weapons, image intensifier based passive night vision devices and weapon and missile systems.

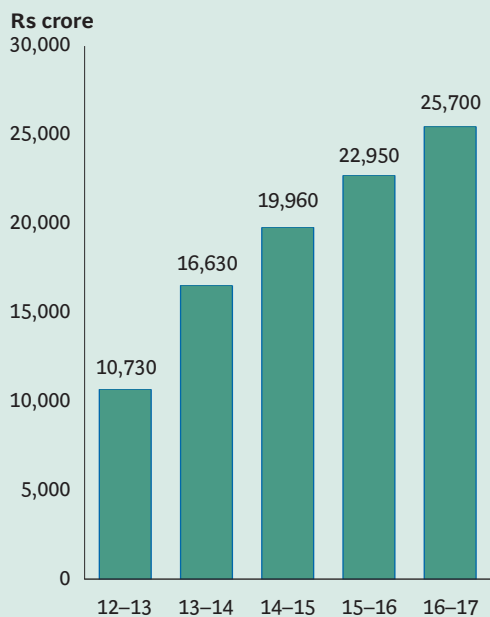
Aerospace

New acquisitions during the 12th and 13th plan period will almost double the military aircraft and helicopters produced in the next five years. Around 650 aircraft are estimated during the 12th Plan period compared to around 300 during the last 5 years. [Source: Hindustan Aeronautics Ltd (HAL) Perspective Plan]

HAL has been the major producer for the Indian armed forces. The turnover of HAL at the end of the 11th five year plan will be INR 14,000 crore with an annual growth rate of more than 10 percent. The growth pattern is expected to continue in the 12th Plan also. The turnover of HAL at the end of 12th five year plan is estimated at INR 23,500 crore. The new programmes will create employment opportunities in HAL. Its manpower requirement at the end of 12th five year plan is estimated at 42,500 from the present level of 34,000.

Capital investment of INR 9,400 crore is estimated for implementation of new projects during the 12th plan and beyond. The capital investments during 11th five year plan were around INR 1,400 crore.

Exhibit 4. Defence electronics production (Projections)



Source: Market estimates.

Domestic Industry Structure Inadequate to Meet Demands

India is already among the top 10 military spenders in the world. However, in contrast with other countries which have large defence industries to support their needs, Indian requirements are met primarily through a mix of Government owned production units and imports. As stated in the Defence Production Policy – 2011, “Self-reliance in Defence is of vital importance for both strategic and economic reasons and has therefore been an important guiding principle for the Government since Independence. Accordingly, Government has, over the years, assiduously built up capabilities in Defence R&D, Ordnance Factories and Defence PSUs to provide our Armed forces with weapons, ammunition, equipment, platforms and systems that they need for the defence of our country”

However, the output from DPSUs and Ordnance Factories has been insufficient to match up to the growing demands. India spends about 30 percent of its total military budget in equipment purchase. In 2010, the total budget for equipment purchase was USD 10–12 billion out of the total of USD 41 billion of military expenditure budgeted (as shown in Exhibit 5). Value of domestic output amounted to ~USD 6.5 billion² in 2009, which is about 60 percent of the budget. A substantial portion of this production however, was low-end manufacturing and assembly with high value components and systems typically being imported. The actual value added by domestic industry accounted for only about 30 percent³ or around USD 4 billion, with the remaining being directly or in-directly imported (as shown in Exhibit 6).

India does have a very extensive defence set-up within the country. Nine PSUs focus on production of defence related equipments (DPSUs) along with thirty-nine other Ordnance Factories. In FY 2009, they accounted

for a total annual sale of ~INR 28,000 crore⁴, primarily to the armed services (as shown in table 3). The DPSUs produce combat aircraft, helicopters, warships, missiles, defence electronics, heavy earth moving equipments and

Table 3. Sales and employment in defence PSUs

Defence public sector units	Value of sales (INR Crore, 2009)	Employees (Nos.)
Hindustan Aeronautics Ltd.	10,373	34,100
Bharat Electronics Ltd.	4,624	11,767
Bharat Earth Movers Ltd.	3,013	12,052
Mazgaon Dockyards Ltd.	5	8,500
Garden Reach Shipbuilders & Engineers Ltd.	741	3,400
Goa Shipyard Ltd.	477	1,671
Bharat Dynamics Ltd.	465	2,894
Mishra Dhatu Nigam Ltd.	309	1,126
Hindustan Shipyards Ltd.	N.A.	3,500
Ordnance Factories	7,229	101,445
Total	27,237	180,455

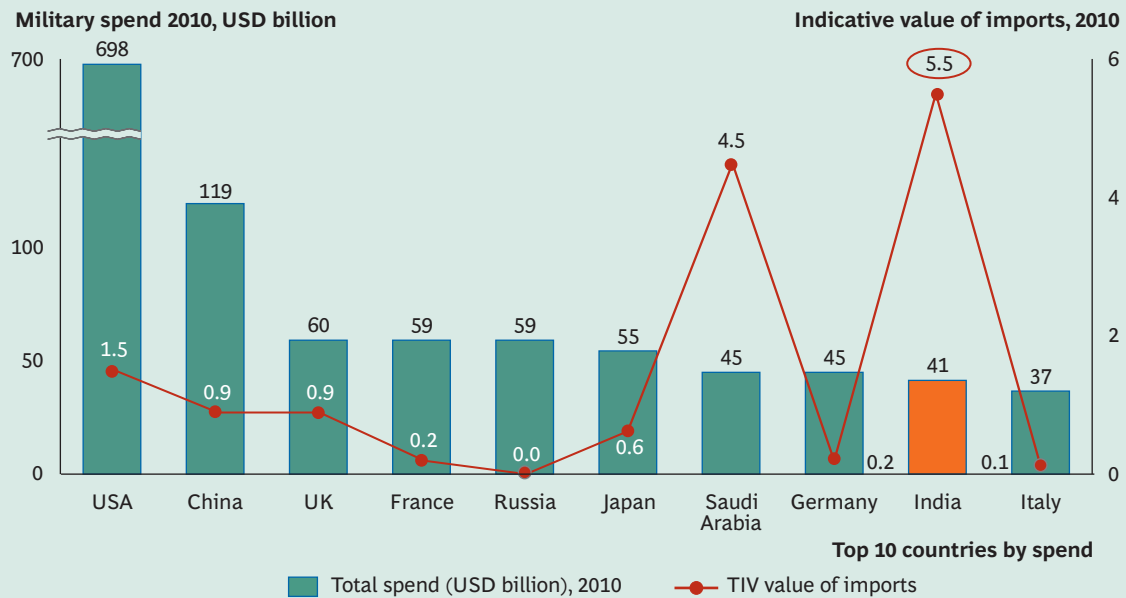
Source: Market estimates.

2. Estimation based on reported annual sales of DPSUs and Ordnance Factories, and 10 percent additional contribution of private enterprises

3. http://www.ciidefence.com/events/MSME_DEFENCE/SME_Flyer.pdf.

4. Annual reports of Ministry of Defence, 2009–10, page 55 of 225; <http://mod.nic.in/reports/AR-eng-2010.pdf>

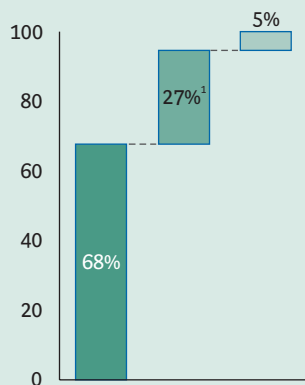
Exhibit 5. Global military spending and import levels



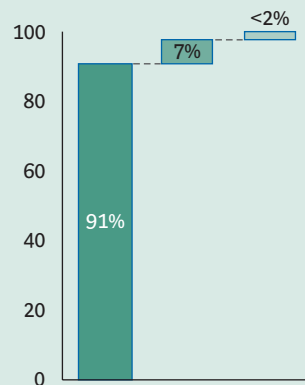
Source: SIPRI.

Exhibit 6. Import dependence in defence across economies

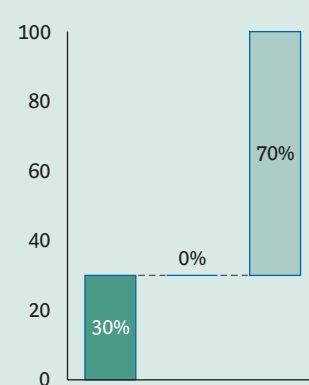
32% of UK spend is with foreign owned companies or multinational programmes (% spend 2004/5)



In contrast in the US less than 10% in total was spent with foreign owned companies



India spends ~70% of capital equipment purchase budget on imports



Legend: ■ Indian owned companies
■ Foreign owned companies
■ Imports

Sources: DS&S analysis of MOD SRG data and DoD document on foreign sourcing — March 2005.

¹Includes European programme organizations (E.g. NETMA).

specialist alloys. The total investment (equity) made by Government in share capital of the Defence PSUs is of the order of INR 1,219 crore and their total net worth in the year 2009–10 was INR 17,554 crore. The DPSUs have also been the recipients of significant support from the Government in terms of research and development assistance (particularly through the work of the DRDO), investments in productive capacity, tax breaks and prioritization for tenders. However, the production activities of the DPSUs in relation to complex systems have typically been by way of licensed production based on foreign developed technology.⁵

In all, the DPSUs and Ordnance Factories employ approximately 1.8 lakh people⁶. This is comparable to industry employment figures for several other countries like UK and France. For example, in UK a 2005 study approximated ~135,000 personnel involved in employment directly related to ministry of defence expenditure (not including sub-contractors). Total employment in UK based defence industries was estimated at ~310,000⁷. Similar figures for France indicate approximate domestic employment of ~200,000⁸ people. However, when compared to the much higher output

levels of these countries, the productivity of the Indian defence sector appears extremely low.

An analysis of the employee productivity reveals that the defence sector has a long way to go even to catch up to benchmarks from the domestic private sector. The annual survey of Industries, conducted by the ministry of Finance reveals an output of 20 to 40 lakh per employee per year for a range of manufacturing sectors (as shown in Exhibit 7). Most of these sectors in India, have a healthy mix of Government owned and other enterprises. In contrast, estimated output per employee for DPSUs and Ordnance Factories comes to 15 lakh per year. Defence production in India can be assumed to be in the mid-tech range of manufacturing, and output figures should

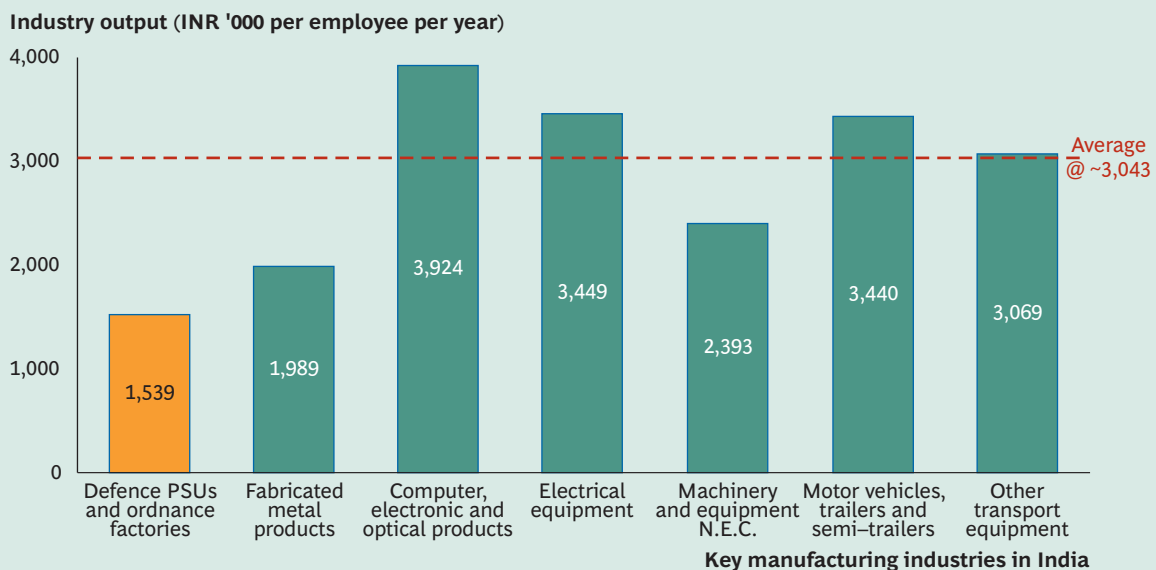
5. Source: (2010) 'Chapter Ten: Reforming India's Defence Industries' in The Military Balance, February, pp.473–478

6. Approximated based on several published annual reports of each defence sector PSU and published articles in respected industry journals.

7. 'Estimated UK Regional Employment Dependent on Ministry of Defence Expenditure,' DASA, Defence Statistics Bulletin, no. 7, London, Ministry of Defence, March 2007.

8. BICC Conversion Survey 2005, page 167–168

Exhibit 7. Manufacturing productivity across sectors



Sources: Annual Survey of Industries — Ministry of Finance, Annual reports of DPSUs and MOD.

ideally lie around INR 30 lakh per employee. This implies a doubling of efficiency from the current.

It will be relevant to compare and contrast industry structures of other manufacturing set-ups within the country to understand the key reasons for this vast difference in efficiency. One glaring difference is the preponderance of Government owned and run institutions in the defence space. While this will not be the only reason for the difference, it is very likely to be a major contributing factor. It is also unlikely that in the near future, the level of step-up being required from the local defence establishments can be delivered purely through additional investment, without an attempt to increase output efficiency within the existing industry.

In addition to Government run and owned institutions, there is also a small private or corporate sector involved in defence related production. The private sector has

mainly been involved in supply of raw materials, semi-finished products, parts and components to Defence PSUs, Ordnance Factories, Base Workshops of Army, Base Repair Depots of Air Force and the Dockyards of the Navy (as shown in Table 4). Defence PSUs and Ordnance Factories outsource ~20–25 percent of their production to the private sector. Out of this outsourcing, about a quarter is met through the small-scale sector. CII estimates that over 6000 SMEs operate in this space supplying components and sub-assemblies to the DPSUs, Ordnance Factories, and DRDO⁹. A few large Indian companies also exist which are licensed for production of actual weapon systems and defence equipment. In all, private players contributed to ~10 percent of the total turnover in the defence industry in 2009.

9. http://www.ciidefence.com/events/MSME_DEFENCE/SME_Flyer.pdf.

Table 4. Key private sector players in Indian defence industry

Private player	Products / services
Ashok Leyland	Design, development and manufacture of special vehicles for armed forces
Bharat Forge	Manufacture of various forged and machined components for the automotive and non-automotive sector
Godrej and Boyce	High tech engineering, including aerospace, construction and custom-built critical equipment
HCL Infosystems	System integration, Large scale project management, technology rollouts
HCL Technologies	IT & software development company offering various services such as application development, outsourcing software, systems integration and communication
Infosys Technologies	Systems integration, product engineering, custom software development, maintenance, re-engineering, independent testing and validation services, IT infrastructure services and business process outsourcing
Kirloskar Brothers	Infrastructure projects (water supply, power plants), engineered and industrial pumps
Larsen and Toubro	Design, development and manufacture of integrated land-based and naval missile systems, electronics, control systems and integrated naval engineering systems
Mahindra and Mahindra	Light combat and armoured vehicles, simulators for weapons and weapon systems, sea mines, small arms and ammunition
Pipavav Defence and Offshore Engineering	Building warships, submarines and other vessels for the Indian Navy. Runs one of India's largest shipyards and dry docks
Tata Consultancy	Software services and consulting, the largest provider of information technology and business process outsourcing services in India
Tata Motors	India's largest company in the automobile and commercial vehicle sector
Tata Power	India's largest private sector electricity generating company
Wipro Technologies	IT and systems support in automobile, aerospace, high-tech, and industrial domains

Sources: Sharma, R (2007), '12 firms to get Raksha Udyog Ratna status', The Hindu, June 18 2007, accessed online: <http://www.thehindu.com/2007/06/18/stories/2007061801911300.htm> and Siddiqui, H. (2008), 'Defence min does away with RUR status for pvt military hardware cos', Financial Express, 3 August 2008, accessed online: <http://www.financialexpress.com/news/defence-min-does-away-with-rur-status-for-pvt-military-hardware-cos/343921/>



Need to Create a Vibrant Local Manufacturing Sector in Defence

Historically, India has always favoured the public sector over the private in the areas of defence production. India's first industrial-policy resolution in 1948 made it clear that a major portion of industrial capacity was to be reserved for the public sector including all arms production. When this document was revised in 1956, it placed the munitions, aircraft and shipbuilding industries in public sector under central Government control, preventing private sector production. In 1998, the Government set up six task-forces to assess and consider the involvement of the private sector in Defence Production. Based on the recommendations of these Task Forces, the Government accepted the recommendation of private sector participation in Defence Production to complement the efforts the public sector. The Government also clarified that entry of private sector should not be considered as a threat towards existence of Defence PSUs and Ordnance Factories, which have several inherent advantages.

It was only in 2002, that the guidelines for licensing of manufacturing arms and ammunition were issued by the Ministry of Industry and Commerce. Therefore, until very recently, the private sector in India has been limited to the production of intermediate products, components and spare parts. Lack of a local supply and high dependence on foreign supply base has created several issues in the procurement of defence equipment.

1. The over-reliance on foreign sources has led to complete lack of local IP development in critical defence areas posing a potential national security threat. In 2005, the Indian Standing Committee on Defence reviewed the defence force procurement policy and procedures¹⁰. This report identified that

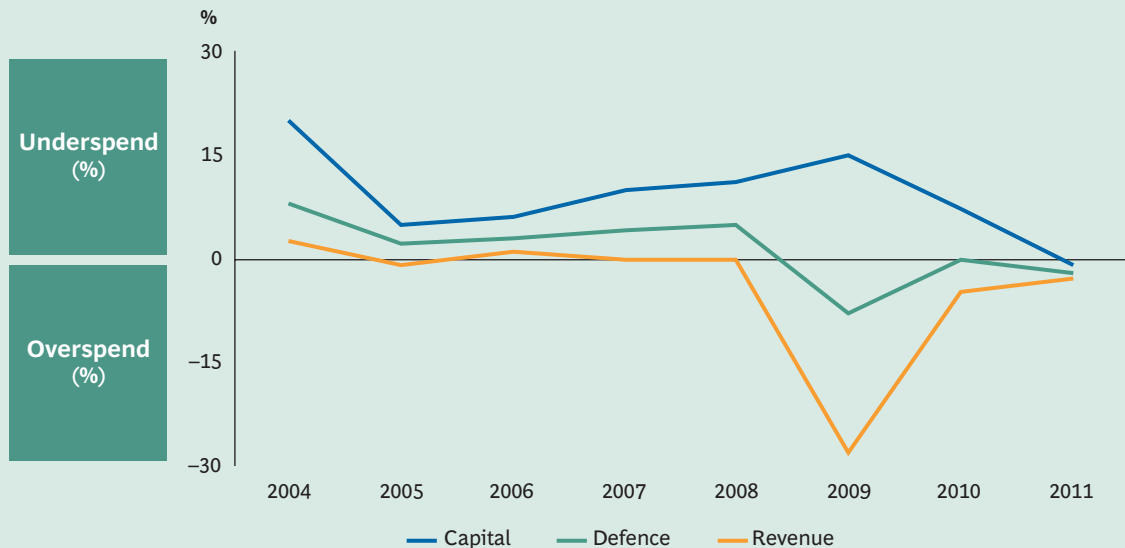
although India had been independent for 55 years, cutting edge military technologies had not been locally developed and the procurement of capital equipment remained reliant on imports. [CII — Deloitte, 2010]

2. Due to the political nature of defence contracts, and security concerns, procurement from global vendors is extremely slow. At the supplier end, global suppliers typically need to customize weapon systems to Indian requirements resulting in both time and cost overruns. Budgetary grants to the level of 20 percent of the total have been surrendered on several occasions due to non-completion of the procurement processes (as shown in Exhibit 8).
3. Different political and administrative systems and language barriers have created fertile playing ground for middlemen. In the case of any illegality, it becomes difficult for the Government to take strong punitive action, as foreign Governments are involved in the process. Both middle-men and Ministry of Defence officials have been placed under the scanner several times in the past decade.

Building India's defence equipment manufacturing capability is of the highest strategic importance. Nations invest heavily in building this capability in order to ensure independence of supply during times of duress. India has already begun on a path of reform of its vast defence production and procurement establishment. It now aspires to move away from the historical pattern of foreign procurement and licensed production or assembly.

10. Procurement Policy and Procedure. Standing Committee on Defence (2005-06) Sixth Report.

Exhibit 8. Budget utilization



Sources: GoI publications, Market estimates.

The principles of self-sufficiency and indigenous development become meaningful only when linked with strengthening national defence capability. Consequently, after careful consideration and in consultation with all stakeholders, Government have decided to put in place a Defence Production Policy. The objectives of the Policy are to achieve substantive self reliance in the design, development and production of equipment / weapon systems / platforms required for defence in as early a time frame as possible; to create conditions conducive for the private industry to take an active role in this endeavour; to enhance potential of SMEs in indigenization and to broaden the defence R&D base of the country. [Department of Defence Production, Government of India, 2011]

Questions rise, certainly in case of the DPSUs' regarding their efficiency and ability to meet targets. One such example is that of the Garden Reach Shipbuilders, which took 12 years to build the INS Brahmaputra, whereas according to CIA estimates, the 'cash strapped' Russians could do it in about 4 years¹¹. On the other hand, private industry in India has repeatedly proven itself capable of rapid up-scaling, and delivering to international standards of quality. Especially in the new sectors of industry like communications, electronics, bio-technology,

Indian industry has already achieved world class standards and is well placed to serve the country in the defence arena as well.

Here are some highlights of private sector's achievements in the above mentioned sectors

- ◇ In Automobiles, India is home to production plants of global majors like General Motors, Tata, Ford, Suzuki, Hyundai, Honda and Fiat.
- ◇ In electronics and semi-conductors, India has over 120-130 top chip-designing firms working with leading edge technology.
- ◇ In Telecommunications, global mobile handset manufacturers like Nokia and LG have established production units.
- ◇ In ITO-BPO, estimated revenues are USD 73.1 billion in FY 2010 with IT software and services accounting for USD 63.7 billion

11. 2007-08, Defence Production: Should the markets be kept out? by Ketan Kapoor. Quote attributed to Mr Vishal Thapar, Defence Correspondent, CNN-IBN.

Domestic capability critical in light of denial regimes of large defence players

The issues surrounding complex weapons systems are compounded by the fact that the effectiveness of a weapon system is relative to other like or adversarial systems. For this reason, Governments which fund the invention and development of these systems have an interest in restraining the transfer of cutting edge weapon systems to other countries and therefore create export barriers or denial regimes for some systems. One example of an exporting barrier is the USA's International Traffic in Arms Regulations (ITARs). ITARS is a set of regulations that controls defence related equipment and services which are on the United States Munitions List. In practice, ITARS regulations

dictate that technology and information used by or for the military cannot be shared with any non-US individual unless proper authorization has been provided. The USA therefore restricts knowledge that is used in the production of their complex weapons systems. Most countries implement similar denial regimes to protect their technological competitive advantage in weapon systems. India will necessarily need to develop the capability of their defence industry prior to making serious advances in proportion of capital equipment that is manufactured locally. [CII — Deloitte, 2010]

Job creation: One million additional jobs

If India is to achieve its strategic objective of 70–80 percent domestic supply in defence, then it needs to rapidly grow its existing industrial base. This would represent an effective reversal of historic trends with the local industry needing to more than double in size in five years. As shown in the table, indigenous production would need to expand by an average of 30 percent a year. Even with a doubling of current levels of efficiency to about INR 30 lakh per employee per year, this will still result in the creation of ~1.2 lakh new jobs. Additionally several jobs will be created in—directly through sub—contractors, vendors and other allied agencies. NASSCOM estimates that indirect job multiplier for IT is 3–5 for every direct job created. Even using the lower limit multiplier of 3, would result in 3.5 lakh indirect jobs. So a total of 0.5 million jobs could be created in the next 5 years alone.

With a smaller increase in efficiency, the workforce required to meet the targets would be even higher. For a 25 percent efficiency gain, the industry would need an overall one million additional people. In all, there is a potential for increasing the defence related workforce by 0.5–1 million people within five years.

In addition to the growth in 'job quantity', increased defence sector exposure is likely to have a larger overall impact on 'job quality' as well. The level of technical sophistication and precision in defence is definitely very high, with small error margins available to manufacturers. Moreover, defence now makes extensive use of sunrise sectors like robotics, biochemicals, carbon nanotechnology etc. Exposure at an employee level will bring benefits to the industry as a whole.

Table 5: Forecast growth of imported vs indigenous production, if targets are met

	2011	2012	2013	2014	2015
Capital Expenditure (USD million)	13,110	14,421	15,863	17,450	19,195
Indigenous growth rate	39.33%	33.16%	29.13%	26.30%	24.19%
Imported growth rate	-2.57%	-4.19%	-6.30%	-9.13%	-13.16%
Potential new direct jobs created in domestic sector ¹	29,341	19,934	21,926	24,131	26,533
Potential new indirect jobs created in domestic sector ¹	146,705	99,670	109,630	120,655	132,665

Sources: Indian 13th Finance Commission Report, Dec 2009; Deloitte analysis — nominal projections, BCG analysis.

A vibrant domestic defence manufacturing sector will build strategic domestic depth in key sectors and also allow the economy to tap into export potential in the defence sector.

Build Domestic Depth in Key Technologies

It is imperative that India should leverage private industry as a strategic defence asset and help it to become a full partner in its growth and modernization plans. Over the last two decades, India has been increasingly moving towards a more open-market economy, reducing historic controls on foreign trade and investment and privatizing Government-owned companies across a range of sectors, from airports to electricity generation to telecommunication firms. This has catalyzed India into one of the fastest growing emerging markets, with its GDP growing by seven per cent each year on an average since 1995.

India's 'economic miracle' has been underpinned by a significant expansion in its advanced manufacturing, engineering and ICT industries and is forecast to continue. As an up-coming manufacturing hub, India is now supporting the global production of several precision

machines. As a leader in IT and ITES services, domestic private enterprises help to build advanced technology systems in several industries in the world.

The increased push for private participation will enable domestic companies to build critical capabilities in areas that were heretofore excluded for them. The multiplier advantages that could accrue in a host of related sectors such as communications, manufacturing, automotive etc, could be enormous. World over, advancements in military technology have eventually filtered down to other sectors, giving companies a host of competitive advantages.

Tap Export Potential

Once the domestic sector develops the requisite skills for meeting the needs of Indian Armed Forces, they can start using these skills for export. This would be further beneficial both in terms of improving export balance but also further accentuating the job creation potential of the sector. A great example for this is Turkey. Over the last decade or so, defence exports from the country have increased by almost 10X from a sum of USD 100 million to almost a billion dollars as per recent estimates. A key driver of this has been strict implementation of offset pledges.

Incredible growth in Turkey's defence industry

Prior to the 1990s Turkey's defence procurement model was based mainly on direct procurement (off-the-shelf purchases), however as a result of the Government efforts and policies in support of local industries, the procurement model of Turkey underwent a gradual but significant change throughout the 1990s to co-production, and finally during the last decade to local production (i.e., developing its own designs) and system integration.

Most major projects encouraged by Turkey have been international joint ventures and coproduction enterprises. In most cases, the foreign partner must agree to an offset provision, i.e., a commitment to purchase some part of the resulting production, or

components or other goods manufactured in Turkey. Turkish defence products now range from modern jet fighters and complex components for anti-aircraft missiles to high speed patrol boats and frigates to armoured vehicles and sophisticated air defence and electronics command and control systems.

Turkish defence industry exports stood at USD 130 million in 2001. According to Turkey's Association of Defence Industry Manufacturers, or SaSaD, local industries exported systems worth USD 576 million in 2008 and USD 669 million in 2009. Recent reports indicate that Turkey is targeting a total of USD 1.5 billion in defence related exports in 2011-12, representing a 10x increase in ten years.

Progressive Policies Initiated but Implementation Remains a Challenge

In recognition of this urgent need for reform, the Ministry Of Defence (MoD) in 2001, allowed private ownership in defence manufacturing. Since then, there has been a continuous endeavour to streamline the defence procurement procedures. The Ministry of Defence in India has been proactive in taking feedback from industry participants and other stakeholders towards making current policy environment more industry friendly. The frequent revisions of Defence Procurement Procedure (DPP) (7th revision in a span of nine years since the first one in 2002) is a clear reflection of the Ministry of Defence's willingness to streamline the process of procurement. [CII — KPMG, 2010]

Defence Procurement Procedure

The Defence Procurement Procedure is a very comprehensive document with a three-fold objective

- ◇ To ensure expeditious procurement of the approved requirements of the Armed Forces in terms of capabilities sought and time frame prescribed by optimally utilizing the allocated budgetary resources.
- ◇ To demonstrate the highest degree of probity and public accountability, transparency in operations, free competition and impartiality.
- ◇ To keep the goal of achieving self-reliance in defence equipment in mind.

Defence Procurement Procedure announced since 2005, have the offset clause which mandates a 30 percent offset obligation for procurement proposals where indicative cost is INR 3 billion or more. Procurement schemes are categorized as 'Buy (Global)' involving

outright purchase from foreign / Indian vendors and 'Buy and Make (Indian) / Buy and Make (Global) with Transfer of Technology' i.e. purchase from foreign vendor followed by Licensed Production. The policy regime, therefore, supports domestic manufacture of defence items. Amendments to the Defence Procurement Procedure in 2009 announced that a 15-year Long Term Integrated Perspective Plan (LTIPP) of the armed forces outlining technology perspective and capability road-map would be made public. The most notable change in Defence Procurement Procedure 2011 is the expansion of scope of offset policy guidelines to include civil aerospace, internal security and training within the ambit of eligible products and services for the discharge of offset obligations. The expansion in the list of companies eligible for Transfer of Technology for maintenance infrastructure has also been done.

The Defence Procurement Procedure 2011 is widely accepted by the industry as a well planned and comprehensive document in spirit. However, its implementation has widely been judged to be inadequate. Provisions for release of the LTIPP have been under implementation for several years, but no document has yet been released for public. In the case of Buy and Make contracts, TOT nominees have traditionally been DPSUs with a large percentage of back-end components and sub-systems being manufactured locally by Ordnance Factories and other feeder units of the DPSUs¹². CII has released a detailed discussion and road-map document highlighting industry viewpoints relating to each point in the Defence Procurement Procedure 2011. This is attached in appendix.

12. "Enhancing role of SMEs in Indian defence industry", CII — Ernst & Young, 2010, Page 6 out of 84.

Defence Production Policy

On a parallel front, the Defence Production Policy was issued recently, with an aim to “harness the emerging dynamism of Indian industry and capabilities available in the academia and the R&D institutes”. Besides taking steps towards the promotion of SMEs, providing necessary impetus to R&D and addressing the grievances of the Indian industry, the Government has been forthcoming to design the domestic manufacturing in line with the futuristic demands from the defence forces. The Production policy also aims at progressively identifying and addressing any issue which impacts; or has the potential of impacting the competitiveness of the Indian defence industry in comparison to foreign companies.

It would be worthwhile to designate a mechanism that works towards enhancement of private sector participation as has been modeled for the DPSUs. [CII — KPMG, 2010]

Proposed Liberalization of the Foreign Direct Investment (FDI) Policy

FDI in the defence sector remains one of the most hotly debated topics for the industry. However, mixed views exist amongst industry segments on FDI liberalization. Where one school of thought believes that enhanced FDI in this sector would provide the much needed boost the defence equipment manufacturing; others believe that such liberalization would impair the growth of the domestic industry and would shift the control and management in foreign hands. To this effect, the Department of Industrial Policy and Promotion (DIPP) had put forth in the public domain, a discussion paper Foreign Direct Investment (FDI) in defence sector (May 2010) suggesting further liberalization of the FDI regime from existing 26 percent to 49 percent under the approval route, however there is significant push back due to security fears within the establishment. [CII — KPMG, 2010]

Overview of Key Implementation Challenges

In spite of the proactive stance of the Government, with regard to private sector participation in defence manufacturing, doing business in India continues to be a highly complex and daunting task for companies¹³. Several implementation challenges need to be addressed for this policy shift to be successful.

No clear Accountability for Building Local Capabilities

All policy documents outline the need for a strong domestic sector in defence manufacturing. There is an urgent need to ensure that the sector is made capable of moving beyond basic component supply to Tier 1 and system integration activities.

This paradigm shift in the concept of indigenization can be facilitated only by proceeding according to a well planned defence manufacturing policy based on ‘product strategy’ [Committee on Review of Defence Procurement Procedure (Vijay Kelkar), 2005]. The Government had also accepted this, and in its initial drafts of the Defence Procurement Procedure itself, had clearly stated its objective to reverse the unequal situation between Indian and global defence players.

However, currently there is no centralized agency accountable to deliver this objective. As a result, no concerted effort has been made to ensure development of a defence manufacturing eco-system. Private sector players desirous of entering the defence space find themselves competing against the much larger and more experienced DPSUs and global manufacturers. In order to correct this historical imbalance, the Government will need to play a more pro-active role in nurturing and developing this sector.

There are several areas where the sector needs support in developing a more conducive eco-system. One key element in this is the availability of ‘right skilled’ resources. With the increasing technological sophistication in defence, skill requirements of the industry are very specific. Meeting these requires a framework of specialized courses, additions to curricula of existing and related fields, and a network of knowledgeable experts in the field who can be tapped.

Another area of immediate concern is R&D and greater co-ordination between research institutes like DRDO, Universities, etc with private industry players. These institutions are a rich source of human capital, which can be very effectively leveraged to help the sector jump-start its development. In the current environment of blanket secrecy, it is difficult to develop meaningful partnerships with academia beyond DRDO. Research grants and funding can be made available through a

Excerpt from Kelkar committee report

“There is an urgent need to review the whole concept of indigenization and self-reliance and it is time to go beyond the idea of looking at indigenization purely as import substitution of components, subassemblies, etc. within the country from raw materials. Today indigenization as a concept will need to involve capability enhancement and development, increasing know-why, design and system integration, rather than having numerical targets.”

13. Doing business with the Indian Defence Regime, By Maj Gen Mrinal Suman, Indian Defence Review, Issue: Vol 23.1 Jan-Mar 2008 | Date: 08 December, 2010

partnership approach if private players are assured that some of the gains can accrue to them.

Skill up-gradation is also necessary within the manufacturing set-ups of interested private participants. Weapons technology requires a high level of precision and sophistication, and needs at its back-end a highly skilled work-force. Skill up-gradation programs for industry professionals in the form of certifiable training and courses are necessary to provide the required lead forward. In addition, companies need support and advice in dealing with the myriad of administrative procedures and regulations. As the industry expands, and begins to look towards exports as an additional source of income, players will also need support in managing international agreements and regulations.

In all of these areas, it is imperative to proceed in a time-bound, centralized manner. This ensures fast and equitable growth for the industry and enables a larger set of companies to come forward with the requisite skills for this sector. A common body, with accountability for these aims is more likely to succeed than ad-hoc attempts by a multiplicity of players, none of whom will have a scale to put together a comprehensive enablement organization.

Ambiguities and Inherent Contradictions in Policy

India has made offsets mandatory for all contracts over INR 300 crore. Though the policy has been promulgated in 2005, a number of major issues remain imprecise. As per the policy, offset obligation can be discharged through any of the following routes:

- ◇ Direct purchase of or executing export orders for defence products and services provided by Indian defence industries.
- ◇ FDI in Indian defence industries.
- ◇ FDI in Indian organizations engaged in research in defence R&D.

Defence Procurement Procedure – 2006 defines the Indian defence industry as consisting of Defence Public Sector Undertakings, the Ordnance Factory Board, and any private defence industry manufacturing these products or components under an industrial licence

granted for such manufacture. Further, for the purpose of defence offsets, ‘services’ mean maintenance, overhaul, up-gradation, life extension, engineering, design, testing, defence related software or quality assurance services.

By the above definition, mostly public sector companies qualify as Indian defence industries as very few licences have been issued to the private sector. In any case licences are required to be issued only for the manufacture of arms and ammunition, whereas defence production covers a vast canvas. For example, IT companies require no licence to produce defence related software. It is not clear if they get counted as a part of the Indian defence industry for offsets. Will export of defence related software by Infosys, Wipro or Satyam be acceptable against offset obligations?

Similarly, provisions are not clear as regards FDI in defence R&D. While foreign investment in defence manufacturing in India is subject to a 26 percent cap, 100 percent FDI is permitted under automatic route in the services sector, irrespective of whether they are provided to the defence industry (such as software development, maintenance services, R&D etc). Moreover, it is not clear if the FDI cap applies to defence R&D as well. The policy is silent about it. Most major foreign defence manufacturers are wary of these ambiguities and want a clear-cut long term policy.

Continued Disadvantage of Private Sector due to Procedural Issues

The DAC has been categorizing Request For Proposals (RFP) as “Buy”, “Buy and Make (Indian or Global)” or “Make”, based on the advice given by DRDO and the public sector. Private industry has been involved at the early stages while recommending categorization (SCAPCC), however industry, including industry organizations, is neither part of the decision making process nor even aware of the final outcomes. At times, RFIs are arbitrarily withdrawn. In all the deals, where transfer of technology was negotiated, the nominated recipient was always a DPSU, even if a private sector company was better placed in terms of infrastructure and know-how to absorb the technology. There is an inherent conflict of interest in the structure of the Indian defence establishment due to common power centre in production and procurement. Due to the tendency of individual decision makers to veer towards known DPSUs as well as

the greater influence of DPSUs themselves in their position as internal to the ministry workings, procurement decisions invariably get taken in their favour.

There are several areas of disadvantage that can be combated to make the playing field more level for domestic private participants:

- ◆ **No advance knowledge of sector requirements:** Requirements of the armed forces are not made known to the private sector sufficiently in advance, with the result that it does not get adequate time, either to scout for foreign tie-ups or to establish the necessary facilities. The time given for the submission of technical and commercial proposals is grossly inadequate for a new entrant in the field. Currently only the Navy shares the LTIPP. The plans for all 3 services should be made available online.
- ◆ **Domestic industry not considered while framing requirements:** Parameters for the equipment to be procured are often formulated with foreign equipment in mind. While RFI publication has been made mandatory, industry sentiment suggests that there is still scope for further improvement. RFI process should be used more effectively to provide rationalization of requirements. RFPs continue to be over-specified, input rather than output based, and without sufficient determination being made as to what requirements are genuinely mandatory and which could preferably be classed as desirable. As a consequence, there are a high number of retractions of RFPs due to specifications not being aligned to what is available in the market. [CII — KPMG, 2010]

There is alignment on need for a balance between getting a desired capability and consideration of locally available technologies. Enhanced consultation with local players would aid in achieving the desired balance. Minor acceptable changes in parameters may make the Indian equipment eligible for consideration in many of the planned RFPs where they would be currently rejected.

- ◆ **Prohibitive process costs of responding to RFPs:** Procurement costs of major items for trials run into millions of dollars and represent a major barrier to entry to many companies. The domestic industry has persistently asserted that ‘no cost, no commitment’

trials are a big constraint on bidding, especially where equipment is required to be brought to India and often trailed in more than one location. In other jurisdictions, the Government procurement authorities pay bid costs in certain cases, even in the event of a halted procurement in order to de-risk and secure properly developed bids for unique or complex requirements. In return, the bidders are sometimes required to transfer relevant R&D, technologies, or other knowledge developed during the bidding process. [CII— KPMG, 2010]

- ◆ Released RFPs are often withdrawn multiple times and re-released with changes. Players interested in participating are forced to undertake the costly process of responding to the proposals multiple times for each bid. This creates uncertainty in timelines, and affects the overall profitability of the project. Participants also face uncertainty in deciding bid amounts as participating DPSUs do not face the same cost constraints in RFP responses. Moreover, a large number of programmes get scrapped because of a single-vendor situation arising when one or more participants in the programme get removed from the process for reasons other than technical or commercial compliance after the Technical Evaluations. This results in persistent delays in procurement which affects the operational efficiency of the armed forces as well as forces the private industry to re-draw its offset linked investment plans.
- ◆ **No encouragement to foreign bidders to undertake JVs:** As RFP are issued to foreign original equipment manufacturers as well, they prefer direct bidding. They decline joint ventures with Indian companies as it helps them to guard their technology and perpetuate their monopoly with consequent financial gains.
- ◆ **Higher taxation for domestic private players vis-à-vis DPSUs:** The current policy overlooks specific benefits that DPSUs enjoy but not made available to the private sector, resulting in making private sector manufacturing inherently uncompetitive vis-à-vis DPSUs. For example Customs and Excise Duty Exemption Certificate (CDEC & ED) are made available to DPSUs for their tiered sub-vendors, a benefit not available to private sector system integrators. This should be allowed for Buy and Make (Indian) and Make and D&D projects.

Several Lessons can be Learnt from International Examples

Defence industries around the globe have already been on the path of modernization for some years. The largest military industries transforming themselves based on the new principles of modern warfare and are well placed to succeed in the 21st century. Due to various factors described earlier, India has lagged behind in this area. The earlier emphasis on public control of defence production left behind an under-developed private industry as well as a lack of a robust framework for dealing with a joint public — private setup in the industry.

A study of the broad structure in which the large defence industries of the world are organized, and their methods of setting up interaction between the public and private institutions will help greatly in thinking about the optimum structure for the Indian defence industry. Key elements of this structure would be to understand the way in which policy making, procurement and development support functions interact. In addition, it will be useful to see how other countries are handling typical policy measures like offsets, and technology transfer requirements with respect to foreign suppliers of material.

The following section outlines these themes with respect to the defence industries of a few major economies:

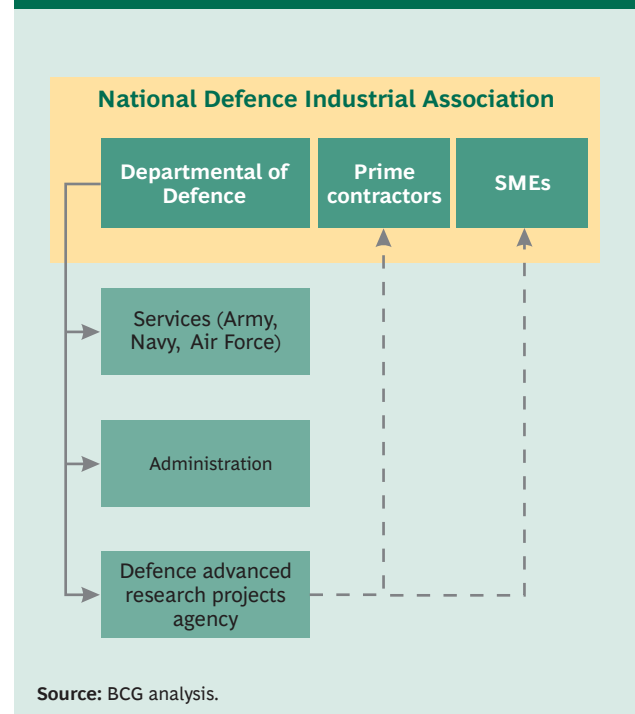
Existence of a Dedicated Body to Enable Structured Interaction Between Government and Private Players

Defence industry is highly regulated in all countries. However, countries with a large and successful private defence industry base have built dedicated bodies with private sector and Government participation. These

bodies enable strong lines of communication between the Government and the private industry and are also often given advisory powers to shape the policy and research agenda.

In the US, the Department of Defence interacts with private industry through the National Defence Industrial Association (NDIA) (as shown in Exhibit 9). It connects Government officials, military and industry professionals, and organizations that represent the branches of the armed forces, homeland security, and first responders. It

Exhibit 9. NDIA structure in the US



has divisions and working groups covering several niche areas. Its members often use the organization to forge business contacts through networking and participating in national and local events¹⁴. The key activities of the NDIA are outlined as follows:

- ◇ Government Policy Advisory: Assist in the policy agenda development process as well as the educational awareness process.
- ◇ Legislative Information Division: Provide NDIA members with access to key Government and industry officials;
- ◇ Procurement Division: Monitors and advances sound and practicable procurement / acquisition policies and procedures on all matters affecting Government / industry business relationships relating to the procurement/acquisition process. The Division also serves member companies by providing information on developments related to the acquisition process.

The UK also has a similar agency structure in place. The National Defence Industries Council (NDIC) is the most senior forum for consultation between the Government and industry on defence matters. It facilitates progress in the areas of defence industrial policy, industrial strategy and acquisition. It is headed by the Secretary of State for Defence and brings together ministers and senior officials from the Ministry of Defence, the Department of Business Innovation and Skills and HM Treasury to consult with the defence industry and trade union representatives. Secretariat support for the NDIC is provided by the Ministry of Defence¹⁵. The NDIC was supported by a number of joint Ministry of Defence/Industry sub-groups addressing specific policy issues¹⁶. They include:

- ◇ Commercial Policy Group
- ◇ Research and Development Group
- ◇ Joint Information Group
- ◇ Skills Group
- ◇ Joint Communications Group

In South Africa, the Aerospace Maritime and Defence Industries Association (AMD) represents the collective interest of all the main players and interest groups within

the Defence related industry. The membership represents in excess of 90 percent of defence related business in South Africa and in excess of 97 percent of all defence related exports. The Department of Trade and Industry recognizes AMD as the Joint Export Action Group representing the Aerospace and Defence Industries sector. [Suman, Sep 2009]

The Korean Defence Industry Association (KDIA) was founded in 1976 as a civilian non-profit organization. Subsequently, it was designated as the sole approval agency for defence exports. In 1986, it took over the responsibility of being a financial guarantee agency for defence contracts. Enlarging its charter further, it was designated as an approval agency for defence imports in 1998. Interestingly, KDIA has much larger participation. Unlike defence associations in other countries, its membership is not limited to defence manufacturers only. Interestingly, concerned defence ministry officials are also on its rolls. [Suman, Sep 2009]

Government grants due recognition to one or two such institutions in the country and they are regularly consulting during the process of policy formulation. In some cases the industry forums draw membership from both industry and Government, and in the case of UK, the NDIA is led by the secretary of defence. The Governments draw on the skills and experience available in the group to build or refine policy and to ensure policies are implementable in the field.

Outline of Critical Technologies, Focus Research Areas Released by the Government and Select Vendors Appointed in these Areas

Countries have established practices for information sharing with industry, to ensure clarity on future requirements and priorities of the sector. This helps the local industry in planning investments and capacities, thereby reducing risk related costs for the industry as a whole.

14. Sourced with changes from <http://www.ndia.org/Pages/Default.aspx>

15. <http://www.mod.uk/DefenceInternet/AboutDefence/CorporatePublications/FinanceandProcurementPublications/MinutesOfTheNationalDefenceIndustriesCouncilindic.htm>

16. "DIC objectives and Membership, sourced from <http://www.adsgroup.org.uk/pages/06316775.asp> Sourced with changes from <http://www.ndia.org/Pages/Default.asp>

In the UK, the Defence Technology Strategy (DTS), launched in October 2006, openly publishes Ministry of Defence's priorities for R&D, funding, skills, improved processes, opportunities, and areas for international research collaboration. The strategy stimulates and nurtures an environment of innovation to create new and effective science and technology solutions, identify the approaches that look most promising, and drive early exploitation onto the front line. This document sets out the following key information:

- ◇ The priority science and technology areas for R&D investment
- ◇ The critical areas where the Government is dependent upon the viability of UK science and technology for operational sovereignty and security
- ◇ Clear opportunities for collaboration with industry, university sectors and international allies
- ◇ Areas requiring adaption and integration within the UK those military sub-systems and components bought elsewhere
- ◇ Areas which require the Government to maintain intelligent customer expertise in order to operate a viable strategy of purchasing COTS products
- ◇ New initiatives to stimulate innovation in defence research

In 2009, Australia released a Defence White paper which outlined a 10 year investment plan in defence technology with the aim of outlining and supporting critical development areas for the local industry¹⁷. The Government releases an annual Public Defence Capability Plan which provides an account of major capital equipment proposals that are currently planned for Government consideration

Australia also identifies Priority Industry Capabilities (PIC). PICs are defined as those capabilities that confer an essential strategic advantage by being resident within Australia and which, if not available, would significantly undermine defence self reliance and operational capabilities of the Australian Defence Force (ADF).

For these identified focus areas, these countries appoint a few (2–3) prime vendors who are given long term contracts (typical duration of 5–15 years, actual duration depending on nature of contract). This combination of focused vendor landscape per critical area and long term contracts allows long term investments and capability building in the defence sector.

Britain has focussed on this approach for several of its major contracts, establishing world class benchmarks in contract structuring and partnership approaches. One example is the 15-year, GBP 2+ billion 'Munitions Acquisition Supply Solution' (MASS) program. MASS is a 15-year deal signed with BAE, guaranteeing supply of about 80 percent of the 'general munitions' consumed by UK Armed Forces for training and front line operations. The contract consists of 3 elements:

1. A 'capability charge' to cover all fixed costs, insulating them from demand swings.
2. Payment for products, priced at direct material and labour costs to compensate for commodity swings like the rapidly rising global price of steel.
3. A further element to allow for flexibility, such as additional engineering tasks and 'surge manufacture' to support operational deployments.

It also guarantees the Ministry of Defence a certain ceiling on ammunition prices for 10 years. Performance under MASS will be enforced through a system of reward and penalty clauses, and investment commitments to improve industrial efficiency in key locations are part of the joint announcement. BAE has committed to over GBP 120 million in new investment to improve its factories, making them safer, more automated, and more energy-efficient¹⁸. Aside from retaining the capacity to meet British demands for ammunition, the investment program will give the company a world-class capability to attack the export market.

The Singapore ministry of defence has also outlined long-term partnership agreements as a key factor

17. "Guide to 2009 Defence White Paper, Department of Defence, Government of Australia" <http://www.defence.gov.au/publications/White%20Paper%20Booklet.pdf>

18. <http://www.defenseindustrydaily.com/MASS-for-Effect-The-UKs-Long-Term-Ammo-Contract-05047/>

towards increase operational efficiency and better cost management. Moving from a predominance of short-term (2–3 year) contracts till 1993, Singapore consciously moved to long-term arrangements. A key example is the contract for aircraft maintenance with ST Aerospace. Under the contract, the SAF committed to a specific baseload to enable the company to plan its resources better. Work tasks were re-packaged to facilitate better management, and mechanisms were put in place to motivate the contractor to exceed performance requirements. The results were encouraging. Among other things, turnaround times improved by about 12 percent (or about two months) and annual cost savings estimated at two million Singapore dollars were generated. The Government has since implemented many such agreements in various areas of platform, systems and software maintenance. [Manohara, 2000]

End-to-End Incentive Plan by Government for Private Industry Involvement, Encompassing R&D Support, Risk Coverage of Capital Investments, and Production Planning Support

Governments have acknowledged the inherently risky nature of defence production. The industry is highly regulated in nature making it difficult for companies to freely expand customer base or use technologies in more than one product lines. This lack of markets is compounded by high volatility in demand. Production capacities need to be able to cater to critical demand spikes, as would occur in times of strife. Moreover, defence agencies must keep pace with global developments, and thus need to rapidly upgrade weapon systems. Thus, industry needs the wherewithal to invest simultaneously on two fronts. High quality product innovation on the one hand, and on the other hand in flexible product lines that can be rapidly upscaled or downscaled in response to the needs of its primary customer.

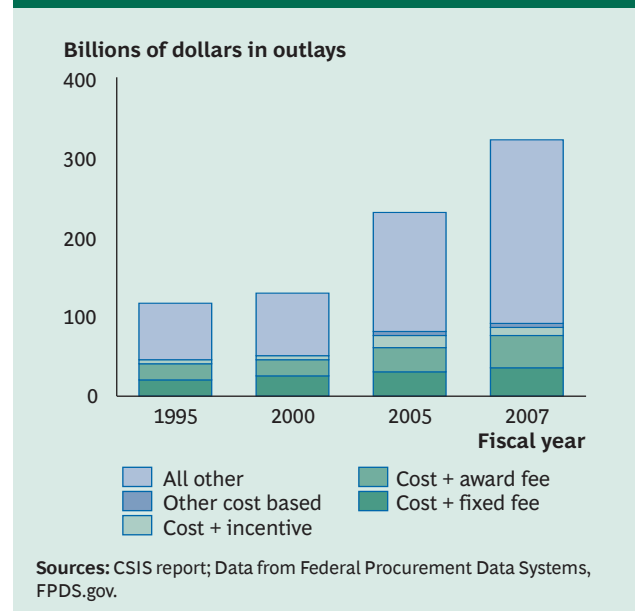
Globally, top defence industries receive significant levels of support from their nations’ Governments. Incentives are provided in the form of risk-sharing contract structures, tax breaks on defence related production and R&D, research grants, access to Government research for licensed production, and a host of other possible incentives that help producers in ensuring their business remains viable, and growing.

The USA extensively uses a cost-plus contract structure in order to share risk associated with its more unpredictable or R&D based procurement (as shown in Exhibit 10). The ‘plus’ in the contract is designed depending on specific needs. This could include award and incentive fees that are dependent on output quality, delay clauses and many others.

The US also provides several tax incentives to encourage innovation in the US aerospace and defence industry. Tax incentives comprise a basic R&D tax credit and an Alternative Simplified Credit (ASC) designed to increase incentives for high-risk defence and aerospace research, by permitting aerospace companies to claim a potential benefit on Qualified Research Expenditures. Some states in the US additionally provide accelerated amortization for depreciable assets for proven sales to the US defence forces.

In the UK, the traditional procurement approach in has tended towards tight definition of the scope of work, the use of competition to select suppliers, negotiation targeted at reducing risk and cost, and then a transactional approach to management of the contract, holding suppliers to account against agreed milestones. More recently the Ministry of Defence recognized that a “one-size-fits-all” approach to engagement with key suppliers is not optimal and have deployed a wider range of supply

Exhibit 10. Defence department total contract outlays



models. In the Defence Procurement Agency, several new contractual models are being deployed on significant programmes, including the use of alliances and lead systems integrators. The UK has a history of leading the way in deploying innovative acquisition and financing models in defence, for example PFI and PPP. [Ministry of Defence, UK, 2005]

In R&D too, the UK Government has a fairly comprehensive strategy aimed at promoting private research. The Defence Industrial Strategy and Defence Technology Strategy stressed the need to enhance private investment in defence R&D, and laid out the following principles:

- ◇ Remove barriers to investments and optimize incentives
- ◇ Balance investment over the maturity cycle
- ◇ Move towards open investment models and encourage partnering
- ◇ Streamline the R&D contracting process
- ◇ Optimize the Intellectual Property (IP) regime

Based on these principles, UK Government has made several changes in its contractual frameworks, including guidelines for establishment and exploitation of research consortia, IP ownership and exploitation (especially in joint research) and identification of supplier risks. The Ministry of Defence undertakes the following key measures with respect to R&D:

- ◇ The Ministry of Defence Technology Strategy identifies those technologies which are critical to defence. These priorities, the challenges faced and the effects sought are actively published in a periodic journal
- ◇ Gradually increase the amount of the research programmes open to competition with the aim of broadening and deepening the supplier base
- ◇ Partnering with industry and universities to share benefits and costs and increase the pull through of technology
- ◇ Defence Technology Centres (DTCs) foster collaboration with industry and universities. DTC's are

jointly funded by Ministry of Defence and industry. They are diverse and cover: Data and Information Fusion, Human Factors Integration, Electromagnetic Remote Sensing, and Systems Engineering for Autonomous and Systems. In 2005, the Ministry of Defence earmarked £ 90 million to the DTCs over a 5 year period. [Ministry of Defence, UK, 2005]

Dedicated Procurement Arm Functioning as a Single Point Reference for Procurement Policy and Contractual Frameworks

Most nations have moved to centralized procurement infrastructures. These systems are typically accessible online, and provide of a host of support capabilities to the contracting agencies and the contractors / bidders. In more advanced setups, a separate organization is carved out, which is focused on equipment and service contracting and supply.

The Defence Equipment and Support (DE&S) equips and supports the UK's armed forces for current and future operations. Employing around 21,000 people, with a budget of some £ 14 billion, DE&S is responsible for the through-life approach to equipment procurement and support, and the creation of an improved service to final users. It manages defence equipment from before it is brought into service until when it goes out of service. DE&S works closely with industry through partnering agreements and private finance initiatives in accordance with the Defence Industrial Strategy to seek and deliver effective solutions for defence.

In South Korea, the Defence Procurement Agency (DPA) of the Ministry of National Defence (MND) is responsible for more than 95 percent of all defence procurement activities in Korea. The DPA handles everything from the initial specification work to payments to contractors. Its major functions include: procurement of defence materials for the Korean military forces; construction of military facilities; sources of supply management; acquisition of price information and cost management; offset negotiation and management; military specification and standardization management. Korea depended completely upon military aid and equipment from the United States until the mid-1960's. In 1971, the Ministry of Defence set up the DPA as an integrated procurement agency. The DPA has since contributed to the

modernization of military equipment used by the country's armed forces and strengthened the nation's war potential by streamlining the process of acquiring war materiel. The DPA currently manages a four trillion Won defence budget¹⁹.

In Australia, defence contracts are released into the common Government tendering system called Austender. This is a comprehensive portal offering centralised publication of Australian Government business opportunities, annual procurement plans, multi-use lists and contracts awarded. It includes a helpdesk for website support to users, and an information database for ready reference on key items, like agency contacts and addresses, policy documents, contract libraries, etc.

USA has one of the largest organizations in the world dedicated to defence procurement and contract management. Run jointly by military and civilian staff, the DCMA or Defence Contract Management Agency represents the military services, other federal agencies and allied Government buying agencies to defence contractors worldwide prior to and after contract award. The organization employs over 10,300 civilian and 530 military personnel in over 730 locations. It manages at any time over 19,500 separate contractors, and 350,000 contracts. The DCMA reports into the Department of Defence. Its roles and responsibilities include:

- ◇ **Before contract award**, DCMA provides advice and services to help construct effective solicitations, identify potential risks, select the most capable contractors, and write contracts that meet the needs of buying agencies in DoD, Federal and allied Government agencies.

- ◇ **After contract award**, DCMA monitors contractors' performance and management systems to ensure that cost, product performance, and delivery schedules are in compliance with the terms and conditions of the contracts.

Dedicated Team to Support Building of the Local Defence Ecosystems

Governments support the development of local defence ecosystems through a slew of direct and indirect methods. These include several types of incentives and grants, joint development programs, support through foreign policy measures, and aggressive transfer of technology mandates when working with foreign contractors.

One of the most comprehensive industry support programs can be found in Australia. The Australian Government published a Defence and Industry Policy Statement in 2010. This delivers a comprehensive defence industry policy, aimed at setting clear investment priorities, establishing a strong defence-industry relationship, seeking opportunities for industry to grow; and building industry's skills, innovation and productivity²⁰. Some of the programs initiated by the Australian Government for supporting and up-skilling the industry are listed below:

- ◇ Australian Industry Capability (AIC) program aims to maximise Australian industry participation. For all defence procurement of USD 50 million or above,

19. <http://www.globalsecurity.org/military/world/rok/industry.htm>

20. Defence Material Organization, Department of Defence, Australian Government, http://www.defence.gov.au/dmo/dmo/function.cfm?function_id=35

New Air Combat Capability — Industry Support Program, Australia

The Australian Government launched a New Air Combat Capability — Industry Support Program, providing USD 8.2 million to support Australian industry and research organizations involved in the Joint Strike Fighter (JSF) program out to 2014.

The purpose of the program is to enable Australian companies and research organizations to support the development of new or improved capability to win work

in the production, sustainment and follow-on development phases of the F-35 Joint Strike Fighter program. The Industry Support Program is a grant program that will be delivered with the assistance of Department of Innovation, Industry, Science and Research (DIISR) through the Enterprise Connect Defence Industry Innovation Centre (DIIC) and Australian industry.

tenderers must submit an AIC Plan, demonstrating how they intend to maximize opportunities for Australian companies.

- ◇ The Global Supply Chain (GSC) program, designed to assist entry by Australian defence industry into global supply chains of multinational primes. The program will establish agreements with multinational primes, called GSC Deeds, which will actively facilitate opportunities for Australian industry to compete in the primes' global supply chains and that of their major suppliers.
- ◇ Defence Export Unit (DEU) aims to assist Australian defence companies to access export markets and global supply chains and thus broaden their customer base. The access to export markets, helps to sustain key defence industry capabilities which are otherwise unviable due to small, irregular or cyclical demand in strategic items. [Source: Defence Material Organization, Department of Defence, Australian Government].
- ◇ Industry Skilling Program Enhancement (ISPE) package includes initiatives to expand the pool of skilled people; enhance work and career pathways in the sector and address specific defence industry capability skills gaps.
- ◇ Defence industry innovation centers function as a part of a larger SME upskilling program run by the Department of Innovation, Industry, Science and Research. Defence SMEs are provided expert advice and facilitation, and in some cases grants.

Brazil has promoted local industry through a strict enforcement of technology transfer and offset contracts with foreign suppliers. In less than twenty years Brazil has become one of the ten largest exporters of conventional armaments in the world. With the state acting as the technological agent and ambassador to external markets, firms in the industry have become innovators of internationally competitive armaments systems. Whenever Brazil purchases arms, it demands with it the transfer of technological knowledge. The four conventional submarines and the 50 helicopters Brazil is buying from France will be manufactured in Brazil. The same will happen with a purchase of 30 fighter jets. UNASUR guarantees Brazil the Latin American market and the agreement with the French gives Brazil the

exclusive access to the sale of the technology in the South American market.

The National Defence Strategy, adopted in 2008, seeks to establish the basis for an arms industry, with the long-term expectation of turning Brazil into an exporter of military technology²¹. The document extends its time scale to the year 2030 and encompasses short-, medium-, and long-term plans and projections in order to 'modernize the national defence structure.' It stresses the 'development of independent technology' with the objective of 'progressively eliminating the purchase of imported products and services.' It asks the state to help support private arms firms and those still unprofitable but vital components of an industry in development²².

Rather than being forced, by military control, to produce highly sophisticated weapons systems, Brazilian defence firms have received support to develop products which cater to an international demand for conventional armaments which occupy a niche just below the technological frontier defined by the superpowers. The partnership between the state and the firm allows the firm to choose a product which is viable economically, given the scientific and technological resources available in Brazil²³.

Turkey is another country with an aggressive strategy for sectoral development in defence. The Undersecretariat of the Defence Industry (UDI) was formed with the objective of making maximum use of the domestic industry infrastructure, directing and encouraging new advanced technology investments, providing capital contributions and cooperation with foreign technology and ensure domestic production of all kinds of weapons, vehicles and equipment needed. The '2009–2016 Sectoral Strategy Document', was published by the Undersecretariat in order to lead the defence industry, towards a pre-planned direction in terms of critical product needs and research imperatives. The document also includes aims and goal

21. "Brazil, an Aspiring Power Strengthening Its Defense Industry" sourced from http://www.dialogo-americas.com/en_GB/articles/rmisa/features/around_the_world/2010/10/27/feature-01

22. "Brazil — Becoming an arms producer power", Published in War Profiteers' News, August 2010, No. 25

23. "Public-Private Partnership; Lessons from the Brazilian Armaments Industry" by Patrice Franko-Jones, University of Notre-Dame

under the general strategies for Sub-sector strategies; Land, Air, Navy, Electronic warfare and sensors, Battle Electronic Information Systems and Missile, Ammunition and Weapon Systems. In accordance with these aims and

goals, possible investment items have been presented to Turkish defence industry, including support for private R&D, SME consultancy centres, creation of production clusters aviation, marine sectors etc.

Importance of building an effective military industrial complex

Almost all countries have established big or small military industrial complexes. They are important from a purely economic standpoint of reducing cost of acquisition and maintenance for the forces. More importantly, they are instruments of foreign policy. Nations use military imports and exports as negotiable levers, and countries with large, self-sufficient bases have that much more leverage at the table.

Like any other country, India has unique requirements and constraints, and it will be a futile exercise to design

a hypothetical defence industrial structure, purely from a pastiche of examples from around the world. That being true, it is still worthwhile to study examples of success and failure, in order to see pointers of what can be done here. The following section will attempt to apply some of the lessons learnt here. It will lay out some key ideas that are common to several defence establishments and re-design them with an Indian perspective.

Six Point Program to Create a Vibrant Domestic Defence Industrial Base

To actualize the vision of creating a vibrant domestic defence manufacturing sector, we propose a six point agenda

1. Set-up a National Defence Manufacturing Commission

Government should set-up a national defence manufacturing commission under the aegis of the Prime Minister’s Office to ensure that domestic manufacturing gets due focus and support from the different Governmental agencies in achieving its goal.

The mandate of this body should be to ensure achievement of following goals:

- ◇ Phased increase in indigenous procurements with timelines and targets. The share of procurement from domestic manufacturers to be increased from the present 30 percent to 75 percent in next 10 years. (50 Percent in five years)
- ◇ Ensure that 8–10 largest weapons programs in the country have at least 80 percent locally manufactured content
- ◇ Build local IP in critical defence areas
- ◇ Promote and track civilian applications of technologies and material developed during defence research
- ◇ Support local defence manufacturers in building export capabilities

- ◇ Enable creation of one million new direct and indirect jobs in the defence manufacturing space
- ◇ Monitor implementation of Government’s offset policy in letter and spirit for large contracts

NDMC would be headed by a Chairperson, a Secretary level Government representative and would have two distinct arms — an advisory unit and an implementation monitoring unit (as shown in Exhibit 11).

Advisory board

The advisory arm of NDMC would have representation from different arms of the Government, armed forces,



industry bodies and external experts. The advisory body would have nominated representatives from different core ministries (defence, commerce, finance, planning commission), industry bodies and key advisors.

This advisory body would have four defence representatives including three nominated representatives of the respective armed forces and a civil officer deputed to the Ministry of Defence.

Each relevant ministry/Government body will set up a nodal officer for supporting promotion of defence industry who will represent the ministry in the advisory commission. The following ministries will be represented: Commerce and Industry (Department of Industrial policy and Promotion), Communications and Information technology (Department of telecommunication), Finance, Planning commission, and Human Resource Development.

The body would have industry representatives from the key industry bodies in India. Each body will nominate a representative who will be an employee of the core team, and not directly employed with any company working in the space.

Finally, the advisory body will have two respected and experienced experts in the field of defence strategy and defence technology as its members. These should be jointly nominated by the representatives of the defence ministry and industry bodies.

NDMC advisory board would focus its activities on three key areas:

1. Aligning policies for defence manufacturing and procurement

The advisory board will be mandated to advise the Prime Minister's Office on national policies affecting defence manufacturing and defence procurement, namely Defence Production Policy, Defence Procurement Policy, National Manufacturing Policies (relating to defence production) and FDI investment in defence industries. The board would suggest ways to align existing reports and policy statements in area of defence procurement and offset into a single coherent policy and also suggest changes in related areas.

It will interact with industry and Government in the form of joint forums, to ensure policy clarity and alignment is achieved. In cases where there is a clear need for policy adjustment or change the NDMC will set-up a discussion group to review the policy and bring out a suggestion paper on possible solutions for the consideration of Ministry of Defence and other relevant ministries.

2. Create a detailed implementation plan for achieving domestic production targets

NDMC will be responsible for preparing manufacturing growth plan for domestic defence industry. It will develop the overall five year growth plan in defence related manufacturing with the objective of achieving 50 percent domestic content in first five years, and 75 percent in a ten year timeframe. It will also prepare an annual domestic defence manufacturing review for measurement against the five year plans with key recommendations on hurdles and bottlenecks. The Prime Minister's Office will be required to reply within three months of the submission of the NDMC, its line of action on each item proposed.

3. Create an implementation framework to achieve domestic growth plan

This body will propose a robust implementation framework to achieve the domestic growth plan. This framework will outline the specific action points and timeframes required to enable achievement of the objectives. It will also look at the LTIPP and the annual acquisition plans and create guidance on possible areas for domestic participation. Based on the LTIPP, it will advise the Government on long term technology growth plan for the industry and outline areas for partnerships and collaboration.

The advisory board can also become the forum for the Government to share and disseminate key policy information with the sector at large (E.g., LTIPP and SCAPCC decisions)

Implementation Monitoring Unit (IMU)

The implementation monitoring unit would be an executive arm of NDMC fully staffed with Government functionaries and will report directly to the Chairperson of NDMC.

This body would have the mandate to monitor the implementation in large defence procurements. They would audit these large programs on actual offset participation, nature of technology transfer and domestic capability building to ensure that policy decisions are getting translated in letter and spirit. In case of violations, the body can recommend financial and contractual actions to the Government.

2. Make / Buy and Make (Indian) to be Mandatory for Flagship Large Programs with Appropriate Financial Models

The Government should enforce Make or Buy and Make (Indian) classification for all flagship defence contracts and mandate that the prime contractor be an Indian entity. It is important to ensure that key programs like the defence modernization, or tactical communication purchases are developed as Make or Buy and Make. This decision is critical to provide Indian vendors with the scale and exposure that is required for the industry to move forward.

To ensure that technology gaps are overcome, this entity can be a JV between a local entity and relevant global vendors.

The current upper cap of 26 percent on FDI in defence production needs to be relaxed to 49 percent to ensure adequate participation of interested parties. The FDI norms for defence R&D should also be clarified and be in sync with manufacturing norms since the current policy is silent about it. Most major foreign defence manufacturers are wary of these ambiguities and want a clear-cut long term policy. Also provisions for FDI investment in industries like IT and communications which provide systems for defence, but are not licensed as defence production units should be clarified.

Lastly, the Government needs to decide the right financial model for Indian entities working with the Government on these flagship programs. There are two broad options that have been observed internationally.

a) Cost plus model: Largely observed in USA, this model promises a pre determined margin for the contractors based on jointly agreed costs incurred. To arrive at the right cost model, the accounts and operations of these private entities are opened to Government nominated auditors for inspection and approval

b) Auction model: In this model, competitive bidding is done by interested parties in an open auction. Minor variations are allowed in approved budget during the length of the project in a transparent and defined process. This will be a win-win for the Government and private sector particularly in the TOT cases.

DDP classifies contracts into Make, Buy and Make or Buy under advice of the DRDO and DPSUs. As a result of this edge available to 'internal players' like DPUSs, private players often lose out. There have been very few/ no cases of TOT to private parties in the recent past. Because of this inherent conflict of interest, it is unlikely that a truly level playing field can be created under the nomination route. Hence classifying all flagship programs under Make, or Buy and Make will remove this anomaly of decision advice being given by interested parties in these transactions.

We propose that 10–15 flagship programs should be immediately put under this scheme, including:

- ◇ Bulk Encryption Unit (BEU), Saksham
- ◇ Multi-Role Transport Aircraft
- ◇ F-INSAS
- ◇ Artillery Modernization Programs
- ◇ Electronic Warfare
- ◇ All Terrain Vehicles
- ◇ Surface Penetrating Radars and other Radars
- ◇ Autonomous Underwater Vehicle (AUV)
- ◇ RIBs with Hydrojet Propulsion
- ◇ Long Range Electro Optic Systems
- ◇ Instrumented EW Range
- ◇ Penetrating Warhead for New Generation LGB Kits NGPGM
- ◇ GPS Jammers

Henceforth, the nomination route should be done away with and all such contracts should be decided through open bidding.

3. Implement a “Domestic Champion (RUR)” Program and Build Private Sector Capabilities

There are three different levels for participation of private sector in Defence Production. These are at the level of major systems, at the level of assemblies and at the level of requirement of spare parts and components. There is need to ensure effective participation by the Industry, both public and private, at various points of interaction. Subsequent long-term association in product development and production, can be only done through those firms of proven excellence and which are capable of contributing, depending on their technical, managerial and financial strength.

As part of this journey, the Government had agreed to award “Raksha Udyog Ratna” (RUR) status to select firms to promote indigenous defence capabilities. These companies (RURs) are essentially platform producers and system integrators and the ones, which earlier described as “first level” of Defence Industry. Once a private firm is accredited and put into the category of ‘RUR’/ ‘Champion’, it should be treated at par with the Defence Public Sector Undertakings. The RURs, who have been identified, based on their managerial and technical capabilities, would be the key drivers towards raising indigenous defence technological base and world-class manufacturing capabilities in India.

It is necessary that the identification of Raksha Udyog Ratna is done on an objective criterion and on a transparent basis. To identify these private sector RURs / Champions, an ‘Accreditation’ process was designed and the Ministry of Defence had constituted a Selection Committee under the Chairmanship of Shri Prabir Sengupta, IAS, Former Director, Indian Institute of Foreign Trade and Secretary, Defence Production and Commerce.

Furthermore, the RUR accreditation can be a rolling process that is opened for changes (additions and deletions) on a regular basis. A rolling process allows the defence department to have a supplier base reflecting the true strengths of domestic manufacturing and technology

sector where new emerging manufacturing powerhouses as well as local technology owners get a chance to participate. At the same time, if firms don’t live up to the mandate under RUR, this accreditation can be revoked or suspended based on predefined criteria and due process.

4. Increase the Limit for Foreign Direct Investment

The FDI limit, from 26 percent to 49 percent, should be increased subject to the following:

- ◇ The foreign collaborator should bring in a high level of specialized technologies into the country which are at present not available in India.
- ◇ The JV should undertake to set up full fledged R&D facilities in India and the IPR for all new technologies developed should vest with the Indian company.
- ◇ The foreign collaborator should, subject to Government of India approval, permit products manufactured by the JV to be exported to global markets, and such exports should start within three years of commercial production.

In any case, the FDI should not exceed 49 percent. In the following cases ab-initio 49 percent FDI could be permitted on a case-to-case basis subject to the proposal conforming to the following conditions:

- ◇ The JV is set up to manufacture products in the ‘priority list’ of the Ministry of Defence.
- ◇ The JV undertakes to export 50 percent of its total production by the end of three years from the start of commercial production.

The entire transfer of technology in the priority sector should be completed over a three year period and suitable monitoring and reporting mechanisms prescribed by the Ministry of Defence should be complied by the undertaking.

Other Conditions (applicable in all cases)

- ◇ Ownership and management control of the JV must always be in the hands of the Indian partner. The

appointment of foreign Directors should be approved by the Government of India as per the rules and regulations that may be framed in this regard. The CEO of the JV, however, must always be an Indian National.

- ◇ Lock in period of foreign equity should be five years.
- ◇ JVs with 49 percent foreign equity should be barred from being consortium partners for 'Make' Projects. However, they could be suppliers for such projects.
- ◇ Workforce: The JV should, to the extent possible, employ only Indian nationals at operational and supervisory levels. In exceptional circumstances, where the engagement of foreign nationals is imperative for the installation and commissioning of equipment, technology transfer, R&D etc., managerial level appointments may be made by the JVs Board of Directors in conformance with the Government of India's extant policies in this regard.

The policy on FDI in Defence must be promulgated in an unambiguous manner. There is a need to keep the policy easily implementable. Some suggestions on this could be as under:

- ◇ The policy must be clear, simple and easily understood.
- ◇ There should be single window for clearance for FDI proposals in a time bound manner.
- ◇ The 'Priority List' of high technology products which would qualify for higher FDI must be listed out in advance.

5. Streamline the Defence Procurement Infrastructure

Defence procurement processes use a variety of systems and processes. Specifically there is need to streamline at the level of offset implementation, DPSU and OFB procurement, and Ministry of Defence centered capital procurement.

Right now, each unit of the public defence manufacturing units use independent processes and procedures for procurement. This creates a very high level of inefficiency.

Also oversight of the processes is more difficult due to the level of fragmentation. Offset facilitation also needs significant ramp-up in terms of a more professional project-based approach and single window dealings. Ministry of Defence capital procurement, while significantly changed over the past year, needs to become even more streamlined and efficient.

Procurement systems and infrastructure for DPSU and OFB should be centralized into a single agency which will manage different aspects of the procurement process. This system will create a centralized list of defence vendors, become a watering hole for all private vendors who wish to participate in the defence procurement process, and provide guidance to new entrant in the system.

Additionally, it will provide standardized contractual frameworks and clauses that can be accessed by the multiple contracting agencies. This will help to reduce contract variation and complexity and promote a common understanding of contract requirements across the system.

The Offset facilitation process should be enhanced through a more professional and specialized approach. Moreover, there is a need for greater role clarity between DoFA, DDP and Ministry of Defence in this area.

6. Create Enabling Infrastructure for Capability Building

Provide access to critical technologies

The Government should allow private sector to access critical technologies developed by different Government of India arms. A royalty/fee model can easily be developed allowing private sector to commercialize these technologies. As part of this, the Government should also manage its IP better and share this information in a transparent fashion.

Provide ready reference point for all key procurements

Additionally the system will become a watering hole for all private vendors who wish to participate in the defence procurement process. They will be able to access tender releases, and announcements at a single location, and can access any communications from the tendering party on a real-time basis.

Procurement process advisory for vendors

Additionally the system will be supported by a procurement advisory cell, which will guide new entrants in dealing with procedural minutiae as they may apply to different institutions and areas of production. This cell will have some additional responsibilities related to helping vendors in enhancing existing capabilities

Skill up-gradation of defence manufacturing workforce

This cell will have a dual focus, to plug the short-term gaps in critical skill areas, and also to create a long-term path for moving industry skills towards higher sophistication.

Short-term skill gaps

Work closely with industry bodies to create an eco-system of minor and major specializations in defence manufacturing. These will be created in the form of part-time and full-time courses, certification examinations, and specialised teaching units that can be added to a variety of existing syllabi.

Actively work towards creating an environment where there is interaction between defence policy makers and industry and the general student population. This will help create awareness of, and interest for defence related subjects at the university and professional education levels.

Long-term skill up gradation

Based on the LTIPP (15 year plan) and more generally on global trend, create a long term plan on skill creation. A 10 year skill plan will be created where it will outline target areas where India can achieve world-class level of sophistication in defence related technology (production).

Based on this, it will lay out an implementation plan for each skill-area. This plan will include establishment of tie-ups with global universities for joint research and development, grants and scholarships for young researchers and scholars to work in global universities for a specific timeframe etc.

As a part of this plan, also recommend to the Ministry of Defence, key areas for setting up technology transfer agreements, or joint research agreements with global system integrators.

Support structure for up-gradation of defence manufacturing facilities (SME specific)

There needs to be a focus on technology and quality up-gradation of SME vendors in the defence manufacturing space. Government should set-up an “Innovation Fund” of 1,000 crore for SMEs in Defence sector.

In addition, programs to encourage new entrants to venture into defence related manufacturing need to be put in place. Activities should be primarily around the following areas:

- ◇ **Vendor certification:** Create a guidance cell for SME vendors to help them achieve manufacturing certifications like ISO. This needs to be marketed through vendor out-reach programs, and clear and effective guidelines for achieving these certifications.
- ◇ **Facility establishment:** Create a support structure to help in the establishment of licensed defence units as well as supporting eco-system such as testing laboratories, supplier linkages etc.



Appendix 1

Successful Indian Examples

Nuclear and Aerospace Sectors

Indian nuclear and aerospace sectors stand out in terms of the spirit of collaboration exhibited by the Government bodies and private sectors and the results that they have jointly achieved.

At the core of this cooperation was a clear role split. From the very beginning, Department of Atomic Energy (DAE) and Department of Space (DOS) focused on developing the core know-how and basic technologies. The industry took these concepts and brought design, engineering and production of equipment and systems into the mix.

Over time, this collaborative spirit also reflected in the nature of contractual arrangements. Developmental orders for critical, long cycle equipment were identified and placed well ahead of project approval allowing the Indian entities to create the capabilities and infrastructure required in time. There were even instances of providing funding for infrastructure investments to support suboptimal scale of operations. In all such joint endeavours, the project monitoring and control remained with DAE and DOS.

This cooperation has allowed development of local technology as well as deep understanding of related

Case Study: ISRO, An effective industry participation programme

The Indian Space Research Organization (ISRO) was largely reliant on international technologies for its various programs. It depended on foreign suppliers for major systems and components. ISRO feared that this success would be accompanied by sanctions and other restrictions that would bring in challenges. ISRO's solution to this challenge focused on a long-term approach that works well for the country, its private and public sectors, and of course, the manpower and intelligence associated with these industries.

The core intent of the approach is to optimize India's inherent resources, intelligence and people capabilities, as also support and encourage the private sector during the development phase. This approach also works on a non-exclusive and merit-based licensing selection process. It has helped to cultivate an environment where there is consistent scaling up, adoption of process and technology audits to ensure international competitiveness and formulation of steering policies,

taking into account the international environment. As a result of this foresight, ISRO has been able to continue with its design, development and execution uninterrupted.

In its endeavor to develop new technologies, ISRO partners with appropriate industries by outsourcing components and sub-assemblies. It provides in-house facilities, shares knowledge and resources, and initiates joint investments and unique test facilities. In addition, it transfers technology to private sector vendors and provides support through documentation, training, provision of components, prototype testing, commissioning of production as well as marketing and export promotion.

Almost 60 percent of a launch vehicle's cost flows to Indian industries. Recent developed applications for tele-education and tele-medicine incorporate nearly 100 percent of ground segment equipment / services. As

for rockets, 80 percent of the work involved was executed through industries as compared to only 40 percent for satellites. ISRO is working to enhance the participation of industries in the satellite area as well.

More than 500 small, medium and large-scale companies participate in these programs in the form of hardware development and supply; they also provide software and other services. The geo-spatial information services (GIS) / remote sensing program includes more than 200 companies and employs over 12,000 professionals. In addition, around 20-30 SME firms join the GIS program every year. In addition, as of March 2009, ISRO had transferred 289 technologies to modern industries for commercialization and provided 270

technical consultancies in different disciplines of space technology.

After establishing a close and effective relationship with the industry, ISRO now wants the private sector to play a larger role in specialized services, improve the quality and reliability of products and reduce timespan in achieving project objectives in the most cost-effective manner. The policy framework of the Indian space program envisages effective industry participation with higher levels of aggregates in system- / stage-level supply from the industry, use of ISRO's facilities by industry, technology transfer to the industry and utilization of ISRO expertise including its technical consultancy services.

Some examples of ISRO — Industry partnerships

Taneja Aerospace and Aviation (Taal): Vendor for Polar Satellite Launch Vehicle (PSLV). Developed a critical structure instrumental in taking the load of the vehicle and connecting the various stages of the PSLV.

Larsen & Tubro (L&T): Designed specific reactors for ISRO's plant in Kerala to indigenously produce titanium sponge, which is a scarce raw material and has to be imported. Developed instrumentation radars for satellite commanding.

WIPRO: In discussions with ISRO to collaborate in the area of robotic design, for ISRO's planned moon-landing mission Chandrayan – II. Design and Production of country's fastest super-computer for Vikram Sarabhai Space Center.

Devas Multimedia Pvt. Ltd. (Devas): Collaboration on satellite design with technical specifications being driven by Devas and implementation by DOS / ISRO / Antrix. long-term definitive agreement with Antrix for DOS / ISRO to provide orbit/spectrum, satellite capacity, launch services, and ongoing operations.

Godrej Aerospace: Manufacture of rocket engines, thrusters and various satellite systems to the specifications of ISRO. Supplied rocket engines to 'Chandrayaan – I'

Walchandnagar Industries: Flight motor casings and nozzles, flight motor segments, domes, nose caps etc. for SLV, ASLV, GSLV and PSLV programmes.

processes. The domestic sector has developed capabilities to develop technologies on its own and has also demonstrated the ability to meet and also create global benchmarks in terms of schedules and costs.

Defence Services and DRDO

Arihant submarines

Among the services, the Navy has been the most forthcoming in encouraging the entry private sector into arms development. Several projects have been undertaken with significant involvement of domestic

private companies. Among these, the Arihant project is a good example of public-private cooperation in defence production.

The Arihant class submarines are nuclear-powered ballistic missile submarines being developed for the Indian Navy. The Arihant class submarines were designed and constructed as a part of the Indian Navy's Advanced Technology Vessel (ATV) Project. The ATV project started with the intent to design nuclear-powered fast attack submarines, though over time the project was re-aligned towards the design of a ballistic missile submarine in order to complete India's nuclear

triad. The project faced many challenges including design and miniaturization of the nuclear reactor

The initial design of the miniaturized naval-version of the reactor developed by the Bhabha Atomic Research Centre (BARC) had technical challenges, after which Russian help was sought to resolve the design glitches. Based on the design provided by the Navy and Defence Research and Development Organization (DRDO), L&T's submarine design centre carried out detailed engineering, using the latest 3D modelling and product data management software. The final production version of the reactor was built by the BARC at the Indira Gandhi Centre for Atomic Research (IGCAR) at Kalpakkam. The hulls for this class are built by L&T's Hazira shipbuilding facility. Tata Power SED built the control systems for the submarine. The systems for the steam turbine integrated with the PWR are supplied by Walchandnagar Industries.

Pinaka multi barrel rocket launchers

Pinaka is a multiple rocket launcher produced in India and developed by the Defence Research and Development Organization (DRDO) for the Indian Army. The system has a maximum range of 39–40 km. and can fire a salvo of 12 HE rockets in 44 seconds, neutralizing a target area of 3.9 sq. km. The system is mounted on a Tatra truck for mobility.

Tata Power's Advanced Material Division and L&T Heavy Engineering Division bagged orders to produce around 40 Pinaka MRBLs each. This was the first major confirmed order from the services after defence production was opened to the private sector in 2001. Both the companies were required to deliver the entire order for the two Army regiments in three years²⁴.

Joint-Ventures in the Defence Space

BrahMos

BrahMos²⁵ is a stealth supersonic cruise missile that can be launched from submarines, ships, aircraft or land. It is a joint venture between Republic of India's Defence Research and Development Organization (DRDO) and Russian Federation's NPO Mashinostroyeniya who have together formed BrahMos Aerospace Private Limited. It is the world's fastest cruise missile in operation. The company was established in India through an Inter-Governmental agreement signed on February 12, 1998 between the Republic of India and The Russian Federation.

The collaboration was made possible by sharing the technological strength of both partners — DRDO and NPOM. DRDO has developed crucial systems like inertial navigation systems, mission software, mobile launchers for Prithvi and Agni missiles. NPOM has expertise in the area of Ramjet engines together with a number of technologies for space systems, launch vehicles and cruise missiles.

The company has become a role model by integrating public-private industries from India and Russia, as a consortium of 'Missile Industry Complex'. It has penetrated the world market with the most potent system for precision strike and a Force multiplier in network centric warfare.

24. "Tata, L&T bag orders for Pinaka rocket launcher", Posted: Mon Apr 03 2006 by indianexpress.com. Sourced from PTI. URL: <http://www.indianexpress.com/news/tata-l&t-bag-orders-for-pinaka-rocket-launc/1662/>

25. <http://www.brahmos.com/content.php?id=1>

Appendix 2

Country Profiles

USA Defence Industry

Overview

The US has the largest defence market in the world, and is also the largest exporter of defence equipments. Five large globally renowned defence companies based in the US — Lockheed Martin, Northrop Grumman, Raytheon, Boeing and General Dynamics dominate the defence sector. Private defence players have evolved a highly integrated structure to interact with the countries' defence establishment as well as policy makers.

Industry structure

The US department of defence is the main policy making body as well as the key customer in the industry. The DOD interacts with private industry through the National Defence Industrial Association. It connects Government officials, military and industry professionals, and organizations that represent the branches of the armed forces, homeland security, and first responders. It has divisions and working groups covering several niche areas. The key activities of the NDIA are outlined as follows:

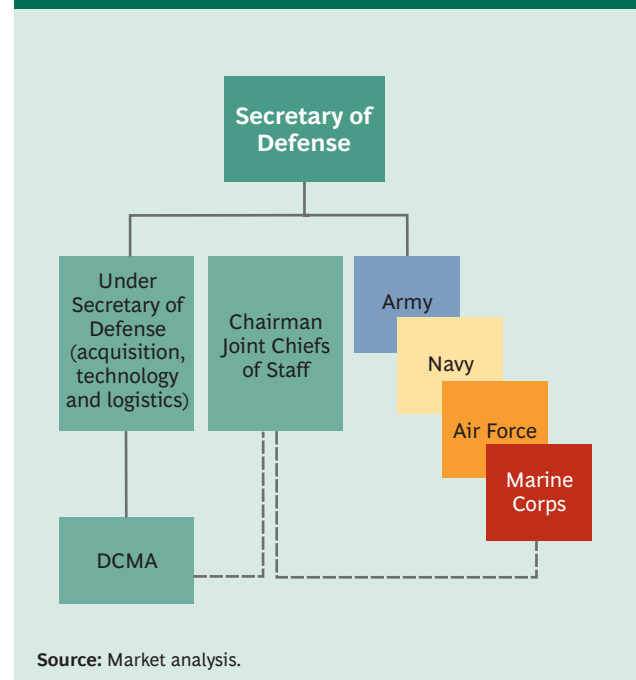
- ◇ **Government Policy Advisory:** Assist in the policy agenda development process as well as the educational awareness process.
- ◇ **Legislative Information Division:** Provide NDIA members with access to key Government and industry officials.
- ◇ **Procurement Division:** Monitors and advances sound and practicable procurement / acquisition policies and procedures on all matters affecting Government / industry business relationships relating to the procurement / acquisition process. The Division also

serves member companies by providing information on developments related to the acquisition process.

Defence procurement

The US Department of Defence (DoD) defines the procedure for domestic procurement in connection with foreign sales. This is strategic in nature and aimed at creating a regulated environment. [CII — Ernst & Young, 2010]. However, the policy making and procurement arms of the DoD are well defined with separate directorates handling procurement and acquisition policy and defence acquisition and contract management (as shown in Exhibit 12).

Exhibit 12. Defence governance structure in the USA



Source: Market analysis.

Procurement policy is handled by the directorate of procurement and acquisition policy.

Contract management is handled by a separate organization called Defence Contract management Agency which reports into the DoD²⁶.

- ◇ Before contract award, DCMA provides advice and services to help construct effective solicitations, identify potential risks, select the most capable contractors, and write contracts that meet the needs of buying agencies in DoD, Federal and allied Government agencies.
- ◇ After contract award, DCMA monitors contractors' performance and management systems to ensure that cost, product performance, and delivery schedules are in compliance with the terms and conditions of the contracts.

The USA extensively uses a cost-plus contract structure in order to share risk associated with its more unpredictable or R&D based procurement. The 'plus' in the in the contract is designed depending on specific needs. This could include award and incentive fees that are dependent on output quality, delay clauses and many others.

Approach to R&D

The US defence R&D budget is by far the largest in the world. This reflects a US approach to reducing risk in the early stages of defence capability development that is very attractive to defence companies and investors. Whereas the UK and other European nations often insist on securing firm price contracts with suppliers, even during early phases of Defence Industrial Strategy programmes, the US tendency is to use cost-plus arrangements until the risk is quantified and manageable. [Ministry of Defence, UK, 2005]

The US also provides several tax incentives to encourage innovation in the US aerospace and defence industry. Tax incentives comprise a basic R&D tax credit and an Alternative Simplified Credit (ASC) designed to increase incentives for high-risk defence and aerospace research, by permitting aerospace companies to claim a potential benefit on Qualified Research Expenditures. Some states in the US additionally provide accelerated amortization for of depreciable assets for proven sales to the US defence forces.

UK Defence Industry

Overview

UK has the world's second-largest defence industry. Historically, European countries have owned and controlled their indigenous defence manufacturing units. The role of the UK defence industry has widened now and the UK Defence Ministry is highly dependent on industry, not only for equipment but also for a wider range of products and services. In addition to high defence spending, market openness, diversity of supply and demand for sophisticated weaponry, all contribute to building a thriving defence industry. As in any other sector, the UK defence industry is driven by a profit motive with a promise to deliver to shareholders and tax payers. [CII — Ernst & Young, 2010].

Industry structure

The UK Defence industry is not just a domestic supplier alone, but is also the largest defence exporter after the US. The defence industry in UK comprises of the ministry of defence as the major buyer of defence equipment and services. In addition, major private players include BAE Systems, Rolls Royce, Smiths Group, VT and QinetiQ who supply to the Ministry of Defence and also maintain significant export portfolios. The Ministry of Defence actively encourages private participation in defence production. The National Defence Industries Council (NDIC) is the most senior forum for consultation between the Government and industry on defence matters. It facilitates progress in the areas of defence industrial policy, industrial strategy and acquisition. It is headed by the Secretary of State for Defence²⁷ (as shown in Exhibit 13).

The NDIC was supported by a number of joint Ministry of Defence / Industry sub-groups addressing specific policy issues²⁸. They include:

- ◇ Commercial Policy Group
- ◇ Research and Development Group
- ◇ Joint Information Group

26. Official website of DCMA, <http://www.dcmamil/about.cfm>

27. <http://www.mod.uk/DefenceInternet/AboutDefence/CorporatePublications/FinanceandProcurementPublications/MinutesOfTheNationalDefenceIndustriesCouncilndic.htm>

28. <http://www.adsgroup.org.uk/pages/06316775.asp>

- ◇ Skills Group
- ◇ Joint Communications Group

Defence procurement

The traditional procurement approach in the UK has tended towards tight definition of the scope of work, the use of competition to select suppliers, negotiation targeted at reducing our risk and cost, and then a transactional approach to management of the contract, holding suppliers to account against agreed milestones. More recently the Ministry of Defence recognized that a ‘one-size-fits-all’ approach to engagement with key suppliers is not optimal and have deployed a wider range of supply models. In the Defence Procurement Agency, several new contractual models are being deployed on significant programmes, including the use of alliances and lead systems integrators. The UK has a history of leading the way in deploying innovative acquisition and financing models in defence, for example PFI and PPP. [Ministry of Defence, UK, 2005].

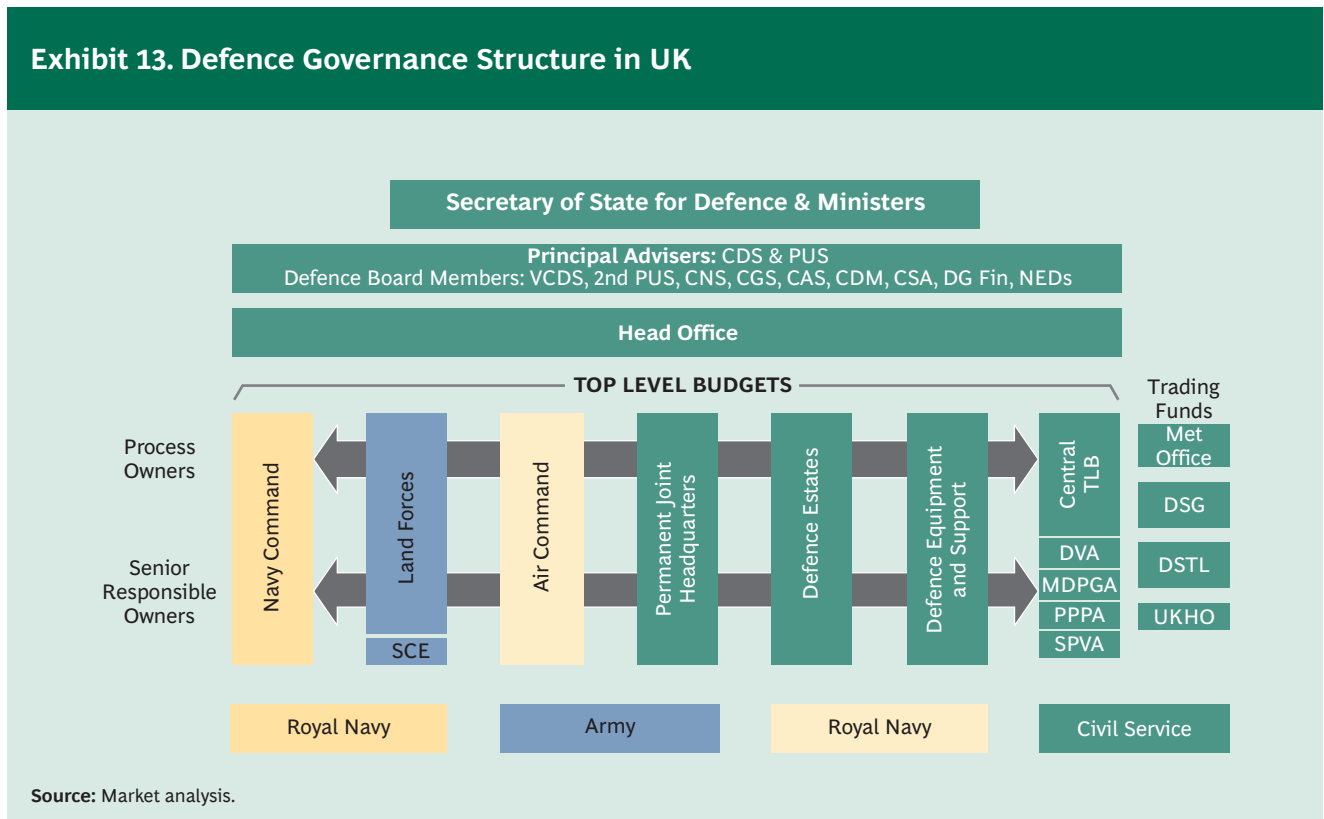
Defence Equipment and Support (DE&S) equips and supports the UK’s armed forces for current and future

operations (as shown in Exhibit 13). Employing around 21,000 people, with a budget of some £ 14 billion, DE&S is responsible for the through-life approach to equipment procurement and support, and the creation of an improved service to final users. It manages defence equipment from before it is brought into service until when it goes out of service. DE&S works closely with industry through partnering agreements and private finance initiatives in accordance with the Defence Industrial Strategy to seek and deliver effective solutions for defence.

Approach to R&D

The Ministry of Defence undertakes the following key measures with respect to R&D:

- ◇ The Ministry of Defence Technology Strategy identifies those technologies which are critical to defence. These priorities, the challenges faced and the effects sought are actively published in a periodic journal
- ◇ Gradually increase the amount of the research programmes open to competition with the aim of broadening and deepening the supplier base



- ◇ Partnering with industry and universities to share benefits and costs and increase the pull through of technology
- ◇ Defence Technology Centres (DTCs) foster collaboration with industry and universities
 - Jointly funded by Ministry of Defence and industry
 - Ministry of Defence earmarked £ 90 million to the DTCs over a five year period (2005 onwards)
 - They are diverse and cover: Data and Information Fusion, Human Factors Integration, Electromagnetic Remote Sensing, and Systems Engineering for Autonomous and Systems. [Ministry of Defence, UK, 2005]

South Africa Defence Industry

Overview

The manufacture of armaments on a significant scale began in South Africa, only around the time of the Second World War and by the 1950s and early 1960s it had a small defence establishment and relied on arms imports for most requirements. At this time, increasing international opposition to its apartheid policies resulted in withdrawal from the Commonwealth in 1961, and imposition of a voluntary United Nations (UN) arms embargo in 1963. These events, together with growing domestic and regional resistance, prompted the expansion of the country's defence-related industries which, at that stage, were concentrated in the private sector.

In the early 1960s a statutory body called Armaments Production Board and later the Armaments Board was formed with the mandate to lay the necessary infrastructural foundations for the development of the defence industry. The duties of the board included overall responsibility for armaments acquisition for the SADEF, and the determination of the best use of the private sector in arms production. At the same time, a Government owned Defence Corporation called ARMSCOR was setup which took over previously Government controlled munitions factories as subsidiaries and, over the next few years, acquired various private sector companies and established a number of new production and research and development facilities.

In the late 1970s as a result of the growing private sector in the country, the Defence Advisory Council (DAC) was established to coordinate the involvement of the private sector in domestic arms production. The council was chaired by the Minister of Defence, and included the President of the Armaments Board and representatives from many of the country's main private sector companies. Meanwhile ARMSCOR itself concentrated on weapons systems development and integration, and the group established operational research and systems engineering facilities, but seeking to avoid the duplication of capabilities already available in the private sector, made use of materials, components, subsystems and, in many cases, complete products, generated by private firms. By 1981 ARMSCOR was contracting more than 900 companies in the private sector and, by 1984, more than 2000 private sector firms were involved in domestic arms production.

Government has been seen to actively support the drive to export South African defence-related products, dedicating State resources to maintain the country's defence export infrastructure. A portion of ARMSCOR's operating subsidy from the defence budget has been used to maintain overseas offices, to provide international marketing support, and to assist the participation of South African firms at international defence exhibitions. Further, a South African Defence Export Support Organization (Sadeso), has been established by the Defence Secretariat, which is the accounting officer of the Department of Defence and responsible for policy and civilian oversight of all defence matters. Sadeso, which comprises the Department of Defence, ARMSCOR and AMD, has taken up the challenge to support the export initiatives of the South African defence-related industry. On behalf of the South African Government and the broader South African defence-related industry (represented by AMD), and by means of Government export support structures, initiatives and incentives, Sadeso aims to develop and facilitate a South Africa incorporated export drive. [Research Unit of Creamer Media, 2006]

Industry Structure

South Africa's defence-related industries are dominated by parastatal Denel and six private-sector companies — Grintek, Reutech (the defence arm of Reunert), Advanced Technologies and Engineering (ATE), African Defence Systems (ADS), Land Systems OMC (formerly known as Alvis-OMC) and Tellumat. In addition, there

are several other smaller firms supplying niche technology, and components. The private industry in South Africa averages about 52 percent of the local defence industry sales, with the remaining coming from Denel. The structure of the local defence-related industry has become such that, although the larger companies usually act as main contractors, much of the work is contracted out, to the point where the value added by the main contractor may be a minor fraction of the total value of the project. In fact, the principal skill of Denel and major private-sector defence-related groups is system or subsystem design, development, integration and testing, while most of the actual manufacture and assembly is subcontracted out to more specialised industries which are part of the country's general industrial base.

The private industry is represented by The South African Aerospace, Maritime and Defence Industries Association (AMD), which claims to represent over 90 percent of all defence-related business in South Africa and over 97 percent of defence related exports.

Defence procurement

ARMSCOR, the Armaments Corporation of South Africa Ltd, is the officially appointed acquisition organization for the SA Department of Defence and with the approval of the SA Minister of Defence, also renders a professional acquisition service to other Government departments and public entities. ARMSCOR has a Board of Directors. Its Chairperson is appointed by the Minister of Defence. Owing to the unique nature of ARMSCOR's task, the Chairperson and the Chief Executive Officer co-operate closely with the Secretary for Defence, the Chief of the SANDF, and the defence-related industry (as shown in Exhibit 14). All ARMSCOR's equity is held by the State.

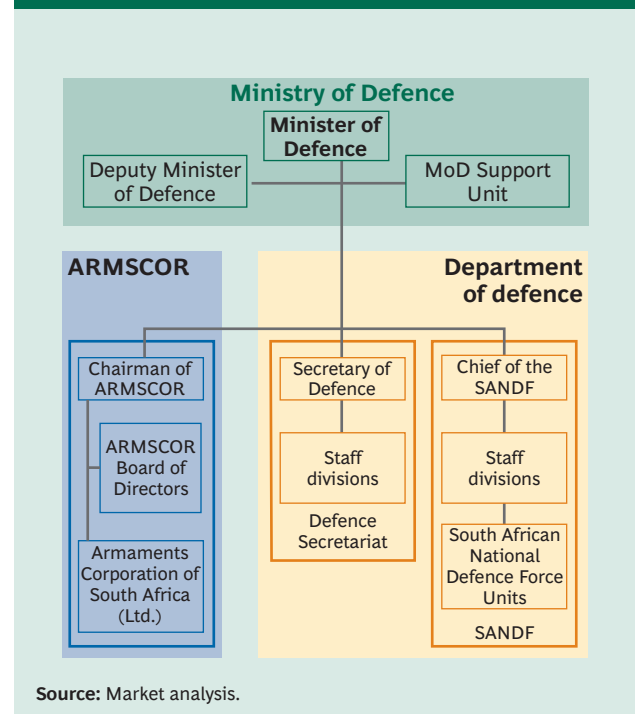
The acquisition role of ARMSCOR entails all the actions that need to be taken to satisfy the need for materiel, facilities or services intended for use in or in support of client requirements. This includes long term operational research, requirement planning, establishment and development of technology, design and development of products and systems, and the industrialization and manufacturing of mature products and systems that fully meet the State user requirements. As such it includes within its ambit the Defence, Science and technology Institute, Several test and evaluation facilities, and other industry support bodies.

In order to facilitate purchase, ARMSCOR operates a centralized tender management system for business and operational tenders. This is supported by a supplier registration and security classification rating system. It also has separate defence expertise institutes providing specialized skills in many areas of defence technology.

Approach to R&D

SA has a fairly collaborative model of Government-Industry participation in defence research. The CSIR is a key is a national research laboratory funded by the Government, which undertakes research in a range of fields of national important. Its dominant focus on applied research (leading to innovative products and services) is still some way from near-market products and services and hence subject to higher commercial and technical risk, thus requiring continued Government funding. The CSIR receives an annual grant from Parliament, which accounts for close to 40 percent of its total income. The remainder is generated from research contracts with Government departments at national, provincial and municipal levels, the private sector and research funding agencies in South Africa and abroad,

Exhibit 14. Structure of the ministry of defence



royalties, licences and dividends from IP management and commercial²⁹ companies created by the CSIR. CSIR DPSS is the wing of CSIR responsible for research in defence areas. Specifically, it aims to provide a defence evaluation and research institute capability for the Department of Defence. It also:

- ◇ Partners with the local defence and aerospace industries to improve strategic capabilities and international competitiveness
- ◇ Collaborates and undertakes joint projects with selected international and local organizations and laboratories
- ◇ Develops and maintains national research facilities and infrastructure

Australia Defence Industry

Overview

Australia's defence budget is the fifth largest in the world per head of the population. In gross terms, it's the 14th largest in the world, commensurate with the size of the economy, which the World Bank rates 13th largest overall. Over the next decade alone, the ADF plans to spend USD 150 billion acquiring and sustaining new and existing defence equipment; acquisition will account for over half of this expenditure.

Industry Structure

Australia's defence industry comprises an important part of Australia's wider national economic and industrial capacity. The industry is concentrated in mainly five main areas of final demand:

- ◇ Shipbuilding and repair
- ◇ Aircraft assembly, modification and repair
- ◇ Electronics and computing
- ◇ Vehicles
- ◇ Clothing

The industry is able to supply and maintain a large percentage of the ADF requirements in-house. Over the past decade, some of ADFs most sophisticated land, sea

and air platforms have undergone major upgrades in Australia. Overall, the industry, including Primes and SMEs employs ~29,000 people. SMEs, numbering about 3,000, account for 50 percent of the employment in the sector. Around 70 percent of the value of defence material procured by the DMO is sourced initially from eight key Prime contractors. Around 30 percent of this work is subsequently sub-contracted to smaller firms in Australia and overseas. In total these eight companies recorded sales revenues of USD 3.8 billion in 2008. Of these primes, one is owned by the Australian Government, with all the remaining being local subsidiaries of large international defence contractors.

The size of the Australian defence industry is not sufficient for it to fully meet its requirements. It is dependent on global contractors, and global primes for designs, components, systems and expertise for construction, integration or upgrades. This is a challenge for Australian SMEs who must accept investment decisions made in USA or Europe. However, this is also an opportunity for them to make profits by integrating into the global supply chains of international primes. In supporting this, Australia has great leverage due to the size of its defence buy. It is was the eighth largest importer from 2001–07 and has significant spending plans in the future. [Department of Defence, Australian Government, 2010]

The Government understands this situation and actively supports the growth of defence SMEs, through several policies. Some of the programs initiated by the Australian Government for supporting and up-skilling the industry are listed below:

- ◇ Australian Industry Capability (AIC) program aims to maximise Australian industry participation. For all defence procurement of USD 50 million or above, tenderers must submit an AIC Plan, demonstrating how they intend to maximize opportunities for Australian companies.
- ◇ The Global Supply Chain (GSC) program, designed to assist entry by Australian defence industry into global supply chains of multinational primes. The program will establish agreements with multinational primes, called GSC Deeds, which will actively facilitate

29. http://www.csir.co.za/research_and_development/national_system_innovation.html

opportunities for Australian industry to compete in the primes' global supply chains and that of their major suppliers.

- ◇ Defence export unit (DEU) aims to assist Australian defence companies to access export markets and global supply chains and thus broaden their customer base. The access to export markets, helps to sustain key defence industry capabilities which are otherwise unviable due to small, irregular or cyclical demand in strategic items
- In 2009, Australia released a Defence White paper which outlined a ten year investment plan in defence technology with the aim of outlining and supporting critical development areas for the local industry³⁰. The Government releases an annual Public Defence Capability Plan which provides an account of major capital equipment proposals that are currently planned for Government consideration
- The Government also identifies Priority Industry Capabilities (PIC). PICs are defined as those capabilities that confer an essential strategic advantage by being resident within Australia and which, if not available, would significantly undermine defence self reliance and Australian Defence Force (ADF) operational capability.

Defence procurement

The Defence Materials Organization is the primary Government agency responsible for acquiring and sustaining equipment and services for the Department of Defence. It employs 7000 people in over 70 locations around Australia and overseas. In the 2010–11 financial year it spent some USD 11.5 billion with over USD 6.1 billion on purchasing new equipment and more than USD 5.3 billion spent on sustainment and through-life support (maintenance, upgrades, fuels, explosive ordnance and spares).

DMO is made up of three general areas comprising seven divisions and five major programs:

- ◇ **Domains:** Aerospace systems division, maritime systems division, electronic systems division, land systems division, helicopter systems division, explosive ordnance division and acquisition and sustainment reform.

- ◇ **Corporate and Operating Divisions:** Includes finance division, human resources and corporate services division, commercial and industry programs, and special counsel to the CEO.

- ◇ **Major Programs:** Airborne early warning and control aircraft program, new air combat capability program, air warfare destroyer program and future submarine project. There are currently 230 existing major projects (each valued at more than USD 20 million) and more than 100 minor projects.

Staff at the DMO, including its leadership team is drawn from a variety of fields, including Government, Law, Private industry and Military. As a service organization, it is guided by strict SLAs and reporting requirements. Detailed information is available to the Parliament and the public through the Defence Capability Plan, the Department's annual Portfolio Budget Statement — listing major projects expected to be approved in the coming financial year — and the Defence Annual Report. The DMO now has a separate annual reporting requirement and from the Financial Year 2005–06 the DMO report is a separate (second) volume to the Defence Annual Report. DMO performance is also regularly assessed by external organizations such as the Australian National Audit Office.

Approach to R&D

Three factors which heavily influence Australia's defence R&D environment are the ADF's dependence on very high technology to offset its lack of numbers; its access to all but the most sensitive equipment produced by the United States and Europe; and its small size. Except for a small but critical portion of ADF capability, Australia faces no overpowering strategic imperative to develop its own high-technology defence equipment. Indeed, it would be pointless and profligate to try and duplicate within Australia much of what is freely available from overseas. One of the key operational challenges for the ADF is not that of obtaining the equipment it needs, but understanding how to make the right choice, and then make best use of it once in service. [Ferguson, 2008]

30. "Guide to 2009 Defence White Paper, Department of Defence, Government of Australia" <http://www.defence.gov.au/publications/White%20Paper%20Booklet.pdf>

The key Government agency responsible for defence R&D is the Defence Science and Technology Organization. The DSTO's primary tasks however, are "to deliver expert, impartial advice and innovative solutions for Defence and other elements of national security". Headed by the Chief Defence Scientist, DSTO has an annual budget of approximately USD 440 million and employs around 2,600 staff, predominantly scientists, engineers, IT specialists and technicians. DSTO also conducts focused research on some topics, specifically for the ADF need. DSTO spends a considerable proportion of its budget sourcing research and technical support from industry, and other research organizations, particularly universities, through contract R&D, collaborative and commercial arrangements. Through its Business and Commercialization office, it actively seeks opportunities to transfer technology to industry. Several successful product innovations have resulted from these partnerships in the past. [Source: <http://www.dsto.defence.gov.au/collaboration/page/3635/>]

Turkey Defence Industry

Overview

Turkey has a long tradition in defence industries. Its shipyards have been producing the fleets for the erstwhile Ottoman empire since the 16th and 17th centuries. However, the industry failed to keep pace with the technological developments in Europe since the 18th century and became insignificant by the advent of the world wars. However, regional problems Turkey faced in the 1960s, Cyprus crises in 1963 and

1967, Cyprus Peace Operation in 1974 and the arms embargo following the Peace Operation necessitated the development of a defence industry based on national resources.

During the 1970s and 80s the Turkish state took several steps to initiate the development of a modern defence-industrial base. After several hiccups, the Government established the Undersecretariat for Defence Industries (SSM), which was given the task of re-organizing and integrating existing industry so that it could satisfy defence related needs³¹. As a result of its efforts the country is now well on its way to becoming a significant player in the global defence markets. Turkish defence companies exported USD 669 million worth of products in 2009 — up from \$337 million in 2005. [Milan, 2011]

Turkey's new defence procurement strategy, announced in 2004 and reaffirmed in 2007, seeks a greater contribution from Turkish firms in defence projects and aims to increase the rate of domestic inputs into defence purchases, presently 25 percent, to 50 percent by 2010.

Industry structure

The Undersecretariat of the Defence Industry (UDI) was formed with the objective of making maximum use of the domestic industry infrastructure, directing and encouraging new advanced technology investments,

31. Sourced with changes from http://en.wikipedia.org/wiki/Military_equipment_of_Turkey

Government — Industry R&D partnerships

LADS — In the 1980s DSTO developed the Laser Airborne Depth Sounder to measure the depth of coastal waters. In partnership with BHP Engineering, Vision Systems LTe won a USD 52 million Defence contract for the further development, manufacture and commissioning of LADS. In the last ten years the LADS technology has generated over USD 100 million for Australian companies.

Chemical Biological Suit — DSTO has worked with an Australian company, Melba Industries to develop a breathable tri-layered fabric. A CB protective suit manufactured using this technology offers a huge

advantage to ADF personnel working in hazardous environments. Melba Industries is now the sole source provider of the CB Combat Suit to the ADF.

Composite Bonded Repair Technology — DSTO is the pioneer and world leader in the use of adhesively bonded fibre composites to repair aircraft structures and arrest stress corrosion cracking. An Australian-owned private company, Helitech Industries Pty Ltd, was licensed to market and develop DSTO's composite bonded repair technology. It is now used in commercial airliners as well as military aircraft of to RAAF, US Air Force and Belgian Air Force.

providing capital contributions and cooperation with foreign technology and ensure domestic production of all kinds of weapons, vehicles and equipment needed. Its main functions are:

- ◇ To structure the existing industry according to the needs of the defence industry
- ◇ To encourage and direct new private, public or mixed investments by loans, advances, long-term standing orders, participation of the state and other financial and economic measures
- ◇ To direct research, development and prototype production activities for modern weapons, vehicles and equipment and
- ◇ To coordinate the subjects of the exports of defence industry products and offset trade.

[Ministry of National Defence, Republic of Turkey, 2000]

The SSM has its own source of capital, named the Defence Industry Support Fund. The fund does not depend on national defence budget appropriations but receives earmarked revenues directly — 10 percent of taxes on fuel, 5 percent of individual and corporate income taxes, and taxes on alcohol and tobacco. Most of the major projects encouraged by SSM have been international joint ventures and coproduction enterprises. In most cases, the foreign partner must agree to an offset provision, that is, a commitment to purchase some part of the resulting production, or components or other goods manufactured in Turkey³².

According to Defence Industrial Manufacturers Association (SaSaD) figures, as of November 2010 there were 718 (+ around 1,000 sub-industry companies) public corporations (military factories and Government controlled companies), private companies and foreign partnerships in the country, employing some 41,000 staff (including 10,978 engineers and 6,689 technicians)³³. A number of foreign defence contractors, including Sikorsky Corp., General Electric, United Defence LP and Loral

Corp. of the U.S., have direct investments in Turkey. Turkish defence products range from modern jet fighters and complex components for antiaircraft missiles to high speed patrol boats and frigates to armoured vehicles and sophisticated air defence and electronics command and control systems.

Defence procurement

Prior to the 1990s Turkey's defence procurement model was based mainly on direct procurement (off-the-shelf purchases), however as a result of the SSM's efforts and policies in support of local industries, the procurement model of Turkey underwent a gradual but significant change throughout the 1990s to co-production, and finally during the last decade to local production (i.e., developing its own designs) and system integration.

By the year 2009, SSM has been coordinating and engaging 111 procurement projects, with a Total Amount of Contract (TAC) of 16 billion USD. Within these developments there are several R&D projects with a TAC of 147 million USD.

Approach to R&D

"2009–2016 Sectoral Strategy Document", was published by the Undersecretariat in order to lead the defence industry, towards a pre-planned direction in terms of critical product needs and research imperatives. The document also includes aims and goal under the general strategies for Sub-sector strategies; Land, Air, Navy, Electronic warfare and sensors, Battle Electronic Information Systems and Missile, Ammunition and Weapon Systems. In accordance with these aims and goals, possible investment items have been presented to Turkish defence industry, including support for private R&D, SME consultancy centers, creation of production clusters aviation, marine sectors, etc.

32. Sourced from GlobalSecurity.org, <http://www.globalsecurity.org/military/world/europe/tu-ssm.htm>

33. "A Comprehensive Overview of the Turkish Defence Industry: Full Report", <http://www.trdefence.com/2011/05/23/a-comprehensive-overview-of-the-turkish-defence-industry-full-report/>



Appendix 3

CII Roadmap Based on Defence Procurement Procedure 2011

SELF-RELIANCE IN DEFENCE IS OF VITAL importance for both strategic and economic reasons and has therefore been an important guiding principle for the Government since Independence. Accordingly, Government have, over the years assiduously built up capabilities in Defence R&D, Ordnance Factories and Defence PSUs to provide our Armed forces with weapons / ammunition / equipment /platforms and systems that they need for the defence of our country. Government considers that the industrial and technological growth in the past decades has made it possible to achieve this objective by harnessing the emerging dynamism of the Indian industry along with the capabilities available in the academia as well as research and development institutions.

Industry's View:

- ◇ There need to be a definite roadmap or quantifiable targets. Without time lines and quantifiable targets, it would be difficult to achieve the same. Government should promulgate the list of the academia as well as research and development Institutions
- ◇ Creating world class indigenous defence production capabilities would not be possible without major structural changes within the Ministry of Defence. Some steps are being undertaken in this regard. However results are yet to be seen

CONSEQUENTLY, AFTER CAREFUL CONSIDERATION AND in consultation with all stakeholders, Government have decided to put in place a Defence Production Policy. The objectives of the policy are to achieve substantive self reliance in the design, development and production of

equipment / weapon systems / platforms required for defence in as early a time frame as possible; to create conditions conducive for the private industry to take an active role in this endeavour; to enhance potential of SMEs in indigenization and to broaden the defence R&D base of the country. However, while pursuing the above objectives, the overall aim of ensuring that our forces have an edge over our potential adversaries at all times — in immediate terms as well as in sustainability — will be ensured. Accordingly, Government have decided that:

Industry's View:

- ◇ A level playing field will significantly ensure the realization of these aims and objectives. Equal opportunity vis-a-vis PSUs and preferential treatment vis-a-vis foreign players would go a long way in ensuring the growth
- ◇ A fixed percentage (at least 20 percent) of all orders placed on PSUs and large Private Organizations should be earmarked for SMEs. The relationship between Large Units and SMEs should be that of a partner in order execution and not of a vendor
- ◇ Small orders should be directly placed on SMEs
- ◇ 20 percent of Offsets should be reserved for SMEs

PREFERENCE WILL BE GIVEN TO indigenous design, development and manufacture of defence equipment. Therefore, wherever the required arms, ammunition and equipment are possible to be made by the Indian industry within the timelines required by the Services, the procurement will be made from indigenous sources.

Whenever the Indian industry is not in a position to make and deliver the equipment as per the SQRs in the requisite time frame, procurement from foreign sources would be resorted to, in accordance with the Defence Procurement Procedure. While examining procurement cases, the time taken in the procurement and delivery from foreign sources vis-à-vis the time required for making it in the country, along with the urgency and criticality of the requirement will be examined as per the Defence Procurement Procedure before deciding to proceed with procurements from foreign sources.

Industry's View:

The criteria for preference should be spelt out. These can be suggested as:

- ◇ Price preference upto 2 percent for indigenous solutions
- ◇ Delivery preference upto 5 percent of the schedule
- ◇ No relaxation for system performance
- ◇ Government should chalk out a strategy in consultation with Industry organizations to promote indigenous design, development and manufacture
- ◇ Indian industry will benefit if adequate policy measures are taken for instance by offering incentives and strengthening overall supply chain from component manufacturers to system integrators

BASED ON THE APPROVED LONG Term Integrated Perspective Plan (LTIPP), equipment / weapon systems / platforms required ten years and further down the line will by and large be developed / integrated / made within the country. Sub-systems / equipment / components that are not economically viable or practical to be made within the country may be imported, ensuring their availability at all times. However, as far as possible, the design and integration of the platform/ system will be undertaken within the country.

Industry's View:

- ◇ LTIPP (at least the sanitized version) should be shared with industry

- ◇ For security clearance industry, both private and public can sign secrecy bonds
- ◇ 10 years is too long a period to develop any system as technology becomes obsolete in five years. This time line should not be more than five years

GOVERNMENT WILL ENDEAVOUR TO BUILD up a robust indigenous defence industrial base by, proactively encouraging larger involvement of the Indian private sector in design, development and manufacture of defence equipment. Towards this end, efforts would be made in progressively identifying and addressing any issue which impacts; or has the potential of impacting the competitiveness of the Indian defence industry in comparison to foreign companies.

Industry's View:

- ◇ Proactive measures should include; easy availability of capital, land (state subject) and infrastructure
- ◇ Reduce industrial licensing requirements to only full systems (as few as possible), and de-licence the shipbuilding, vehicles and aircraft sector
- ◇ Remove non-lethal products from the arms act
- ◇ Tax benefits particularly on expenditure towards R&D to include:
 - Tax holidays — corporate and Income tax — on the same lines as for SEZ units
 - All R& D expenditure eligible for Tax exemption as long as it is 2 percent or greater of revenues and can be accepted as part of the CSR process
 - Imports of capital goods for building indigenous plants and kits for exports to meet offset obligations should be given single window clearance. Ministry of Defence must have a section / division that addresses these issues of licences, import duties, export permits etc in a multidisciplinary model. All issues of advance licence, SCOMET clearance, EPCG certifications and exemptions should be centrally addressed with appropriate representation for the concerned

departments at any one Ministry whether Ministry of Defence, DGFT, DIPP, etc.

- Sale of defence products to Government of India against a purchase order should be exempted from all taxes. This will bring down the overall defence budget
- Special incentives to promote defence industry in accordance with SEZ incentives
- Defence industry should be accorded a similar status as infrastructure — with tax savings allowable in bonds / instruments raised by private / public sector

IN ORDER TO SYNERGIZE AND enhance the national competence in producing state of the art defence equipment / weapon systems / platforms within the price lines and timelines that are globally competitive; all viable approaches such as formation of consortia, joint ventures and public private partnerships etc. within the Government approved framework will be undertaken. The Academia, Research and Development Institutions as well as technical and scientific organizations of repute will be involved for achieving this objective.

Industry's View:

- ◇ Government should spell out specific guidelines related to Joint Ventures as the FDI in the defence sector has not succeeded despite the potential of about a USD 100 billion over the next two plan periods. As per DIPP's FDI statistics, issued in June 2010, the defence sector has received only USD 0.05 million since the FDI norms were announced and ranks amongst the bottom three of sectoral FDI. Quite obviously the JV model has not been encouraging and is full of subjective assessment and is hardly transparent.
- ◇ Synergizing public and private sector for creating robust indigenous defence industrial capabilities is a must. Industry is ready to provide its share in this regard and partner with public sector and the DRDO
- ◇ Government should promulgate a approved list of academic, research and development institutions

where industry may tap for research and technical advice. The list may include, IITs, IIMs, IISc and some select labs of DRDO

GOVERNMENT WILL FURTHER SIMPLIFY THE procedures under the "MAKE" category of the Defence Procurement Procedure in such a manner that it enables the indigenous design and development of the required equipment / weapon systems / platforms by both public and private industry in a faster timeframe.

Industry's View:

- ◇ We should also push forward indigenous design and development and industry can partner with DRDO for Design and Prototype development with budgetary support. As per Defence Procurement Procedure 2011 Government of India would meet 80 percent and industry would meet 20 percent. However assured orders, a minimum order quantity, post successful trials must be ensured

SERVICE HEADQUARTERS (SHQS), WHILE LAYING down the qualitative requirements for defence equipment/ weapon systems/ platforms to be developed / integrated / made, will exercise due diligence at all times to keep in view feasibility and practicability of the QRs. It will be ensured that the systems / platforms designed / developed / integrated in the country provide a competitive edge to our Services vis-à-vis our potential adversaries.

Industry's View:

- ◇ Although having the best systems and equipments constituted of the best of the materials and technologies is desirable, it might not be practical and feasible. Therefore, SQRs should be in conformity with the actual requirements of the services
- ◇ SHQs should only define top level capability / performance requirements from systems and leave industry to find the solution using the appropriate technology

GOVERNMENT ALSO RECOGNIZES THAT DEVELOPMENT OF complex systems is generally a stage process with

incremental changes progressing from Mk-I and Mk-II and so on. The stage process will be followed. However, at every review of such developmental projects by the Defence Production Board or Defence R&D Board as the case may be, it will be ensured that our equipment, weapons systems and platforms are such that they provide an edge to our forces over our potential adversaries. In case of delays in the realization of the projects, the corresponding proposal will be processed as per the Defence Procurement Procedure and the option of “Buy” shall be followed for the necessary numbers till indigenous production capability is established where after indigenous systems shall be procured.

Industry’s View:

- ◇ In any case all the decisions of the DAC and the DPB should be made public or at least shared with industry bodies. The policy should not be treated as a legitimate resort to import everything
- ◇ RFP should entail the concepts like “throughout life support” or from “womb to tomb.” There should be provision for upgradation and assigned agency should not withdraw after delivering Mk-I. It is also easier for the industry to export the lower version of any sophisticated equipment or system

POLICIES WILL BE PUT IN place to encourage the OFB, DPSUs and the Private Sector to strengthen their research and development wings so that constant up-gradation and improvement in systems under manufacture is possible.

Industry’s View:

- ◇ Government should adopt innovative methods of encouraging private industry to invest in R&D. These may include providing tax exemption and providing infrastructural and technical support, hiring of renowned experts from the world
- ◇ Import of all test and laboratory equipments for conduct of R&D, tests, verification and validation should be made duty free
- ◇ IPR and patent should be tradable. In case of SME, SME and DRDO shall co-own the IPR

- ◇ This would encourage IPR/patent owner to even export its products
- ◇ Industry should also be able to buy technology from DRDO on competitive basis
- ◇ Industry should be allowed to outsource to DRDO specific projects against payments. This would allow DRDO to develop a corpus for its future growth
- ◇ The SMEs ability to manage innovation should be leveraged for Defence Research
- ◇ DRDO should give a grant upto INR 5 crore for proof of concept and prototype work
- ◇ If innovation is accepted by Ministry of Defence, PSU, Large Indian or Foreign Defence Supplier, a royalty or one-time fee would be paid which will be shared by Industry and DRDO

GOVERNMENT WILL SET UP A separate fund to provide necessary resources to public / private sector including SMEs as well as academic and scientific institutions to support research and development of defence equipment / systems enhancing cutting edge technology.

Industry’s View:

- ◇ Government should clearly spell out all the details related to this fund. For instance, what kind of project will qualify, what is the process and who will administer the fund? What would be the borrowing norms and eligibility criteria
- ◇ Government should come out with a concrete list of scientific institutions.

IN ALL CASES OF TRANSFER of Technology, DDP along with DRDO, HQIDS and SHQs will be involved in identification and evaluation of requisite technology, and subsequently would be responsible to ensure that appropriate absorption of technology takes place in the Indian industry. Thereafter, successive generations of the weapon systems / platforms will be developed in the country.

Industry's View:

- ◇ Private industry should also be given adequate opportunities to prove their mettle as far as TOT is concerned. If a critical technology has to be bought, it should be bought but not more than once.
- ◇ Para 19 of Chapter 1 of Defence Procurement Procedure 2011 would need to elaborate the selection methodology for the PA to absorb ToT.
- ◇ Indian industry should also be eligible for ToT from DRDO to compete for being the Production Agency for indigenously developed programs.

UPGRADES WILL BE CARRIED OUT by the Indian Industry as far as possible. DRDO, HQIDS, SHQs, OFB, DPSUs and the private sector will work in close coordination for continuous upgradation in systems.

Industry's View:

- ◇ All upgrades may be difficult to carry out as a larger platform comprises of many sub systems. However Indian industry will eventually gain these capabilities.
- ◇ Upgradation of systems are either at Mid Life or are taken up as Service Life extension. Specific capabilities sought for mid life upgrades and life extension should be shared by SHQs with the industry before the categorization process commences.

THE COMMITTEES SET UP UNDER the Defence Procurement Procedure will process the acquisition proposals in accordance with the above policy guidelines.

Industry's View:

- ◇ Industry's views should be taken on board through the industry bodies.
- ◇ SCAPCC, SCACHC and DOFA and Defence acquisition and offsets need to be streamlined in accordance with the Defence Production Policy.

THE RAKSHA MANTRI WILL HOLD an Annual Review of the progress in self-reliance that has been achieved during the year.

Industry's View:

- ◇ Government should put in place a common and public domain monitoring matrix. The annual review by RM can only be meaningful if the policy has measurable and well defined milestones. These should be identified by March of every year and shared with industry.
- ◇ All categorization proposals and their final disposal by DPB and DAC should be placed on the Ministry of Defence website.
- ◇ RFIs issued and companies who have responded should be placed on the Ministry of Defence website.
- ◇ The Annual Review should be posted on the website and must include details of proposals considered:
 - Number of proposals considered
 - Number categorized as Buy Global and estimated worth
 - Number categorized as Buy Indian and estimated worth
 - Number categorized as Buy and Make Indian and estimated worth.
 - Shipbuilding categorizations
 - Make categorization proposals
- ◇ This policy should come into force with immediate effect.



Bibliography

- CII — Ernst & Young. (2010). Enhancing the role of SMEs in Indian Defence Industry.
- CII — KPMG. (2010). Unlocking the Potential: The Indian Aerospace and Defence Sector. Confederation of Indian Industry.
- CII — Deloitte. (2010). Prospects for Global Defence Export Industry in Indian Defence Market. CII Indian Defence Industry Mission.
- CII — KPMG. (2010). Opportunities in the Indian Defence Sector — On Overview.
- Committee on Review of Defence Procurement Procedure (Vijay Kelkar). (2005). Towards Strengthening Self Reliance in Defence Preparedness.
- Department of Defence Production, Government of India. (2011). Defence Production Policy.
- Department of Defence, Australian Government. (2010). Building Defence Capability: A policy for a smarter more agile Defence industrial base. Australian Government.
- Ferguson, G. (2008). Commercialising Defence R&D. Australian Defence Magazine.
- Hen-Tov, E. (2004). The Political Economy of Turkish Military Modernization. The Middle East Review of International Affairs, Volume 8, No. 4, Article 5 — December 2004.
- Manohara, C. (2000). Defence Procurement in Singapore. The DISAM Journal.
- Milan, F. F. (2011). Turkey's Booming Defense Industry. ISN Insights.
- Ministry of Defence, Government of India. (2004–2010). Annual Report of the Ministry of Defence.
- Ministry of Defence, Government of India. (2004–2009). Defence Services Estimates.
- Ministry of Defence, UK. (2005). Defence Industrial Strategy, Defence White Paper.
- Ministry of National Defence, Republic of Turkey. (2000). Defence White Paper. Ankara.
- Parliamentary Standing Committee on Defence, Government of India. (2005–06). Procurement Policy and Procedure: Sixth Report.
- Research Unit of Creamer Media. (2006). South Africa's Defence Industry. Johannesburg.
- Suman, M. G. (Sep 2009). India Needs Association of Defence Manufacturers. Indian Defence Review.
- Suman, M. G. (October 2010). Private Sector in Defence Production. Indian Defence Review.



Note to the Reader

About the Authors

Dr. Arindam Bhattacharya is the Managing Director of BCG India. Navneet Vasishth is a Partner and Director in the New Delhi office of The Boston Consulting Group.

For Further Contact

If you would like to discuss the themes and content of this report, please contact:

Arindam Bhattacharya

BCG New Delhi +91 124 459 7093
bhattacharya.arindam@bcg.com

Vikram Bhalla

BCG Mumbai
+91 22 6749 7421
bhalla.vikram@bcg.com

Sachin Nandgaonkar

BCG New Delhi
+91 124 459 7058
nandgaonkar.sachin@bcg.com

Arvind Pandey

BCG New Delhi
+91 124 459 7212
pandey.arvind@bcg.com

Sharad Verma

BCG New Delhi
+91 124 459 7025
verma.sharad@bcg.com

Ashish Iyer

BCG Mumbai
+91 22 6749 7156
iyer.ashish@bcg.com

Ravi Srivastava

BCG New Delhi
+91124 459 7038
srivastava.ravi@bcg.com

Navneet Vasishth

BCG New Delhi
+91 124 459 7196
vasishth.navneet@bcg.com

Rahul Jain

BCG Mumbai
+91 22 6749 7081
jain.rahul@bcg.com

Rohit Vohra

BCG Mumbai
+91 124 459 7075
vohra.rohit@bcg.com

Amit Ganeriwalla

BCG Mumbai
+91 22 6749 7232
ganeriwalla.amit@bcg.com

Suresh Subudhi

BCG Mumbai
+91 22 6749 7160
subudhi.suresh@bcg.com

Acknowledgments

This report has been prepared by The Boston Consulting Group (BCG). The authors would like to thank The Confederation of Indian Industry (CII) for help with conducting discussions within member organizations and for their help in evolving the industry consensus on core issues and potential solutions for this sector.

The authors also gratefully acknowledge the contributions of Megha Jain from BCG and the CII team comprising Gurpal Singh, Amit Singh, and Rajesh Kapoor in conducting various analyses for this report.

A special thanks to Payal Sheth for managing the process logistics along with Jamshed Daruwalla for his editing, designing and production support for this report.



For Further Reading

The Boston Consulting Group has published other reports on this topic which may be of interest to senior management. Recent examples include:

Aadhaar — An Indian Megatrend: Leveraging the Potential

A report by the Boston Consulting Group, March 2012

The Tiger Roars: An In-Depth Analysis of How a Billion Plus People Consume

A report by The Boston Consulting Group in association with The Confederation of Indian Industry (CII), February 2012

Indian Manufacturing at a Point of Inflection

A white paper by The Boston Consulting Group in association with The Confederation of Indian Industry (CII), December 2011

Beyond License to Operate: India Mining: Solving the Sustainability Conundrum

A report by The Boston Consulting Group in association with The Federation of Indian Chambers of Commerce and Industry (FICCI), December 2011

Sustainability: The ‘Embracers’ Seize Advantage

A research report by MIT Sloan Management Review and The Boston Consulting Group, December 2011

India Food Processing: Mission 2020

A report by The Boston Consulting Group in association with The Federation of Indian Chambers of Commerce and Industry (FICCI), November 2011

Large Project Management: A Blueprint for Success

A focus by The Boston Consulting Group, May 2011

Green Manufacturing: Energy, Products and Processes

A whitepaper by The Boston Consulting Group in association with The Confederation of Indian Industry (CII), March 2011

Digital India: The \$ 100 Billion Prize

A white paper by the Boston Consulting Group, January 2011

Companies on the Move: Rising Stars from Rapidly Developing Economies Are Reshaping Global Industries

A report by The Boston Consulting Group, January 2011

The Adaptive Public-Sector Agency

A perspective article by The Boston Consulting Group, May 2010

Indian Manufacturing: The Next Growth Orbit: Aspiration and Roadmap for Indian Manufacturing

A report by The Boston Consulting Group in association with The Confederation of Indian Industry (CII), January 2010

India’s Demographic Dilemma: Talent Challenges for the Services Sector

A report by the Boston Consulting Group, published with the Confederation of Indian Industry (CII), December 2008.

To find the latest BCG content and register to receive e-alerts on this topic or others, please visit bcgperspectives.com.

Follow [bcg.perspectives](https://www.facebook.com/bcg.perspectives) on Facebook and Twitter.

BCG

THE BOSTON CONSULTING GROUP



Confederation of Indian Industry