AIR POWER

Journal of Air Power and Space Studies

Vol. 6 No. 2, Summer 2011 (April-June)

AIR POWER

CENTRE FOR AIR POWER STUDIES

New Delhi

AIR POWER is published quarterly by the Centre for Air Power Studies, New Delhi, established under an independent trust titled Forum for National Security Studies registered in 2002 in New Delhi.

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ISBN: 81-87966-30-0

AIR POWER Journal is published four times a year and is distributed by
KW Publishers Pvt. Ltd.
4676/21, First Floor, Ansari Road, Daryaganj, New Delhi 110 002
Telefax: 23263498 e-mail: knowledgeworld@vsnl.net

Printed and Published by Air Cmde Jasjit Singh (Retd) on behalf of the Forum for National Security Studies (the Trust running the Centre for Air Power Studies, New Delhi) and Printed by Rajkamal Electric Press, Plot No. 2, Phase IV, HSIIDC, Kundli 131028, Sonepat, Haryana and Published at P-284, Arjan Path, Subroto Park, New Delhi 110 010. Editor: Air Commodore Jasjit Singh (Retd).

RNI REGN No. DELENG/2006/18450

CONTENTS

Vol. 6 No. 2, Summer 2011 (April-June)

to deal with such contingencies. This has been badly shaken by the complex accident at Fukushima in Japan recently. India, China and many other countries are planning to expand nuclear energy and reactors substantively. It is in this context that **Sitakanta Mishra** has explored the possible and desirable measures to enhance the safety and security of nuclear establishments and infrastructure.

EDITOR'S NOTE

As noted in the contents section, with this issue, we complete seven years of continuous publication of this journal. In order to facilitate easy identification of the articles published, an issue-wise index has been included in this issue. And with that we thank the authors and readers of *AIR POWER*, especially the larger community of the Indian Air Force (IAF) and its air warriors whose support has made the success of the journal possible. We will continue our efforts to bring you professional writings on national security and aerospace power issues.

The long awaited finality of acquisition of the MMRCA is at last getting closer to the end with the down selection of two aircraft types (from a total of six in competition), that is, the French Rafale and the Cassidian/EADS four European nations consortium's Eurofighter Typhoon. What has been significant is that this down selection has been accepted gracefully though with natural disappointment by the rival companies and their countries (the US, Russia and Sweden). No complaints of bias or scam have yet appeared although the deal had meant a great deal in techno-economic and geo-political terms to all the competing nations and companies. This is largely due to the extensive and detailed evaluation system designed by the IAF and Ministry of Defence to work out the relative criteria that would meet IAF requirements.

For the first time in Indian aviation history, the MMRCA evaluation of each of the contending aircraft was carried out in-country at three different locations (Bengaluru, Jodhpur and Leh) to test their performance

in different climatic and altitude conditions against the listed criteria. This acquisition, as we have said so often in the past, would and should set the pattern for future acquisitions of defence equipment not only from abroad but also from indigenously produced systems.

IMPACT OF OFFSET POLICY ON INDIA'S DEFENCE INDUSTRIAL CAPABILITY AND POLICY ISSUES

S. N. MISRA

INTRODUCTION

The Indian Ministry of Defence (MoD) introduced the offsets provisions in its Defence Procurement Procedure 2005 (DPP-2005)[1] for capital acquisition schemes exceeding an estimated cost of Rs. 300 crore i.e. around $ 66 million. Its scope, the obligation and role of the Defence Offset Facilitation Agency (DOFA) and the modality for finalising offsets contracts and monitoring implementation thereof were indicated therein.

The subsequent changes in the offset policy in DPP 2006[2], 2008[3], 2009[4] included provision for credit banking,[5] delineation of defence products,[6] and relaxation in the licensing requirements.

DPP-2011[7] makes a substantial leap from the earlier stipulation of direct offsets by including dual use civil aerospace products and homeland security

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Mr **S. N. Misra** is the Principal Controller of Defence Accounts (Navy).

1. DPP-2005, http://mod.nic.in.
2. Ibid.
3. Ibid.
4. Ibid.
5. DPP-2011, http://mod.nic.in, p. 57.
6. Ibid., p. 55).
7. http://mod.nic.in.

items,[8] thereby ushering indirect offsets in a limited way. It also makes a definitive policy statement for progressives indigenisation in crucial areas with a view to improving our Self-Reliance Index (SRI) in acquisition of equipment, platforms and weapon systems, and ensuring a level playing field for the private sector, including private shipbuilding companies.[9] DPP-2011 was soon followed up with a Defence Production Policy[10] document which outlines the roadmap for indigenisation.

With such an evolving offset policy, this paper examines its **impact during 2005-10 in** bolstering defence industrial capability and self- reliance, and its stated objectives.

INDIA'S MILITARY INDUSTRIAL COMPLEX

India's military industrial complex consists of nine Defence Public Sector Undertakings (DPSUs), 40 Ordnance Factories (OFs), 50 Defence Research and Development Organisation (DRDO) labs, 140 private defence companies, and 5,000 Small and Medium Enterprises (SMEs) involved in production of around 450 items.[11]

Product Range

The nine DPSUs are engaged in the manufacture of products like helicopters, fighters, warships, submarines, patrol vessels, heavy vehicles and earthmovers, missiles and a variety of electronic devices, alloys and special purpose steel.[12]

The 40 OFs are engaged in production of small arms and ammunition of all the weapon systems, armoured and transport vehicles.[13] A very high degree of self-reliance has been achieved in these areas except in the area of artillery guns of 155 mm calibre where the Army is still groping to fill up the void in the towed and wheeled category – thanks to the Bofors imbroglio. This acquisition is fortunately in the pipeline.

8. DPP-2011, p. 56.
9. DPP-2005, http://mod.nic.in.
10. http://mod.nic.in.
11. Annual Reports, MoD.
12. Ibid.
13. Ibid.

Production Capability

The DPSUs and OFs have built substantial production capability largely through licence agreements (Buy & Make) for tanks, Infantry Combat Vehicles (ICVs), missiles, frigates, submarines, aircraft and electronic devices. The **overall value addition of DPSUs hovers around 37 percent. Midhani is a healthy exception** (57 percent) where substantial self-reliance in several critical materials like titanium alloys, manganese steel, special steel alloys, nickel base and cobalt base, super alloys and niobium-hafnium required by strategic sectors and programmes has been achieved.[14]

In the case of **OFs,** the **value addition is substantial** (85 percent), possibly because of the lesser technology depth of land systems compared to fighters and submarines.

Even amongst the naval platforms, value addition in submarines is substantially less (23 percent) than patrolling vessels (37 percent).

The value addition of each product would, however, depend on the stage of technology absorption.

An overview of the performance of the DPSUs and OFs is placed below as Table 1.

Table 1: Financial Performance of DPSUs/OFs (2009-10) (Rupees in crores)

DPSU	VOP	VOS	PAT	ADDITION
HAL	13,489	11,456	19,674	39%
BEL	5,247	5,219	7,208	41%
BEML	3,708	3,537	222.8	39%
MDL	2,856	3,150	240.1	23%
GRSE	870.7	424.2	114.8	35%
GSL	866	472.9	130.7	37%
MIDHANI	373	371	44,6	57%
BDL	631.6	627	33.7	50%
HSL	608	618	2.3	-
TOTAL	28,649.3	25,893.1	3,477.2	38%
OFS	11,817	8,715	--	85%
Grand Total	40,466.3	34,610.1	3,477.2	

Source : Annual Report, MoD.

14. Annual Report, Midhani (2009).

In other words, the **value of sales of DPSUs and OFs is of the order of $7.7 billion, with profit after tax to sales a healthy 13 percent for the DPSUs.**

DRDO

The 50 Defence Research and Development Organisation (DRDO) labs are dedicated towards progressive enhancement of self-reliance of defence systems and enhancement of Research and Development (R&D) infrastructure and capability of the country. [15]

Some of the major strides towards making the country self-reliant in the areas of military technology are:

- Prithvi (surface-to-surface missile) in the ranges of 150 and 250 km.
- Agni-I (surface-to-surface missile) with a range of 700 km.
- Akash (surface-to-air) missile with 25 km range.
- Brahmos (supersonic cruise missile) – a Joint Venture (JV) product of India and Russia.
- Light Combat Aircraft (LCA) Tejas, whose Initial Operational Clearance (IOC) is scheduled for December 2011.
- Battlefield surveillance radar – short range, phased array radars.
- Electronic warfare programme for the Army (Samyukta) and Navy (Sangraha).
- Multi-barrel rocket system (Pinaka) in the 37.5 km range.
- Hull mounted sonars HUMSA (NG).
- Torpedo Advanced Light (TAL) MK-1.

The value of systems/products/technologies developed by DRDO and included into the services is in the range of $11 billion.

PRIVATE SECTOR PARTICIPATION

Consequent on the opening up of the defence industry sector in May 2001, allowing the Indian private sector participation, with a Foreign Direct Investment (FDI) cap of 26 percent, a number of JVs have mushroomed between Indian and foreign companies. Major private sector industries and SMEs are also actively

15. Annual Report, MoD.

engaged as suppliers, fabricators and designers to DPSUs and OFs, accounting for 17 percent of outsourcing.[16] They are also closely associated with strategic programmes like Arihant, Dhanush, Brahmos and Pinaka. However, they are rarely system integrators or recipients of technology. The Buy & Make (Indian) option in 2009 would provide them a window to Transfer of Technology (TOT)[17] which was the exclusive preserve of DPSUs/OFs.

They are now into production of Fast Patrol Vessels (FPVs) and Inshore Patrol Vessels (IPVs) and competing with defence shipyards thanks to the level playing field provided in the Shipbuilding Procedure.[18]

MILITARY CAPABILITY

It is estimated that **15 percent of India's defence equipment is state-of-the art** while around 50 percent is obsolete. A comparison of our military hardware capability vis-a-vis our major adversaries is placed below (Table 2).

Table 2: Military Capability

	China	India	Pakistan
MBTs	6,500	4,047	2,461
Artillery	17,700	11,258	4,249
Submarines	65	16	8
Frigates	52	12	7
Aircraft	1,617	632	383
FGA	283	536	104
Defence Budget	$70.3B	$36B	$4B

Source: *Military Balance*, 2010.

SELF-RELIANCE INDEX

Despite such an impressive indigenous capability, the self-reliance quotient has remained around 30 percent for quite some time. The SRI Committee under Dr. Kalam had set a target of improving the Self-Reliance Index from 0.3 (1995) to 0.7 by 2005.[19] This has remained a pipedream. The Defence Expenditure Review Committee (2009) makes a strong case for drawing up

16. Reply to Parliamentary Standing Committee on Defence (2009-10).
17. DPP-2009, http://mod.nic.in.
18. DPP-2011, http://mod.nic.in.
19. SRI Committee Report – Prof Amitabh Malik (Member Secretary).

a self-reliance roadmap for attaining the goal of 70 percent indigenisation in a 15–20 year time-frame.[20]

Our track record, particularly in critical areas like propulsion systems, weapons and sensors remains abysmally poor. Even for aerograde material used for fuselage by fighters[21] and high quality steel required by frigates, submarines and aircraft carriers,[22] our dependence on imports is around 90 percent. Some of these critical technologies are listed below in Table 3.

Table 3: Critical Technology

1	Gas Turbine Engine	Single Crystal
		Special Coating
		FADEC
2	Missile	Uncooled FPA Seekers
3	Aeronautics	Smart Aerostructures
		Stealth Technology
4	Material	Nano Material, Carbon Fibres
5	Naval Systems	Super Cavitating Technology
6	Sensors	AESA, Radar, RLG, INGPS
7	Communication	Software Defined Radio
8	Avionics	Gen III, II Tubes
9	Surveillance	UAVs, Satellites

The Standing Committee on Defence (15th Lok Sabha) has sardonically observed that "achieving self-reliance in defence equipment is a distant dream" and has strongly recommended R&D in all defence production to be strengthened and private industries to share the responsibility of indigenisation and self-reliance in defence production.[23]

DEFENCE PROCUREMENT POLICY, OFFSETS AND SELF-RELIANCE

The Defence Acquisition Council, chaired by the Raksha Mantri (RM), with all the Service Chiefs and Secretaries in the Ministry of Defence (MoD) as members, **decides on the Long-Term Perspective Plan (LTIPP)**, identifies make projects and categorises acquisitions into Buy, Buy & Make, and Buy & Make (Indian). **Categorisation is critical for bolstering self-reliance as it**

20. Defence Expenditure Committee Report (2009).
21. Source: HAL.
22. 15-year Indigenisation Plan (Navy) (2003).
23. Report of the Expert Committee, DRDO, August 1998.

is only through the Make, Buy & Make, and Buy & Make (Indian) routes that the Self-Reliance Index can be improved.

There is, however, **simmering criticism that the Services plump for only the Buy option, with the Make category given short shrift**. Its fructification flows through a tortuous route.[24] Even financial assistance earmarked for Make projects to the private sector is yet to be availed of.

DRDO's unflattering **track record** in terms of timelines to design and develop major programmes like the **Kaveri**, **LCA** and **Main Battle Tank (MBT)** has given **added impetus to the import option**.[25]

It would be of interest to note that the MoD's procurement policy never flagged improvement in indigenous defence capability as a thrust area till 2011. In marked contrast, the policy statements of countries like Japan, China and South Korea have always rooted for indigenisation as a thrust area. Unsurprisingly, Malaysia improved its share in the defence market from 28 percent in 1997 to around 45 percent the next year by absorbing technology flowing through offsets during 1991-98.[26]

The offset policy of 2011 has, therefore, brought in a whiff of fresh air by affirming progressive indigenisation in crucial areas as a national commitment. However, the decision to include civil aerospace products in the policy ambit has drawn criticism from some quarters as it is likely to nullify the very rationale of the offset policy and deprive the nascent defence industry of development.[27]

The Defence Production Policy (2011)[28] is a watershed policy statement for achieving substantive self-reliance in design, development and production of equipment, platforms and weapon systems by creating conditions for the private sector and carving out a funding mechanism.

IMPACT OF OFFSET POLICY ON DEFENCE INDUSTRIAL CAPABILITY

There has been a significant spurt in acquisition by the Indian Air Force

24. DPP-2008, p. 157-162.
25. Rama Rao Committee Report (2008).
26. Kogila Balakrishna and Ron Mathews, "The Role of Offsets in Malysian Defence Industrialization," *Defence & Peace Economics*, vol. 20(4), 2009, pp. 341- 358, V.N. Srinivas, *Defence Offsets* (New Delhi: Knowledge World, 2010).
27. Ajay Shukla, "Moments of Truth for Defence Offsets," December 14, 2010.
28. www.mod.nic.in

(IAF) and Navy in recent years, the major acquisition contracts signed being the MiG-29 (upgrade) (Rs. 3,856 crore), medium lift helicopters (Rs. 5,600 crore), C-130 J aircraft (Rs. 366 crore) and Long Range Maritime Recce Anti-Submarine Warfare (LRMRASW) aircraft for the Navy (Rs. 10,684 crore).[29] The trend of capital acquisition expenditure is placed at Table 4.

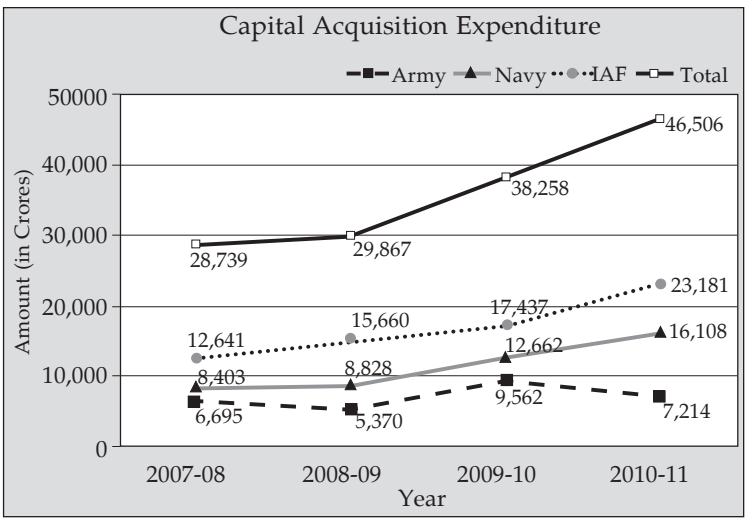
Table 4: Capital Acquisition Expenditure

Service	2007-08	2008-09	2009-10	2010-11
Army	6,695	5,370	9,562	7,217
Navy	8,403	8,828	12,662	16,108
IAF	12,641	15,660	17,437	23,181
TOTAL	**28,739**	**29,867 (0.4%)**	**38,258 (27.4%)**	**46,506 (21%)**

Source: Defence Service Estimate MoD & MoD (Finance/Budget).

The trend analysis is as under (Fig 1).

Fig 1: Capital Acquisition Expenditure



The broad details of the 12 acquisition programmes concluded with foreign companies with their contract value and offset contract value are placed as Table 5 below.

29. DOFA, DDP.

Table 5: Offset Cases: Contracts Finalised (2005-10)

Sr. No	Acquisition Programmes	Foreign Companies	Contract Value (In crores)	Offset Contract (In crores)
1	Medium Power Radar (Contract signed on Oct 16, 07)	IAI ELTA Israel	810	243
2	Upgrade of MiG-29 aircraft for IAF (Contract signed on Mar 07, 08)	ROE, Russia	3,856	1,233
3	Fourth Fleet Tanker (Contract finalised on Apr 23, 08)	Fincantieri, Italy	800	240
4	Long Range Maritime Recce Anti-Submarine Warfare Aircraft (Contract finalised on Jan 01, 09)	Boeing, USA	10,684	3,205
5	HAROP Unmanned Aerial Vehicles (UAVs) (Contract signed on Feb 13, 09)	IAI, Israel	720	220
6	Medium Lift Helicopters (Contract signed on Dec 05, 08)	Rosoboron Export, Russia	4,950	1,485
7	C-130 J Aircraft (Contract signed on Mar 31, 09)	Lockheed Martin, USA	3,666	1,100
8	EO/ IR Pods – Jaguar upgrade (Contract signed on Feb 06, 09) * The actual value of contractual offset obligations is Rs. 105 crore but over the offset contract signed.	RAFAEL, France	350	159
9	Fourth Fleet Tanker - under option clause (Contract finalised on 09)	Fincantieri, Italy	800	240
10	Low Level Transportable Radar (LLTR) (Contract finalised on July 29, 09)	M/s Thales, France	570	171
11	VVIP Helicopters (Contract signed on Feb 08, 10)	M/s Agusta Westland UK	4,227	1,268
12	UAV	M/s IAI	1,265	379
	Total		**32,698 cr.**	**9,943 cr.**

Source: DOFA, MoD.

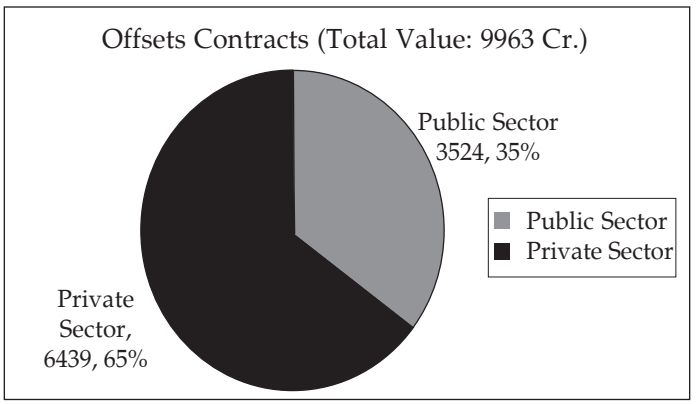
The major beneficiaries of the offset arrangements in the public and private sector are placed as Table 6.

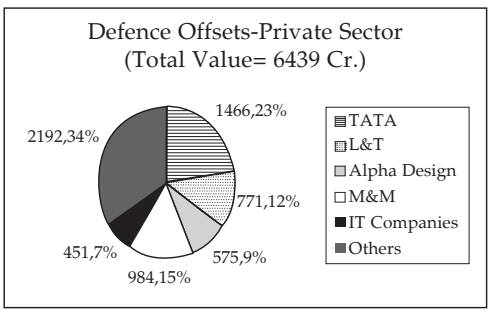
Table 6: Beneficiaries of Offset Contracts (Rupees **in Cr.)**

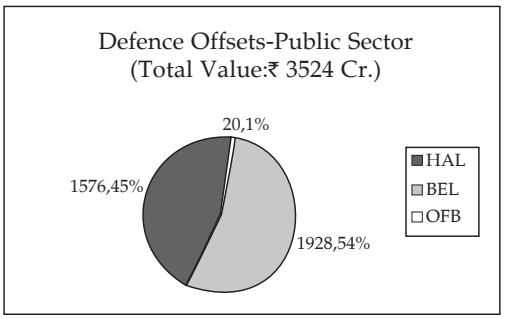
Entity	No. of contracts	Value
HAL	6	1928
BEL	6	1576
TATA	4	1466
L & T	7	771
ALPHA DESIGN	2	575
M & M	1	984
HCL	1	235
WIPRO	1	216

Source: DOFA, MoD.

A pie chart showing an overview of contracts amongst private and public players is placed below (Fig. 2):







The Highlights of Offset Contracts

- Steady increase from $48.6 million in 2007 to $519.5 million in 2008, $974 million in 2009 to around $700 million during 2010.
- The aerospace sector accounts for 65 percent and the balance by the other Services.
- Level playing field concern has been turned on its head as the Indian private industry accounts for 70 percent in value of these contracts.
- The DPSUs viz. HAL and BEL, and Tatas and L&T from the private sector, are major players.
- The SMEs and Information Technology (IT) companies also have a fairly handsome share and invest well is R&D.
- There is no positive impact on exports.
- In terms of FDI inflow, for infrastructure, production and R&D, the impact so far is minimal.
- Only one case of credit banking has been approved so far, with seven in the pipeline for a long time.

The major area of offset realisation is sub-contractisation (58 percent) involving supply of fuselage, cabins, radome, tail cone, data link and engineering projects for the P-81 aircraft programme followed by **overhaul and repair facilities** and **various types of training facilities and simulators**

Table 7: Types of Offset Contracts

Manufactured Final Assembly 58%
Simulators, Training Centre 18%
MRO 16%
GHE/GSE 8%

Source: DOFA, MoD.

AEROSPACE SECTOR

The aerospace sector has been the prime beneficiary of offsets since the beginning as most countries source their fighter aircraft like the F-5, F-15,

F-16 and F-18 from the USA, with varying degrees of offset obligations. Besides, aerospace goods provide multi-dimensional benefits; as high technological products are characterised by oligopoly, a rationale exists for bargaining to ensure flexibility in prices.[30]

The USA accounts for nearly 60 percent of global arms production which was around $471 billion during 2008. Of the 100 major global arms producing companies, aerospace products account for nearly 80 percent.[31]

In India, the aerospace sector is a near monopoly of HAL. Through a series of licensed production arrangements with Russia for the MiG-21, MiG-27, MiG-29 and Su-30, it has achieved a high level of technology capability in combat aircraft, engines and Repair and Overhaul (ROH).[32] In the helicopter segment also, considerable expertise has been built up due to successful indigenous design and development of the Advanced Light Helicopter (ALH).

The TOT arrangements in the past, however, did not create defence industrial capability for supplying advanced weapons system that would be competitive with Western equipment. Nor has the technology gap closed.[33]

The types of work realised through offset arrangements in HAL are as under:

Table 8: Types of Offset Realisation in Aerospace Sector

1. Build to Print 32%
2. Design to Build 21%
3. MRO Facilities 27%
4. Software Packages 12%
5. Design Packages 8%

Source: HAL.

In the defence sector, it is contended that capability to undertake Maintenance, Repair and Overhaul (MRO), upgrade and assemble is the

30. Stephen Martin, *Counter Trade & Offsets: An Overview of Theory and Evidence* (Routledge), pp. 37-38.
31. *SIPRI Year Book*, 2010.
32. A. Bhaskaran, in Brauer and Dunne, eds., *Role of Offsets in Indian Defence Procurement Policy: Arms Trade and Economic Development* (Routledge), p. 220.
33. Ibid.

most basic level capability. In Malaysia, offsets have facilitated development of local MRO capacity.[34] Depot maintenance capability (MRO) is one of the key areas flagged by Dr. Kelkar for offset arrangements.[35] The offset contracts for the MiG-29 (upgrade) and VVIP helicopters, are in this genre. In the case of the 'Globe Master' contract, HAL is likely to benefit in terms of ROH facilities through offsets.[36]

Critics of the offset arrangements often contend that offsets come at an additional cost implication ranging between 4–15 percent[37] and that such sub-contractorisation would have come about even without the offset stipulation because of the cost-effectiveness in the developing countries.

A case in point is the export of empennage for the Su-30 to the Russians, where due to the lower Man-Hour Rate (MHR) in HAL i.e. $18 compared to Russia's MHR @ $45, the order was placed by the Russians on HAL, though TOT was passed on by them.[38] According to a study by the Boston Consulting Group, India's vast domestic market and relatively low cost workers, with advanced technical skills, will make it a manufacturing powerhouse within the next 5 to 10 years.[39]

GLOBAL TRENDS

Table 9: Global Trends in Offset Contracts

Direct Purchase	40%
Sub-Contract	24%
Technology Transfer	17.5%
Co-Production	7%
Credit Assistance	4%
Investment	4%
Training	2.3%
Licensed Production	0.6%

Source : GOCA, DMA (1993 – 2005).

34. Balakrishna and Mathews, n. 26.
35. Towards Strengthening Defence Preparedness, MOD, April 2005.
36. *Indian Express*, May 31, 2011.
37. Balakrishna and Mathews, n. 26.
38. MD(M) Nasik.
39. Shri J.D. Patil, VP, and Mathews L&T, Conference on Offsets, April 2007.

It would thus be seen that bulk of offsets (2/3rd) is for direct purchase and sub-contract. Investment and co-production arrangements get a secondary pie.

Countries like Malaysia have experienced that a high proportion of technology transfer is for training (58 percent), skill upgradation, MRO work (18 percent), manufacturing and sub-assembly (8 percent) with very little R&D flowing in (2 percent).[40]

In the US, for the 10,661 offset transactions reported with 50 countries during 1993-2009 involving $52.6 billion, direct offsets accounted for 37 percent and indirect offsets for 63 percent; 84 percent of these transactions involved sub-contracting, purchase and technology transfer. Though data on specific technology transferred is not available, it is unlikely that any nascent technology was transferred.[41]

Both China and Malaysia have become production hubs for many items like landing gears and pylons in the Original Equipment Manufacturers' (OEMs) global supply chain through technology transfer.

On the other hand, Far Eastern countries like Japan, South Korea and Taiwan have insisted on technology transfer rather than more production work through offsets.[42]

Lessons for India

These global experiences **hold important lessons for India for revisiting our offset policy in regard to FDI, technology transfer and indirect offsets.**

India has come to be recognised as an economic and technological powerhouse in the making. Manufacturing now accounts for above 27 percent of India's Gross Domestic Product (GDP), contributes 53 percent of total exports, 79 percent of FDI, and employs 11 percent of the workforce.[43] Sectors like Telecom, with a FDI limit of 74 percent has been receiving

40. Balakrishna and Mathews, n. 26.
41. US Department of Commerce, December 2010.
42. Martin, n. 30, p. 5.
43. n. 39.

significant FDI inflow (around $25 billion)[44] in the recent past despite the global financial crisis. It would, therefore, be useful to take stock of the trends in JV formation, credit banking and impact of offset contracts on Indian partners.

JV Arrangements

A few JV arrangements have taken place and a few are in the offing, predominantly in the private sector. Tatas are in the forefront with a tie-up with Lockheed Martin for aerostructures for the C-130-J and helicopter cabins with Sikorksy, titanium flow transfer with Boeing. Defence Land Systems with BAE systems are looking at design, production of artillery systems. L&T is tying up with EADS[45] and Samtel with Thales for flight display and tracking systems[46] and Alpha Technology with EADS for opto-electronic sensor systems for Electronic Warfare (EW) application and Rosobornexport for simulators.[47]

The foreign OEMs show a distinct predilection to partner with well known Indian private sector companies like Tatas, L&T, Mahindra & Mahindra rather than with DPSUs. Increasing **FDI limit is, therefore, critical for fostering such long-term investment decisions,** transferring production lines and making India a hub for various deliverables in their global supply chain**.**

Impact on Credit Banking

A provision of banking credit with the sunset and sunrise clause was introduced in DPP 2009. Of the eight proposals received, only one has been approved so far in respect of M/s. Eurocopter.[48] There has been unusual prevarication to finalise such banking arrangements. This has understandably embittered foreign OEMs like Lockheed Martin[49] as they look for an expeditious approval process. There is also a perception that

44. Economic Survey – 2010-2011.
45. "Defence & Aerospace Offset Policy & Practice," www.google.com, February 18, 2011.
46. E-mail dated May 8, 2011 from Georgarian Philip, Lockheed Martin.
47. Meeting with CEO, Alpha Technology.
48. DOFA, DDP.
49. E-mail.

the policy-makers are unnecessarily intransigent on the sunset and sunrise clause. Transfer of credit, though advocated by some, is a more complex issue.

Impact on Indian Partners

From the feedback received, it is seen that the offset arrangement has helped HAL and SMEs in skill upgradation, boosting exports and helping market penetration.

In the case of BEL, there is a significant impact on export. The position is tabulated below as Table 10.

Table 10: Impact of Offset Programmes on an Indian Company

Financial Parameter	HAL (2010)	BEL (2010)	ALPHA Design Tech. (2010)
Annual Turnover	13061 Cr.	5220 Cr.	72 Cr.
Profit (PBT)	2781 Cr.	1043 Cr.	3 Cr.
Impact			
More Profit	✓	No	✓
More Export	✓	✓ ($10.6 M)	✓
Creation of Jobs	✓	X	✓
Skilled Manpower	✓	X	✓
Skill Upgradation	✓	X	✓
(f) Sub-Contractor Base	✓	X	✓
Market Penetration	✓	X	✓
Future Business Opportunity	✓	X	✓

Based on response to questionnaire.

In terms of its impact on technology capability, offsets seem to have facilitated introduction of new products and registration of patents with a wide array of countries as summarised at Table 11 below.

Table 11: Impact on Technology Development Capability

Sr. No.	Type of Capability	BEL	Alpha Technology	Samtel Display
1	% Expenditure on New Technology	< 10%	41-50%	31-40%
2	R&D Expense	<10%	41-50%	21-30%
3	Patent Registered	(5)	No	(2)
4	Sourcing of Technology	Local & Foreign	Local & Foreign	Local & Foreign
5	Introduction of New Products	Yes	Yes	Yes
6	Countries with Offset Partnership	USA, France & Israel	Russia, Italy, Britain, Israel	France

Significantly, these SMEs are investing handsomely in R&D (20-40 percent), making them technically fleet-footed and more sure of absorbing leading edge technology. The Indian companies, therefore, need to invest more in R&D to spur foreign OEMs to collaborate in high technology products.

The private sector companies like Tatas, L&T and Pipavav, despite having excellent facilities, have an inherent handicap in terms of design and development capability and integration. Japan's success in fast technology absorption was largely due to its highly skilled personnel and low cost of labour.[50]

Offset Proposals in the Pipeline

It is estimated that 39 acquisition cases with offset expectation are in the pipeline involving around $10 billion.[51] The Medium Multi-Role Combat Aircraft (MMRCA) tender is the mother of all these proposals for an estimated offset opportunity of around $5 billion. This Request for Proposal (RFP) contains an offset obligation of 50 percent unlike the normal stipulation of 30 percent in our offset policy.

50. Chinworth and Mathew, *Defence Industries Through Offsets: Arms Trade and Economic Development* (Routledge, Japan).
51. DOFA, MoD.

The government is also in the process of finalising a contract for the heavy lift helicopter (Globe Master) from the USA in the Foreign Military Sales (FMS) route.[52] With an offset obligation of $1.25 billion, the prime beneficiary would be DRDO, which will have a high altitude engine facility and trisonic wind tunnel facility at a cost of $510 million. Presently, such tests are being done abroad.

HAL will also benefit in terms of repair and overhaul facilities and Tactical Communication System (TCS) for avionics and defence land systems in terms of armoured vehicles. These are significant add-ons in terms of defence capability.

While offset contracts are traditionally in the aerospace sector, a few big acquisitions for the Army for 155 mm wheeled and towed guns are likely to generate around $1.2 billion for the land systems.[53]

EXPERIENCE SO FAR AND POLICY ISSUES CHALLENGES

While offsets have helped in sub-contractorisation of low end products and services, setting up simulator and training facilities, engineering projects and depot maintenance capability, the response to **FDI, in production of R&D and JV arrangements has been rather lukewarm.** So is the case with exports, as the following Table 12 would reveal.

Table 12: Trend of Exports

Entity	2008-09	2009-10 (In Crores)
HAL	421	204.6
BEL	84	108.8
BEML	248	156.2
OFB	46	11.5
TOTAL	799	481.1

Source: Annual Report, MoD.

52. *Indian Express,* May 3l, 2011.
53 n. 45.

MAJOR POLICY ISSUES

FDI

The DIPP circulated an approach paper rooting for more than 74 percent FDI cap in defence production to offer significant incentives to foreign companies for transferring leading technology.[54] While the Confederation of Indian Industry (CII) and Federation of Indian Chambers of Commerce and Industry (FICCI) are generally guarded while recommending an increase to 49 percent, foreign OEMs are vociferous and recommend more than 74 percent. Dr. Kelkar and Deepak Parekh also recommend FDI higher than 49 percent if they bring in critical technology.[55] However, the present[56] and earlier Chief of Integrated Services Committee (CISC)[57] are of the view that the FDI limit is good enough to encourage JV arrangements. Chief Executive Officer (CEO) Sankhya[58] shares the same sentiments.

Countries like China had substantial increase in FDI inflow i.e from $5.8 billion (1990) to $67.3 billion in 2007 because of liberal FDI norms. A case in point is their JV with Embraer where 51 percent FDI was allowed.[59] In Malaysia also, the FDI varied between 30-70 percent,[60] depending on the quality of technology coming in. The JV arrangement with Russia for the Brahmos cruise missile is considered as a useful model. The JV model of the Brahmos with 50:50 FDI participation of India and Russia has been a success story and can be a model for the future needs of the nation.[61]

Dual Use Technology

It is too early to judge the impact on the civil aviation sector, consequent on the inclusion of this sector in DPP-2011. However, the indications are that it has generated enthusiasm, particularly for security related products,[62]

54. http:/dipp.nic.in/Discussion papers 17th May 2010.doc
55. Interview with Dr. Kelkar & Deepak Parekh, September 2010.
56. Reply from CISC.
57. E-mail – Admiral Puri.
58. E-mail – Sridhar Nadupalli.
59. Nelhie Yan, China's Search for Indigenous Industrial Development, Ph.D. Thesis, June 2009.
60. E-mail from Dr. K. Balakrishna.
61. E-mail from Dr. A.P.J. Abdul Kalam.
62. Sr. Adviser, HCL (Overseas).

aero structures and cabins. Japan has been the prime beneficiary of dual use technology in areas like electronics, cryptology, sensors, etc.

The Dr. Rama Rao Committee strongly advocates such technology for Air Traffic Control (ATC), imaging for agriculture, water and mineral resources, meteorological and oceanographic study and disaster warning.[63] In the area of flight display, avionics and inflight entertainment and propulsion systems, dual use technology will have excellent commercial spin-off.[64]

Malaysia's MoD has given primacy to promoting dual use items on priority.[65]

TECHNOLOGY TRANSFER

Inclusion of technology transfer for identified key technologies seems to be gaining wide support in the offset policy. Many DPSUs like HAL, BEL, BDL, MDL, Midhani have been recipients of technology, predominantly from Russia and a smattering of Western sources.

While substantial indigenisation has been achieved in non-critical technologies, in critical technologies, OEMs rarely provide manufacturing knowhow, leading to continued dependence on them for upgrades.[66] Prof. Brauer, a recognised expert, is also of the view that India being a big buyer of defence equipment, does not guarantee that counterpart countries will transfer the relevant technology.[67] Even if transferred, it can become obsolete by the time it is installed and absorbed. BEL's TOT for the Night Vision Device (NVD) is a case in point.

However, there have been exceptions. Key technologies like the single crystal blade for turbines was passed on by Russia and was successfully absorbed, making India a major destination for machining engine components of engine houses like Pratt & Whitney.[68]

63. Dr. Rama Rao Committee Report.
64. CEO, SAMTEL.
65. Balakrishna and Mathews, n. 26.
66. Director (R&D), BEL.
67. E-mail - Prof. J. Brauer, "Economic Aspects of Arms Trade," April 25, 2011.
68. GM, HAL, Koraput.

TECHNOLOGY TRANSFER, INDIGENISATION AND COST REDUCTION

Table 1.3

DPSU	PRODUCT	Indigenisation	Cost Saving
BDL	Milan	71%	60%
	Konkur	97%	30%
HAL	SU-30(Air Frame)	55%	45%
	AL31FP(SU-30 Engine)	65%	45%
	HAWK	40%	18%
Medak	ICV	90%	50%
Midhani	Titanium Alloys	60%	15%
BEL	Sonobuoys	70%	30%

Some economists suggest that obtaining technology through offsets is a more efficient way than direct purchase. When TOT is part of a large contract, the risk is shifted to the vendor who will have greater incentive to transfer the technology successfully.[69]

Multipliers

On the issue of multipliers, the Ministry of Defence seems to be against a dog in the manger policy. This is universally accepted, depending on the quality of offsets transferred.

Ironically, in the contract concluded by the Civil Aviation Ministry with Boeing and Airbus, the offsets contracts envisage multipliers of 2-5 in several areas.[70] The Tatas are getting the benefit of this offsets arrangement in aero structures and titanium floor beams.

With this backdrop, the civil shipbuilding could be considered for offsets. In the Report of the Prime Minister's (PM's) group on the growth of the Indian manufacturing sector, Shri Krishnamurthy had advocated the mission made approach for building domestic shipbuilding capability and new shipyards.

69. Martin, n. 30, p. 41.
70. Dir(CP) HAL.

Level Playing Fields

Some of the private players are clamouring for customs duty exemption on import and treating indigenous value additions as import substitution, on par with imports. Extending the Exchange Rate Variation (ERV) to private players is another demand.

Indirect Offsets

The key to the global competitiveness of India's economy lies in building high class infrastructures. In the telecom sector, there is great potential to manufacture items like wireless core equipment which is being imported through technology transfer.[71] **Indirect offsets can infuse much needed FDI into the infrastructure sectors** where the requirement is assessed as $1,025 billion during (2012-17).[72]

Cost Effectiveness

Economists like Paul Dunne[73] aver that the economic benefits of offsets are simply an excuse, and are unproven. Prof. Brauer calls for a full audit of each offsets contract.[74] Some critics consider defence offsets to be detrimental to the Services, with additional cost penalties of 10 percent for 50 percent offsets.[75] However, Bernard Udis' case study of the Swiss F-5 purchase reveals that a cost premium upto 10 percent is reasonable for a well established offset programme.[76]

The general conclusions, however, seem to be that:[77]

- The defence offsets are more expensive than off-the-shelf purchase.
- They create little by way of new or sustainable employment
- They do not make a substantive contribution to general economic development.
- No significant technology transfer takes place to either the civilian or military sector.

71. Economic Survey, 2010-2011.
72. Ibid.
73. E-mail, Prof. Paul Dunne, April 26, 2011.
74. E-mail, Prof. Brauer, April 25, 2011.
75. Maj. Gen. Suman, Defence Offset Proving Detrimental to the Services, *Indian Defence Review*, 2009.
76. Bernard Udi, *US-Swiss F-5 Transaction: Evolution of Swiss Offset Policy* (Routledge), p. 332.
77. "Defence Offsets," *Transparency International*, April 2010.

FUNCTIONING OF DOFA

There are also rumblings regarding the present functional arrangements of DOFA and its effectiveness. There is a strong case for a full-time monitoring and empowered agency with technical, legal and financial expertise.[78]

OTHER ISSUES

Making credit-banking provisions more flexible and not insisting on an offset realisation period being co-terminous with the supply contract period are issues that need to be revisited. In fact, as per global practice, OEMs are allowed to implement offsets agreement in 11 years.[79] Our policy seems to be unnecessarily sticky.

NATIONAL OFFSET POLICY

A discussion paper in October 2006 mooted having a national offset policy under the Ministry of Commerce. It preferred direct offsets by availing of high end technology through TOT and co-production. It also recommended indirect offsets by way of investment in the IT, telecom, bio technology, agricultural research and export promotion sectors. The paper, however, did not get an enthusiastic response from other ministries that consider such nodal initiatives dilatory.

CONCLUSIONS

The study reveals that while the perception of major stakeholders viz. Services, DPSUs, Indian private industry, foreign OEMs, think-tanks and policy-makers may be divided on several issues like indirect offsets, multipliers and transfer of credit, there is a general consensus on the following:

- Technology transfer should be included in the offset policy by identifying key technologies in the RFP.

78. Feedback from private industry.
79. Martin, n. 30, p. 41.

- Growth of the defence industry in high technology areas[80] and boosting fledging private industries[81] should be a priority for the government.
- As the TOT route may not provide key technology and knowhow,[82] design and development through the JV mode should be assiduously pursued.
- The FDI limit could be increased to 49 percent by ensuring that there is minimum value addition and investment in the country. The JV in the Brahmos case is a good example to emulate.[83]
- Investment in R&D by DPSUs and DRDO must be upscaled from the present level of 6 percent to around 10 percent.[84] The private sector must invest substantially in R&D to be able to absorb cutting edge technology.
- Value addition should be the thrust of both the private and public sectors and not mere integration/assembly.
- Protectionist bias towards DPSUs and OFs should be avoided.[85]
- In acquisition cases, credit banking should be finalised in a time-bound manner as it would send the right signals to foreign OEMs to collaborate.
- Our policy must abdicate its overly prescriptive and complex character.[86]
- In view of the specialised nature of leveraging the offsets strategy, setting up of a Standing National Task Force for offsets under the PMO should be seriously considered.[87]

80. Chairman, TCS, November 12, 2010.
81. AOC-IN-C, WC, August 5, 2010.
82. Admiral Raman Puri, CISC (Retd).
83. Dr. A.P.J. Abdul Kalam, Ex President.
84. Parliamentary Standing Committee.
85. Feedback from major private sector players.
86. E-mail, Prof. Ron Mathew, April 25, 2011.
87. Air Cmde Jasjit Singh (Retd), "Arms Trade Offsets: Key to Energise Defence Industry," *Air Power Journal*, Vol. 2, No. 1, Spring 2005 (January-March).

ATOMS FOR PEACE: BALANCING THE PROMOTION OF NUCLEAR ENERGY AND NON-PROLIFERATION

HINA PANDEY

The resurgence of nuclear power that was highlighted by the successful conclusion of the recent Nuclear Security Summit in March 2010, in which 47 nations participated, has once again set the platform for the international community to deliberate on newer issues related to nuclear security. The significance of addressing these newer issues has accentuated post the Fukushima incident. The option of nuclear power as a viable source of energy is indeed valid today. However, there are concerns that need to be addressed before a country decides to depend mostly on nuclear power as its route to social development.

The idea of deriving electricity from nuclear power is not new. In the United States, the need to promote the civilian use of the dual use technology was felt way back in the 1950s.

The use of nuclear energy for peaceful purposes was demonstrated by the US in 1951 by generating electricity for the first time from nuclear fission. Internationally too, the use of this technology to serve developmental purposes was promoted by the United States throughout the Eisenhower Administration.

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The basic argument of the draft that Presidential adviser Baruch presented was that a worldwide international atomic energy development authority must be created in order to control or monitor the international nuclear activities leading to the production of fissile material.

Ironically, the United States championed the cause of peaceful nuclear energy just a few months after it dropped the bombs on Hiroshima and Nagasaki. The collateral damage witnessed by Japan during World War II resulted in a vehement reaction from the international community. The atomic experiment that the United States carried out with vigour led to the subsequent realisation of a dangerous scenario taking shape in the near future. The degree of destruction that resulted from the atomic bomb made the US realise the need to control the spread of this perilous technology to other parts of the world. In fact, the US exercised stringent secrecy control on nuclear weapons material, and cooperation was denied even to the United Kingdom, its closest war-time ally.

CIVILIAN NUCLEAR ENERGY: AN IDEA

One of the first ever attempts to launch the idea of civilian use of nuclear technology in the world was initiated by the United States through the Baruch Plan. The idea of promotion of peaceful use of nuclear technology was a strategic decision taken by the United States in order to counter a 'threat of destruction' through atomic weapons, which was realised clearly soon after the atomic bombings of the Japanese cities. This was an attempt to divert attention and focus from the military to the peaceful exploration of the atom.

The Baruch Plan (1946)

In his speech to the United Nations Atomic Energy Commission (UNAEC) Presidential Adviser Bernard Baruch offered the world community a choice

between the *"quick"* and the *"dead"*[1] or *"world peace"* and *"world destruction"*[2] as he presented the idea of peaceful use of atomic energy. Keeping a check on the proliferation of nuclear weapons worldwide became an important agenda of the US foreign policy and has remained so since then.

The basic argument of the draft that Presidential adviser Baruch presented was that a worldwide international atomic energy development authority must be created in order to control or monitor the international nuclear activities leading to the production of fissile material. Broadly, the Baruch Plan aimed at achieving an international mechanism that would be responsible for the inspection, monitoring and licensing, mining and processing of uranium ore.[3]

The Baruch Plan was authoritative in nature as it emphasised the need for effective enforcement by providing the international institution with the power to impose sanctions. Interestingly, the plan also suggested immunity from the UN Security Council's power of veto.[4] Consequently, the Baruch Plan faded away gradually, as it was not able to win the support of other major powers, mainly the Soviet Union, which regarded it as biased in favour of the US. Its rejection by the Soviet Union was inevitable as the plan allowed the US to retain the possession of nuclear weapons material as long as possible while restraining other states, primarily the Soviet Union, from the option of nuclear weapons. The strict supervision of the international authority was embedded in the plan to "*avoid any undeterable atomic wars in future.*"[5]

It was because of this provision of veto that scholars like McGeorge Bundy doubted if the Baruch Plan could become operational. The plan was indeed dead in less than six months. The provision of exemption from the veto was unacceptable to the Soviet Union. Although the discussions and

1. Lewis Copeland, Lawrence W. Lam, Stephen J. McKenna, *The World's Greatest Speeches (1999)*; Bernard Mannes Baruch, *The Control of Atomic Weapons* (Dover Publications), pp. 587-591.
2. Ibid.
3. David Fischer, *Stopping the Spread of Nuclear Weapons: The Past and the Prospects* (London: Routledge Publishers, 1992), p. 32.
4. Phillip Margulies, *Nuclear Non-Proliferation : Global Issues* (New Delhi: Viva Books, 2010), p. 25.
5. Henry D. Sokolski, *Best of Intentions : America's Campaign Against Strategic Weapons Proliferation* (Praeger Publishers, 2001), p. 2.

The panel suggested the means to get a reduction in the size of nuclear stockpiles of both the superpowers.

negotiations over the idea continued in the United Nations for the next two years, it was not able to render any substantive results.[6]

The Baruch Plan was indeed a short-lived endeavour as four years later, the Soviet Union acquired nuclear weapons and other nations followed suit. However, the Baruch Plan indirectly contributed towards subsequent non-proliferation efforts of the United States. The plan established the idea of promoting the peaceful use of atomic energy. This idea was taken forward by the United States in its Atoms for Peace programme that was aimed at promoting nuclear non-proliferation and nuclear technology for peaceful purposes.

THE ATOMS FOR PEACE PROGRAMME

In his Atoms for Peace proposal of December 8, 1953, President Eisenhower had proposed that the nuclear powers contribute portions of their stockpiles of normal uranium and fissionable materials to an international atomic energy agency, which would then allocate these materials toward peaceful uses.

The Baruch Plan failed, but behind the scene efforts to put the nuclear genie back into the bottle did not. One of these efforts was led by the technical director of the Manhattan Project; Robert Oppenheimer continued efforts to mobilise support from the Truman Administration to prevent an inevitable arms race. In the year 1952, a panel was established. Robert Oppenheimer through this panel conveyed the apprehensions regarding the arms race that was about to begin. The panel's report painted a grim picture of the nuclear world. It foresaw, *"a very rapid expansion of the stockpiles on both the sides to a point where both sides could have many thousands, and neither side could have any useable superiority."*[7] The panel suggested two measures to curb the forthcoming arms race. First, the United States must disclose publicly the strength of its own nuclear arsenal as an attempt

6. Ibid.
7. Ibid., p. 288.

to get a similar declaration by the Soviets, so that misinterpretation or mistrust could be avoided. Second, the panel suggested the means to get a reduction in the size of nuclear stockpiles of both the superpowers.[8]

The succeeding Administration of President Eisenhower too, continued the non-proliferation initiative. In the 470th plenary meeting of the United Nations General Assembly in 1953, President Eisenhower proposed the idea of international control of nuclear technology. He called for international efforts to monitor a certain amount of fissionable material of the two superpowers, such that it could be made available to other countries under the condition of its peaceful use. In essence, the Eisenhower Administration took the route of promoting the peaceful use of nuclear energy.[9]

In his "Atoms for Peace" speech, President Eisenhower spoke in the language of *"atomic warfare"*[10] and warned the world about the dangers that lay ahead if the arms race was not contained on time. It is noteworthy that the speech was delivered approximately four months after the Soviets had conducted their first thermonuclear test in the year 1953.

Meanwhile, deriving the reference from the United Nations Resolution (1953), the US President expressed the willingness of his country to carry forward the diplomatic and private talks with the powers principally involved to seek an acceptable solution to the United Nations report.[11]

The Eisenhower speech was much appreciated by the international community and especially by the states that wished to engage in nuclear energy for peaceful purposes. However, it is interesting to observe that by this time, the United States had already detonated the world's first ever thermonuclear weapon, that was approximately five hundred times more powerful that the previous atomic weapons. Hence, despite an open declaration to curb the further spread of nuclear weapons, the United States itself engaged in activities of building the nuclear arsenal. It could be argued that the promotion of peaceful use of atomic energy by the United States

8. Margulies n. 4, p. 27.
9. Dwight D. Eisenhower, "Atoms for Peace Speech to the UNGA," December 8, 1953, in Sokolski n. 5, p. 115-122.
10. Ibid.
11. Ibid.

was done in such a manner as to deny weapons capability to other states while retaining its own.

McGeorge Bundy has argued that through the Atoms for Peace programme, the United States wished to curtail the Soviet Union's nuclear capability. It hoped that with time, the Soviet Union would eventually be able to submit a considerable amount of fissionable material that, in turn, would serve as the basis for further negotiations between the two countries.[12] The Soviet Union in the beginning opposed the Atoms for Peace programme but later agreed to it, mainly because it was slightly different from the earlier Baruch Plan. It not only provided incentives for the states that complied with the international standards of control but also did not demand unacceptable provisions such as on-site inspections, deposition of nuclear weapons in the hands of an international agency or strict punishment for non-compliance.[13]

ROLE OF DOMESTIC FACTORS

Atomic Energy Act (1946)

The development of nuclear energy in the United States was a two-dimensional process. While the Atoms for Peace programme was conceived to promote the peaceful use of nuclear technology in other parts of the world, the United States itself had to undergo institutional and legal changes to accommodate the policy.

There were several requirements such as the passing of the US Atomic Energy Act (1946) and creation of the Department of Atomic Energy that ensured the smooth execution of the programme which had to be undertaken in line with this US nuclear energy policy .

Within its domestic realm, the United States in the immediate post World War II period, passed the McMohan Act or the Atomic Energy Act of 1946 that strengthened government control over the nuclear related activities, such as uranium mining, nuclear fuel production, etc. This legislation

12. Ibid., p. 26.
13. Ibid., p. 26.

nationalised all aspects of nuclear ventures, and also outlawed US exports of nuclear materials and technological knowhow to other states. The degree of secrecy was so intense that even its closest war-time ally, the United Kingdom, was denied collaboration.[14]

In the McMahon Bill (1945) which was later enacted into a law called the Atomic Energy Act of 1946, the findings highlighted the possibility of the spread of atomic knowhow for military purposes to other parts of the world. The Act contained a provision of control, which stated that the export or import of any fissionable material, directly or indirectly, in any manner, outside the United States was unlawful.[15]

The development of atomic energy for peaceful purposes in the United States was the responsibility of the US Atomic Energy Commission (AEC) that was established by the McMahon Act. The Act formally established three advisory committees — the Congressional Joint Committee on Atomic Energy, a Military Liaison Committee and a General Advisory Committee — that would look after the peaceful development of atomic energy. Within one year, the Manhattan Engineer district was replaced by the AEC in 1947. The US Congress also provided this commission with an immense amount of authority and freedom to carry out its work even in matters relating to personnel selection. Even the production facilities and nuclear reactors were government owned. The commission also controlled research findings and technical information concerning the development of peaceful nuclear energy. The Argonne National Laboratory (1946) was one of the first laboratories established to carry forward the mission of peaceful nuclear energy by the development of nuclear power reactors.[16]

The efforts to launch the peaceful atomic programme in the United States did not really kick-start even after President Eisenhower's Atoms

14. Gary T. Gardner, *Nuclear Non-Proliferation: A Primer* (United States: Lynne Rienner Publications, 1994), p. 38.
15. "The McMahon Bill, December 1945 (Atomic Energy Act-1946)," in. Robert C. Williams and Philip L. Cantelon, eds., *The American Atom : A Documentary History of Nuclear Policies From The Discovery of Fission To the Present (1933-1984) (*1984).
16. "The Atomic Energy Commission" (1947), The US Department of Energy, [Online:Web], Accessed on June 02, 2011, http://www.ch.doe.gov/html/site_info/atomic_energy.htm; and Argonne National Laboratory : History, http://www.anl.gov/Administration/history.html.

for Peace initiative, as the era of the late 1940s was marked by a massive competition between the two power blocs. This compelled the United Sates to concentrate more on the weapons development programme. By 1949, the Soviet Union had already detonated the nuclear device that ended the US monopoly over nuclear weapons. This came as a surprise to the United States since the scientific community had estimated that it would take much longer for the USSR to catch up with the American nuclear lead. The Iron Curtain, however, drew attention away from the peaceful use of nuclear energy.

Thus, it almost took a decade to actually start the peaceful programme. Most of post World War II period was spent in building a nuclear arsenal by the United States to sustain its competition with the USSR. The Soviet detonation had encouraged the AEC to take a *quantum jump* and pursue the development of thermonuclear weapons. Interestingly this development was supported by the Congressional Joint Committee on Atomic Energy; however, the General Advisory Committee was against it. Eventually, in 1950, the AEC was ordered by President Truman to make speedy progress on the thermonuclear weapon. The United States detonated the world's first thermonuclear device in November 1952 and by the end of 1953, approximately 30 weapon tests had been conducted successfully by the US.[17]

Hence, one could argue that no substantial progress in the realm of peaceful use of atomic energy was made for a long time. The US Atomic Energy Complex was more or less dedicated to largely military tasks. However, in December 1951, the Idaho test station successfully produced a small amount of electricity from an experimental fast breeder reactor.

Atomic Energy Act (1954)

The Atomic Energy Act of 1954 had a significant influence on the US nuclear energy policy as it revised the provisions of the previous Atomic

17. Alice L. Buck (1983), "A History of Atomic Energy Commission," US Department of Energy, [Online: Web], accessed on May 12, 2011, http://www.atomictraveler.com/HistoryofAEC.pdf.

Energy Act to enable the commission to share technical and scientific information with foreign governments. The new Atomic Energy Act also enabled the commission to participate fully with foreign governments in the promotion of peaceful use of atomic energy. The Act contained liberal licensing provisions and the right to own reactors made way for further private development of nuclear power in the United States.[18] In 1955, the AEC announced its Power Reactor Demonstration Programme that provided the research and development funding to utility companies operating prototype nuclear power plants. This programme gave birth to the first ever commercial nuclear power plant of the United States that was connected to the electricity grid. This 60 megawatts power plant became operational in 1957 in Pennsylvania, and was built by Westinghouse Electric Corporation.[19]

The Atomic Energy Act of 1954 gave the Atomic Energy Commission the responsibility for regulating and licensing of commercial atomic activities. The amendments to the 1954 Atomic Energy Act (AEA) legally allowed nuclear cooperation for peaceful purposes. Further amendments to the Act were incorporated later by the Nuclear Non-Proliferation Act (NNPA) of 1978 that added more requirements for controlling US exported nuclear related materials to other countries. These amendments play a major role in the contemporary US nuclear energy policy as the conditions defined in the AEA and the NNPA serve as the basis of civilian nuclear cooperation of the United States with any country. According to the provisions stated in both the Acts, the exported material of US origin was subjected to the international safeguards of the International Atomic Energy Agency (IAEA). Thus, both the Atomic Energy Act and the NNPA govern any bilateral agreement of the United States in terms of peaceful use of nuclear energy.[20]

18. Ibid.
19. The US Nuclear Engineering Education : Status and Prospects (1990), "The National Academic Press", Committee on Nuclear Engineering Education, National Research Council, [Online:Web], accessed on June 01, 2011, http://books.nap.edu/openbook.php?record_id=1696&page=15.
20. "Origins & Evolution of the Department of Energy," US Department of Energy, [Online: Web], accessed on May 12, 2011, http://www.energy.gov/about/origins.htm.

The Contribution of Private Players

The US nuclear power industry also owes its origin to the Atomic Energy Act of 1954 as certain provisions in the Act encouraged the private industry to build its own nuclear power plants by making use of the fissionable material leased from the government. By the end of 1957, the private industry was able to participate with the Atomic Energy Commission in the development and production of electricity, until the mid-1960s.[21]

In 1962, President Lyndon Johnson ordered a 25 percent cutback in the production of enriched uranium and the shutdown of plutonium piles in order to extract significant cuts from other nations as well. It is argued that the Soviet Union did announce production cutbacks in response. In the realm of the nuclear power industry, the very same year, a significant development occurred. The Jersey Central and Power and Light Company contracted for a large nuclear power reactor to be built by Oyster Creek in New Jersey.[22]

The private players influenced the growth of the US nuclear power industry. However, for a long time, the government retained monopoly on the ownership of nuclear materials. This was changed after the "Private Ownership of Special Nuclear Material Act" was signed by President Lyndon Johnson in 1964. This Act ended the eighteen-year government control over nuclear material and permitted private ownership of special nuclear material.[23] No longer would enriched uranium for power reactors have to be leased from the government, and private entities were permitted to assume title to special nuclear materials. This takeover by the private industry of the government function was given a transition period of approximately ten years. After 1973, private ownership was made mandatory and the AEC was authorised to offer uranium enriching services to both domestic and foreign customers under long-term contracts.[24]

There remained licensing issues which led the Atomic Energy Commission to take further steps such as regulations for licensing and

21. Buck, n. 17.
22. Ibid.
23. n. 19.
24. Buck, n. 17.

establishing a specific material and accounting procedure in 1967. The next year, the AEC assumed sole responsibility to oversee materials safeguards applicable to private industry. In response to the increase in international trade in nuclear material, the AEC issued regulations regarding physical protection requirements for nuclear material for licensees to protect against terrorist and other threats.[25]

It is noteworthy that by the end of the 1970s, the US nuclear energy industry was operating in full swing. Since the beginning of the civilian nuclear energy programme until the Three Mile Island incident that halted the US nuclear energy industry, the annual production of electricity ranged from 0.2 billion kilowatt-hours (1958) to 255.2 billion kilowatt-hours by the year 1979. In a span of about 22 years, the average nuclear electricity generation was registered around 7,293.63 billion kilowatts-hours. This implies an average share of 3.8 percent of nuclear power electricity generation in the last two decades.[26]

Major Boost to the Nuclear Energy Industry

The Nixon Presidency in 1973 had directed the AEC to conduct a review of the overall energy research activities. The review report came in the form of recommendations of the "Nation's Energy Future" after which the President announced a five-year $10 billion energy research and development programme. In the year 1974, the Energy Reorganisation Act was passed that ended the Atomic Energy Commission's supervision over the US' civilian nuclear programme.[27]

The AEC's research and development responsibilities were assumed by the Energy Research and Development Administration (ERDA) and the regulatory licensing functions by the Nuclear Regulatory Commission (NRC). Approximately, 6,320 employees went to the ERDA, while 1,970 former regulatory personnel became part of the new NRC. Today, the

25. n. 19.
26. See Table 9.1, Nuclear Generating Units, 1955-2009 and 9.2, Nuclear Power Plants Operation, 1957-2009, Report No. DOE/EIA-0384(2001), US Energy Information Administration, Annual review 2001, [Online: Web], accessed on May 12, 2011, http://www.eia.doe.gov/emeu/aer/pdf/pages/sec9_.pdf.
27. Buck, n. 17.

The IAEA was formed as an autonomous body of the United Nations. Its function is to conduct, and assist in, peaceful nuclear activities.

NRC is the most important player and the only US government agency that is responsible for the regulation of the US nuclear industry.

ROLE OF INTERNATIONAL FACTORS (1960-1970)

By this time, the significance of nuclear power as one way to achieve socio-economic development was realised not just by the United States but also by the international community. Even though the UNAEC was formally abolished in the year 1952, new efforts to promote civilian nuclear energy with adequate safeguards had begun to take place in the late 1960s.

The International Atomic Energy Agency

On March 19, 1954, the United States presented the Soviet Union with a draft of the proposed IAEA. The first official position of the US on the IAEA included a safeguards provision, which emphasised health and safety and control over plutonium.[28] In the year 1957, the International Atomic Energy Agency (IAEA) was established; as head of the United States delegation to the first IAEA conference, Lewis Strauss, who was a part of the US Atomic Energy Commission, delivered the President's message to the agency.

Today, the international agency is one of the pillars of the nuclear non-proliferation regime. The IAEA was formed as an autonomous body of the United Nations. Its function is to conduct, and assist in, peaceful nuclear activities.[29] Since its founding, the IAEA has promoted two interrelated goals: (a) it sought to promote internationally the use of civilian nuclear energy; (b) it was also tasked to prevent and detect the diversion of civilian nuclear energy for nuclear weapon purposes.

The beginning of the 1960s also saw the rise of many developments that made way for further negotiations of arms control and non-proliferation

28. John A. Hall, "International Atomic Energy Agency: Origins and Early Years" Tropical Reports; Thirtieth Anniversary Year, *IAEA Bulletin*, 1978, pp. 47-54.
29. Gardner, n. 14, p. 40.

agreements, such as the development of long range rockets, and environmental hazards caused by nuclear testing. Other events, such as the Cuban missile crisis in the year 1962, and the Chinese detonation of a nuclear device in the year 1964, etc gave impetus to the non-proliferation efforts. Combined with these, Germany and Japan also gained the technological competence needed to build a nuclear bomb. With this backdrop, various measures were taken to strengthen the non-proliferation regime in the 1960s, such as the efforts towards the Limited Test Ban Treaty, which was concluded in the year 1963, that prevented nuclear testing on land, water and anywhere in the atmosphere.[30]

Subsequently, in 1968, governments represented at the Eighteen-Nation Disarmament Committee (ENDC) finished negotiations on the text of the nuclear Non-Proliferation Treaty (NPT). In June 1968, the United Nations General Assembly endorsed the NPT with General Assembly Resolution 2373 (XXII), and the very next month, the NPT was opened for signatures. The NPT entered into force in March 1970.[31]

The Nuclear Non-Proliferation Treaty

The NPT came into being a decade after the IAEA was established; however, the origin of this effort lay in Ireland's resolution to the United Nations General Assembly in 1958. The Irish resolution drew attention to the dangers inherent in the further spread of nuclear weapons. Three years later, the General Assembly again responded to the Irish initiative by calling for the international negotiation of an agreement for the "prevention of the wider dissemination of nuclear weapons."[32]

By the year 1967, the United Kingdom, the Soviet Union and the US reached an agreement over the draft of the non-proliferation treaty. However, the treaty was yet to be launched. The treaty finally came into effect in the year 1970. It remains committed towards nuclear non-proliferation. The treaty provisions have also extracted commitments from

30. Ibid.
31. Sarah J. Diehl and James Moltz, *Nuclear Weapons and Non Proliferation: A Reference Handbook* , Chronology (ABC-CLIO Publishers, 2002), pp. 93-94.
32. Fischer, n. 3, pp. 5-6.

the nuclear weapon states to not assist any non-weapon states to develop nuclear weapons.

The treaty since then has become the backbone of the efforts to control the spread of nuclear weapons, and as one of the most important elements of the global non-proliferation regime, the treaty has institutionalised the norm of non-proliferation around the world. It is one of the most widely observed arms control agreements in history and relevant even today.

The Nuclear Suppliers Group

Four years after the NPT came into effect, India conducted its first Peaceful Nuclear Explosion (PNE). This questioned the adequacy of the NPT for regulating the flow of nuclear materials and technology. Also, two incidents of thefts of nuclear material by Israel came to the forefront in 1964 and 1968 respectively through the routine inspections by the US Atomic Energy Commission. It was evident by this time that the neither the NPT nor the IAEA were adequate to prevent such incidents. A decade earlier, the Chairman of the General Advisory Commission of the US Atomic Energy Commission, Isador Rabi, had warned the US State Department about the inadequacy of international controls that may lead to diversion of commercial nuclear materials into military purposes. This indeed was prophetic. By the end of the 1960s, the international concern towards this issue had already emerged. This led to the creation of an informal arrangement called the Nuclear Suppliers Group (NSG), or the London Club, to further prevent the supply of the materials that might be utilised in advancing another nuclear programme.[33]

The NSG has today become an important part of the nuclear non-proliferation regime that regulates the nuclear power commerce of the member states. It operates under strict export conditions of import of nuclear material to any country that may or may not be its member. Any international nuclear material related commerce is undertaken on the basis

33. Gardner, n. 14, p. 58; Thomas B. Cochran, "Secrecy and Nuclear Power", *The Bulletin of Atomic Scientist*, August-September 1981, p. 37; and Peter R. Lavoy, "The Enduring Effects of Atoms for Peace", Arms Control Association, [Online: Web], accessed on May 11, 2011, http://www.armscontrol.org/act/2003_12/Lavoy.

of the strict provisions of the NSG guidelines. The countries that wish to engage in nuclear commerce with other NSG members are required to accept international safeguards on all their imported materials and technology and on facilities using or replicating sensitive materials and technology. The states are also required to provide for the physical security for the transferred nuclear facilities and materials. They also remain committed not to transfer nuclear materials or technology to any third party without consultation with, or agreement from, the original exporter. The idea behind these strict provisions is to further prevent the manufacture of nuclear explosives.

The Atoms for Peace programme set the ball rolling for further international endeavours to promote peaceful use of nuclear energy.

It may not be incorrect to suggest that the NSG may be called a revision of the "Atoms for Peace" programme, which remains committed to the promotion of nuclear power for the purpose of socio-economic development.

ATOMS FOR PEACE: A REVIEW

Every foreign policy option has two types of consequences: the intended ones which justify the rationale behind the policy decision, and the unintended consequences, that might fallouts from the intended ones. These unintended consequences may later transcend into challenges of the policy option that had once been adopted. Similar is the case with the US "Atoms for Peace" policy, which indeed promoted the peaceful use of a dual use technology, but, at the same time, posed many future challenges for the United States and the world. It is, thus, important to review the progress made by the Atoms for Peace programme. Overall, the policy offered mixed results.

(a) Intended Consequences

On the brighter side, the Atoms for Peace programme set the ball rolling for further international endeavours to promote peaceful use of nuclear energy, and brought into the limelight the prospects of international

cooperation towards these objectives. It also led to the creation of the IAEA alongside the first ever open international conference on nuclear security.

In the United States itself, the policy was much appreciated and within the first three years, the US concluded about 40 civilian nuclear agreements with other states. Not only this, the states allowed the American inspectors to monitor the US technology.[34] Statistically, as of 2009, more than 2,000[35] bilateral civilian nuclear cooperation agreements have been signed by countries that further promote the peaceful use of this dual technology.

In essence, the "Atoms for Peace" promoted the development of the peaceful use of dual use technology and this principle has remained intact in today's nuclear non-proliferation regimes such as the NPT. The treaty dating back to 1970 is very much alive today and supports the principle of peaceful use of nuclear technology through various treaty provisions.

The success of "Atoms for Peace" may be gauged from the fact that the very institution that oversees the smooth execution of international, multilateral and bilateral civilian nuclear cooperation today owes its origin to the "Atoms for Peace" initiative. The IAEA contributes not only towards the advancement of use of nuclear science and technology but also attempts to prevent the spread of nuclear weapons through its checks and control, together with the NPT. This idea was originally articulated by Eisenhower's Atoms for Peace initiative.

In the year 2003, the "Atoms for Peace" completed 50 years. On this occasion, the Former Deputy Director General of the IAEA highlighted its relevance. He stated that in principle, the commitment of "Atoms for Peace," that is, the development of peaceful use of nuclear technology, is now being carried forward by the IAEA as the agency believes in promoting the peaceful use of nuclear technology to address socio-economic needs. It was concluded that the Atoms for Peace policy in the

34. Gardner, n. 14, p. 40.
35. Mathew Fuhrmann, "Spreading Temptation: Proliferation and Peaceful Nuclear Cooperation Agreements," *International Security*, vol. 34, no. 1, 2009, pp. 7-41.

long run has been able to bring about a complete international rethinking of the approaches involved in maintaining the safety of nuclear power plants that had been supported by many countries and accepted worldwide.[36]

The Atoms for Peace programme played the role of a catalyst in developing the weapons capability of many states.

The programme, which was initiated six decades ago, clearly altered the way the world treated nuclear energy in the time to come. The most significant elements of the present non-proliferation regime were indeed laid down by Atoms for Peace policy. It contributed in the way of norm setting of the international regime both for the promotion of nuclear energy and prevention of nuclear proliferation.

Ever since the gradual decline of the Atoms for Peace programme, the international community has come together many times, for the civilian use of nuclear power. The IAEA, NSG and NPT are examples of how states have sustained the will to spread nuclear energy for peaceful purposes while constraining the proliferation of nuclear weapons. Of course, the mechanisms have suffered from limitations, and failures have taken place.

(b) Unintended Consequences

The Atoms for Peace programme went into effect but could not effectively function as by the end of the 1990s, the intentions of development of the nuclear weapons complex by many states became evident. It may be argued that the Atoms for Peace programme played the role of a catalyst in developing the weapons capability of many states. Even though there is no pertinent data to suggest whether the "Atoms for Peace" directly fuelled the nuclear weapon ambitions of other states, it is assumed so,

36. The International Atomic Energy Agency and World Nuclear Order, L. Scheinman, Resources for the Future, Washington D.C. (1987), Atoms for Peace and IAEA. Accessed on May 11, 2011. Source: http://www.iaea.org/newscenter/statements/ddgs/2003/waller08122003.html, Statements of the Deputy Director General, December 08, 2003, Washington D.C., USA, Statement at the "Atoms for Peace: A Future After 50 Years?" Conference, Atoms for Peace: A perspective from the IAEA, by Mr. David Waller, IAEA Deputy Director General.

because the programme involved training of selected scientists all over the world, in the field of peaceful nuclear energy.

The NPT that was one of the derivatives of the "Atoms for Peace" has been criticised on various grounds. To start with, it divides the countries into two groups: the five states that have already tested nuclear weapons (the US, the Soviet Union, Britain, France and China), and the rest of the world that has not yet developed these weapons. Secondly, the treaty has been breached and has not been able to prevent countries from testing nuclear devices. This adds to the non-proliferation failures.

(c) Proliferation of Nuclear Weapons: A Challenge for the Future

One of the most severe challenge of the Atoms for Peace policy emerged in the form of horizontal proliferation of nuclear weapons. It is ironic that the policy indirectly made way for the objective it was fundamentally against. Prior to the conception of the programme, only two countries possessed the weapons capability.

Even in the late 1950s and 1960s, the weapons capability was limited only to the United States , Soviet Union, Great Britain, France and China because of the secrecy and high cost involved in weapons production that acted as a technological bulwark against the spread of dual use technology to other parts of the world. The Atoms for Peace programme reduced to a great extent the cost barrier by providing the basic assistance in terms of nuclear research. Immediately after the Atoms for Peace programme was launched, the United States began imparting technical knowhow to foreign scientists at Argonne Laboratory and later released hundred of declassified studies related to nuclear research. Countries such as Argentina, Brazil, and Pakistan that had no prior experience in the nuclear programme, received assistance in the development of a civilian nuclear programme through the Atoms for Peace programme.[37]

The sharing of technological knowhow that began as part of the programme was later diverted into clandestine weapons production by

37. The process of uranium enrichment was complex that required huge technological investments and electricity that many countries in the 1950s-1960 could afford. James L. Ford and Richard Schullar, "Controlling Threats to Nuclear Security: A Holistic Model," p. 77, and Lavoy, n. 33.

many countries. The linkages between the civilian nuclear programme and its diversion into the weapon programme have been highlighted by many scholars.

Mathew Fuhrmann has argued about the linkages between peaceful nuclear cooperation and nuclear weapons proliferation by analysing the case study of India and Pakistan. There is no denying the fact that dual use technology and materials such as uranium enrichment and plutonium reprocessing have a legitimate civilian application and are linked to the nuclear weapons programme. Also, civilian nuclear cooperation increases knowledge in nuclear-related matters, such as handling of radioactive materials, the process of fuel fabrication and the operation and function of reactors and electronic control systems. This knowledge, in turn, can be applied to weapons related endeavours. The states receiving this kind of assistance would be likely to consider a nuclear weapons option as the knowledge base provided by the civilian nuclear programme reduces the expected cost of a weapons programme.[38] The civilian nuclear assistance in this manner helps the recipient country prepare for a weapons base. Although not every recipient country in the end may divert from the civilian nuclear programme to acquire the destructive capability, there are rationales such as that the prevailing security circumstances may compel a state to take the route towards the nuclear capability.

CONCLUSION

Atoms For Peace: US Cold War Strategy

There is no doubt that the American Atoms for Peace policy had an embedded concept of peace attached to it. The promotion of the peaceful use of atoms in one way aimed at encouragement of the use of nuclear energy to provide an impetus to socio-economic development. However, it cannot be overlooked that the American promotion of peaceful use of nuclear energy was executed in the immediate period of the containment era, during the heightened Cold War politics. Hence, it could be argued

38. Fuhrmann, n. 35, pp. 7–41.

Under the Eisenhower Administration that was in favour of the peaceful use of nuclear energy, the US nuclear stockpile grew from 1,005 to more than 20,000 weapons.

that the Atoms for Peace policy was also partially influenced by the Cold War political gains.

The Atomic Energy Act of 1954 was so modified that nuclear material and technology could be exported to the developing countries under the American terms of engaging solely in peaceful nuclear activities. It was argued that this was done in a manner to *strengthen the American world leadership.*[39] In March 1955, the Eisenhower Administration increased its efforts to promote peaceful nuclear use and also directed the Atomic Energy Commission to provide *'free world'* nations with assistance for building power reactors. It could be argued that this assistance was aimed to reduce the Soviet influence. The NSC 5507/2: Peaceful Uses of Atomic Energy was approved by President Eisenhower in 1955 to utilise nuclear technology exports to promote the international and regional interests of the United States.[40]

Hence, it is clear that the policy indeed promoted the American Cold War interests. It is noteworthy that under the same Eisenhower Administration that was in favour of the peaceful use of nuclear energy, the US nuclear stockpile grew from 1,005 to more than 20,000 weapons.

The American policy-makers have turned to the options of nuclear energy from time to time in order to suit their own national interest. It is significant to note that during the period of energy crisis in 1974, the United States looked towards the possibility of exploration of other sources of energy. For instance, one year after the oil embargo of the Organisation of Petroleum Exporting Countries (OPEC), the United States speeded up the development of its domestic nuclear energy. In the years 1973 and 1974, as many as 42 and 55 units became operable respectively, as compared to 27 units in the previous year. It is important to note that maximum numbers of construction permits of nuclear reactors were issued in the same year.

39. Lavoy, n. 33.
40. Ibid.

From 1966-74, the number of operable units increased as ordered units were constructed, tested, licensed for full power operation and connected to the electricity grid. However, the number of units ordered surpassed the number of units operable due to the long time required for construction.[41]

The Arab oil embargo compelled the United States to rethink about its dependence on imported oil. The oil embargo led the OPEC nations to unilaterally cut oil production to about 25 percent that raised the oil prices by 17 percent. This led to an overnight decrease in the oil imports of the United States from the Arab nations, from 1.2 million barrels of oil per day to approximately 20,000 barrels per day.[42]

The very same year, President Nixon directed the Chairman of the Atomic Energy Commission to undertake an immediate review of federal and private energy research and development activities and to recommend an integrated programme for the US. He proposed a five-year energy research and development programme worth $10 billion.[43]

More than 35 years have passed since the idea of promoting the civilian use of nuclear technology was conceived, and yet, till date, France generates approximately 76 percent of its electricity from nuclear energy. It is ironical that the US, the nation that popularised the idea of peaceful use of nuclear technology, lags far behind and generates only 19 percent of electricity from nuclear power.[44]

41. n. 26.
42. Alan. M. Herbst and George W. Hopley (2007), "Warheads to Washing Machines: Post-WWII Nuclear Developments," cited in *Nuclear Energy Now: Why the Time has Come for the World's Most Misunderstood Energy Source* (John Wiley & Sons), p. 15.
43. Buck, n. 17.
44. "Nuclear Power by Country" [Online: Web], accessed on July 01, 2010, URL: http://en.wikipedia.org/wiki/Nuclear_power_by_country#cite_note-World_Nuclear-0.

CHINESE DEFENCE FORCES: MODERNISATION AFTER 1980

J. V. SINGH

Combine the military and the civil, combine peace and war, give priority to military products, let the civil support the military.

— Deng Xiaoping

On October 1, 2009, the People's Republic of China (PRC) held the largest parade in its history to celebrate the 60th anniversary of the founding of the Communist state. Hundreds of thousands of people marched past the review stand in Beijing's Tiananmen Square, with President Hu Jintao and his predecessor, Jiang Zemin, looking on. The military units taking part, which included 14 infantry, 30 mechanised and 10 airborne formations, offered an insight into China's evolving strategic posture, and their equipment showed the fruits of over 30 years of reform and modernisation within China's defence forces.

Overall, the formations on show indicated that the People's Liberation Army (PLA) is rapidly reaching its goal, spelt out in a 2008 Defence White Paper, of creating smaller, more agile and flexible units that are designed to win regional wars in the digital era with full use of information, communications and surveillance technologies, an objective that parallels

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those obtaining in most of the Western armed forces. Under this approach, rapid reaction units, as well as airborne and special forces, are designed to be supported by a highly developed civilian transport network and infrastructure, as well as by a military civilian integrated logistical system. While some units specialise in amphibious warfare, the main goal is to be able to operate over a wide range of terrains.

MILITARY REFORMS AND MODERNISATION

The origins of military reforms and modernisation can be traced back to the beginning of Deng Xiaoping's "Reform and Opening Up" movement of the late 1970s. The costly war with Vietnam in 1979 forced the Chinese leadership to acknowledge the need to modernise the PLA. Military reforms gained a new urgency after the 1991 Gulf War, when the destruction of the Iraqi Army by a US-led coalition made the PLA realise its own obsolescence. Reforms focussed initially on the ground forces, as the PLA was expected to fight its next war against a Soviet style adversary. Air and naval forces received little new investment. The main objective of these reforms was to create smaller, more sophisticated forces. To this end, the PLA was reduced in size from six million active personnel in the 1970s to the current 2.3 million through a series of substantial force reductions in the 1980s and 1990s. Under Jiang Zemin, the PLA began to place technological modernisation at the centre of its development for the future, importing many modern weapon systems from abroad.

Reforms under Hu's leadership have seen the PLA both maintaining existing policies and taking new directions. It has continued to decrease the size of military formations, experimenting with reorganising divisions into brigade size units, while building up the quality of the recruits. At the same time, it has shifted the emphasis of development from ground forces to the more technology intensive air and naval forces. The 60th Anniversary Naval Review that took place in April 2009 indicated that advances were being made in naval forces, and the Beijing parade provided further evidence of progress on all these fronts.

Less Infantry, More Mechanised

Among the ground forces, the most significant change was the reduction in the number of infantry units. This showed the progress the PLA has made towards the mechanisation of the armed forces. On display was the highest ever percentage of mechanised formations, comprising 30 different blocks, including the latest generation of Chinese Main Battle Tanks (MBTs) and Infantry Fighting Vehicles (IFVs). The infantry units on display indicated shifts within the military. The presence of army cadets, drawn from the Shijiazhuang Army Command College, underlined the PLA's emphasis on developing a new, well educated and professional officer corps. There are already 1,20,000 university graduates serving in the PLA and, under a new recruitment campaign, future Non-Commissioned Officers (NCOs) are directly recruited from among high-school graduates. The PLA hopes that this new generation of officers and NCOs will enable it to man its new generation of high technology weaponry and will provide the capability to conduct wars in the information age.

The PLA has special forces detachments deployed in every Military Region (MR), available to be deployed rapidly.

Underlining the drive towards creating a 'small but elite' army, special forces made their first appearance in public. The PLA has special forces detachments deployed in every Military Region (MR), available to be deployed rapidly to any potential hotspot. In addition, a naval infantry formation was drawn from the Submarine College in Qingdao, highlighting the increasing prominence of China's submarine force in its strategic thinking.

Missiles Fill Projection Gap

The formations that were most eagerly anticipated and scrutinised by observers were the strategic missile forces of the Second Artillery. The DF-15 short-range, DF-21C medium range and DF-31A Intercontinental Ballistic Missiles (ICBMs) remain the mainstay of Chinese deterrence, as also provide area denial capabilities over the Taiwan Strait, with the DF-15

As it focusses on achieving air superiority, the latest fighters such as the J-10 and J-11 are being integrated into a command and control network which will be directed from AWACS aircraft rather than from the ground.

possessing the shortest warning/detection time and the greatest ability to break through anti-missile defences.

The combination of ship and ground-launched missiles of various payloads and ranges offers real strategic depth to the PLA for the first time. While the absence of both the DF-41 ICBM and the latest JL-2 Submarine Launched Ballistic Missile (SLBM) suggested that this was not a point that China wished to emphasise, it was clear that China could use missile forces to compensate, at least temporarily, for a lack of power-projection capabilities. The missile forces fill the gap by providing area denial and precision strike capabilities over both the Taiwan Strait and the South China Sea.

Confidence in the Air

Instead of the traditional long range bombers, the flypast was led by the air force's new generation of Airborne Warning and Control System (AWACS) aircraft. The KJ-2000 AWACS aircraft have been in service for several years, but were only publicly acknowledged shortly before the 2009 parade. The aircraft allow the air force to operate with increasing confidence and to move away from a reactive, static defensive posture and towards one of more active defence. This means that the PLA Air Force (PLAAF) possesses more flexibility to choose the air space in which to operate, instead of merely reacting to airborne incursions.

The message was that the air force is increasingly confident in both its aircraft and its air defence network. As it focusses on achieving air superiority, the latest fighters such as the J-10 and J-11 are being integrated into a command and control network which will be directed from AWACS aircraft rather than from the ground. However, the lack of a capable helicopter arm was evident, and this will restrict battlefield air support for the

ground forces. Naval aviation assets are meanwhile aimed at assault capabilities, with the JH-7A able to perform low-level anti-shipping attacks as well as Electronic Counter-Measure (ECM) 'growler' missions. These factors, combined with mid-air refuelling, demonstrate China's strategic shift from a defensive posture to active defence, with the potential, for example, to mount long range fighter patrols and to develop anti- shipping strike capabilities as a means of protecting what China sees as its territorial concerns in the South China Sea.

The emphasis of China's military modernisation has clearly switched from the domestic issue of reforming ground forces, and is now looking outwards.

China has been criticised for a lack of transparency in its military establishment. In this context, the 2009 show was truly surprising. Models of the equipment were shown, even including those of missiles in the previously mysterious Second Artillery force. This too was a sign of the PLA's growing confidence, along with a wish not to be seen as opaque or threatening by its neighbours. The emphasis of China's military modernisation has clearly switched from the domestic issue of reforming the ground forces, and is now looking outwards. As it pursues projects such as its aircraft carrier building programme, as well as continued developments in space technology, China's next step is likely to be to seek to provide the PLA with battlefield dominance and the country with regional power-projection capabilities.

AIM

The aim of this paper is to examine modernisation of China's defence forces since the 1980s and the likely impact of its military strategy and doctrine on the region, especially in the Indian context.

CHINESE DEFENCE FORCES MODERNISATION: AN OVERVIEW

The PLA is in the fourth decade of a comprehensive programme of modernisation and transformation that began in 1979 after the PLA's last major campaign against a foreign enemy — its "self-defensive counter attack"

In 1985, China's Central Military Commission (CMC), headed by Deng Xiaoping, declared the most likely military contingency China could face to be "local, limited war."

against Vietnam. The programme continues with renewed vigour into the new century.[1]

Chinese military modernisation encompasses all four Services with priority of effort directed toward the PLA Navy (PLAN), the PLA Air Force (PLAAF) and the strategic missile force known as the Second Artillery.[2] The ground army, which previously had been the centre of gravity of the Chinese armed forces, remains the largest Service and still provides the bulk of senior leadership for the military, but it has felt the brunt of force reductions as the PLA's mission emphasis has shifted.

The strategic underpinning for a long-term military modernisation process was set in 1985 when China's Central Military Commission (CMC), headed by Deng Xiaoping, declared the most likely military contingency China could face to be "local, limited war" replacing the threat of the "early, major, and nuclear war" foreseen by Mao. Because the threat of major war was deemed low, senior Chinese leaders made the critical strategic decision to subordinate military modernisation to other aspects of national economic development such as agriculture, industry, and science and technology. Thus, in the 1980s and early 1990s, the Chinese government did not spend vast sums of money and national resources to rapidly modernise the PLA.

ECONOMIC DEVELOPMENT AND MILITARY MODERNISATION DURING THE 1980s

The current Chinese security policy framework has its roots in the shift of the Chinese Communist Party's (CCP's) strategic view towards war and peace in the 1980s. A consensual strategic view was developed within the CMC in 1985 that, while the possibility of a world war still existed, it was increasingly seen as remote. Previously, the PLA prepared for a full scale

1. Dennis J. Blasko, *The Chinese Army Today: Tradition and Transformation for the 21st Century* (Routledge, 2006), p. 17.
2. Ibid., p. 53.

war because it was thought that a world war in which China would be involved was imminent. China's strategy in this potential global conflict was to "lure the enemy in deep" in order to overcome the enemy's technological superiority with China's numbers of troops.[3]

Adoption of this strategic view gave additional impetus to the force restructuring and modernisation that was already linked to the broad trend of economic development. Based on the new strategic view, Deng Xiaoping predicted that China could then carry out the "Four Modernisations" plan with the assurance of a stable international environment. While military modernisation was the last of the "Four Modernisations," Deng rationalised that a successfully modernised economy would facilitate a successful military modernisation, and, thus, PLA modernisation should be focussed on supporting economic success.[4] At the 1985 CMC conference, Deng offered the explanation, "We can modernise military equipment after we have successfully developed the domestic economy. Therefore, we have to be patient for several years. The PLA must reduce its manpower by a million soldiers." Secondly, Deng emphasised that the PLA would have to determine its role in China's future using the principle that economic growth is the highest priority.

The PLA responded by proposing a policy framework that incorporated preparations to wage a limited war, and suggesting future roles of the PLA within the context of Chinese economic development. One of the first Chinese military leaders to envision the new role was Gen. Liu Huaqing. Liu, who had a close personal relationship with Deng Xiaoping since they were in the 2nd Field Army and was promoted to Commander of the PLAN in 1982. Liu published a paper on November 24, 1984, titled, "Let Chinese Maritime Business Develop by Building up a Strong Naval Capability."[5] In this paper, Liu argued how the PLA should contribute to economic development by further developing the defence industrial base as a critical

3. David Shambaugh, "China's Military: Real or Paper Tiger?" *The Washington Quarterly, 19:2*, 1996, p. 26.
4. Deng Xiaoping, *Collected Works of Deng Xiaoping*, Vol. 3 (Beijing: Renmin Chubanshe, 1993), p. 62.
5. Liu Huaqing, "Let Chinese Maritime Business Develop Through Building up Strong Naval Capability", *Renmin Ribao*, November 24, 2004.

sector of the national economy. Liu argued that a significant part of the Chinese maritime business sector consisted of providing technical support functions to the PLAN.

For the first 10 years of modernisation, China perceived its major potential foe to be the Soviet Union. Using force to reunify Taiwan with the mainland was low on the list of China's military priorities. By the mid-1990s, the situation between the mainland and Taiwan had changed considerably.[6] A multi-party democratic form of government was taking hold on the island, and voices for independence had risen. After the 1995-96 crisis in the Taiwan Strait, China's leaders decided they needed to develop military capabilities more rapidly to prevent what Beijing perceived as further steps toward Taiwanese independence. Although the Chinese leaders preferred peaceful reunification of the island with the mainland, they knew Taiwan and its supporters in the United States had to see China's military power as credible. As a result, after 1999, the intensity of the PLA's modernisation process increased, focussing principally on the goal of deterring Taiwan's independence and, if necessary, on imposing the will of the Chinese leaders by force.

The acceleration of PLA modernisation after 1999 became possible to a large extent because of the confluence of a more specifically defined mission, the availability of increased resources, a smaller force, and 20 years of previous effort that had laid the groundwork for what was to follow. In particular, many advances in the PLA since 1999 have taken advantage of the nation's impressive economic growth during the 1990s, especially developments in the Chinese electronics industry. The end of the Soviet threat, along with the availability of advanced military weapons from a cash strapped Russian government, also contributed to changes in China's strategic posture in the late 1990s. Still, despite some marked improvements in China's military capabilities, the effectiveness of PLA modernisation has yet to be proved in battle against a hostile force.

The modernisation of the Chinese armed forces is occurring in virtually

6. Seiichiro Takagi, "China and Multilateral International Cooperation in Asia-Pacific," *International Affairs*, 442: 1997, pp. 53-67.

every aspect of military matters. However, trend analysis shows that faster progress is occurring in some areas while others prove to be more complex and/or resistant to change. Military equipment modernisation has become the PLA's number one priority. The leadership in Beijing also espouses a strong desire to produce the new military equipment indigenously. Also, they are pouring more money into their defence industries in the hopes of producing this modern equipment within the country.[7] But lack of resources and slow conversion of the defence industries has thus far enabled them only to purchase high-tech weaponry from outside China in the hope of "reverse engineering" the technology. They have also purchased dual use technologies in the hope of converting the concepts or devices to military applications.

The military has vast numbers of tanks and airplanes that were built in the 1950s and 1960s and are nearing the end of their service lives.

Equipment Modernisation

The vast majority of the PLA's conventional weapons is rugged, reliable equipment based on the 1950s and 1960s technology. It continues to rely on modernised versions of obsolescent Soviet and Chinese equipment. Another major problem the Chinese military faces is the obsolescence of a large amount of other military equipment in the near future. The military has vast numbers of tanks and airplanes that were built in the 1950s and 1960s and are nearing the end of their service lives. Therefore, in addition to desiring advanced technology equipment to modernise and upgrade its forces, China is acquiring new equipment to replace the existing force structure.

Also, the modernisation efforts have given China the ability to deploy and conduct limited amphibious operations beyond its borders. But the units' small size, their dispersal throughout the country, and lack of lift capability limit the effectiveness for large scale operations. The navy has

7. David L. Shambaugh, *Modernizing China's Military: Progress, Problems, and Prospects* (Berkeley: University of California Press, 2002), pp. 159-187.

significantly improved its operational range, firepower, and air defence capabilities. These improvements allow the navy to operate farther from the coast for longer periods. However, it still cannot mount sustained, coordinated operations. The air force still has very limited capability, even with the purchase of the advanced Russian fighters. These aircraft, while modern, do not compare to the F-16s possessed by other regional nations.

Elements of Modernisation

By the turn of the 21st century, several distinct but interrelated elements could be seen in the PLA's modernisation programme. The following components of modernisation were directly linked to developments of the previous two decades and enhanced by increased resources available since 1995:

- Reduction in force size.
- Changes in force structure.
- Reform of the structure and missions of the reserves and militia.
- Changes in the personnel system.
- An influx of new equipment.
- Doctrinal revision to prepare the PLA to fight and win local wars under modern high-technology informationalisation conditions.
- Improvements in the frequency, content, and methods of military training, with emphasis on joint operations.
- Transformation of the PLA logistics system.
- Enhancement of all soldiers' standard of living, pay, and lifestyle.
- Modification of the professional military education system.

CHINA'S WHITE PAPER ON NATIONAL DEFENCE, 2004

China published its fourth White Paper on national defence on December 27, 2004, in its national daily, *People's Daily*. The highest priority goal for China's defence policy is to defend national sovereignty and integrity, including maritime rights and interests, and prevent separation of parts of the state. In the paper, China identifies its key security concerns, even though it states that the overall national security environment in the modern world has improved. These are:

- The "vicious rise of Taiwan independence" forces.
- The technological gap resulting from the Revolution in Military Affairs (RMA).
- The risks and challenges caused by the development of the trends towards economic globalisation.
- The prolonged existence of unipolarity vis-a-vis multipolarity.
- To stop separation and promote reunification, guard against, and resist, aggression, and defend national sovereignty, territorial integrity and maritime rights and interests.
- To safeguard the interests of national development, promote economic and social development.
- To modernise China's national defence in line with both the national conditions of China and the trend of military development in the world by adhering to the policy of coordinating military and economic development, and improving the operational capabilities of self-defence under the conditions of 'informationalisation.'
- To safeguard the political, economic and cultural rights and interests of the Chinese people, crack down on criminal activities of all sorts and maintain public order and social stability.
- To pursue an independent foreign policy of peace and adhere to the new security concept featuring mutual trust, mutual benefit, equality and coordination with a view to securing a long-term and favourable international and surrounding environment.

What also emerges from the White Paper is an unambiguous statement about the status of Taiwan with respect to China and also of China's desire to bridge the gap in RMA by adopting information technologies. Towards this achievement of RMA, modernisation of its navy, air force and Second Artillery Force has been highlighted as a key understanding of the necessity of joint operations to achieve a clear victory over its adversaries and the need to intensify training to achieve this. This has evolved out of detailed studies undertaken by various military scholars of China on Allied forces' operations in the Gulf War, Kosovo, Afghanistan and the Iraq War. Chinese

Chinese planners believe that future campaigns will be conducted simultaneously on land, at sea, in the air, space and electronic medium.

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The drive to incorporate RMA with Chinese characteristics and to intensify joint training are to be viewed as efforts to develop its joint operations capabilities with an enhanced Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) network, a new command structure, and a new integrated tri-Sservice (joint) logistics system. The overriding concerns expressed in the White Paper are about Taiwanese separatist forces, the need for modernising China's armed forces, especially the Second Artillery Force, PLAAF and PLAN, and the USA's growing military influence in the region. India has been mentioned to appreciate that "tensions between India and Pakistan have eased and the two countries have maintained the momentum of peaceful dialogues," and later to indicate cooperation in anti-terrorism operations and conduct of the exercise with the Indian Navy in November 2003. Obviously, India is not a strategic concern for China in the near future. But is the converse as true?

CHINA'S ACCELERATED MILITARY BUILD-UP: THE STIMULI

China's accelerated military build-up, its military upgradation and integrated warfare operational training dates from 1992 onwards. In every successive year, the military power enhancement process has picked up more steam. China's ambition to emerge as a global power, competing strategically with, if not confronting, the United States, has been the major underlying national ambition of China. China has, in no uncertain terms, with such accelerated military build-up, made it clear that it intends to emerge as a "military superpower". Also, China does have a well thought out strategy to achieve this aim. The *China's National Defence* publication of 2006 spells out the following: "China pursues a three-step development strategy in modernizing its national defence The first step is to lay a solid foundation by 2010, the second is to make major progress around 2020,

and the third is to basically reach the strategic goal of building informatized armed forces, capable of winning informatized wars by the mid-21st century." The implied reference in the last sentence is unmistakable. With such a blueprint, China's military power build-up annually would be a constant feature.[8]

'Active defence' is an operational guideline for military strategy that applies to all the branches of the armed forces.

Drawing upon foreign military experiences, particularly US led campaigns up to, and including, Operation Enduring Freedom and Operation Iraqi Freedom, Soviet and Russian military theory, and the PLA's own combat history, China is transforming across the whole gamut of its armed forces. The pace and scale of these reforms are broad and sweeping. However, the PLA remains untested in modern combat. This lack of operational experience continues to complicate outside assessment of the progress of China's military transformation. According to the 2008 Defence White Paper, these guidelines emphasise fighting and winning local wars under conditions of informatisation and building toward integrated joint operations, with a stress on asymmetric warfare to "make the best use of our strong points to attack the enemy's weak points."

The broadest guideline for war-fighting within China's military doctrine is the concept of "active defence". Attempts to discern a systematic hierarchy among Chinese war-fighting principles usually identify two concepts: 'active defence' and 'local wars under conditions of informationalisation' at the top level of a military doctrine. 'Active defence' is an operational guideline for military strategy that applies to all the branches of the armed forces. It means that China does not start wars to achieve strategic ends and, thus, remains committed to use its armed forces only to defend against attacks at its national sovereignty. According to the 2006 US Department of Defence (DoD) report, any attack by the People's Republic against Taiwan would be legitimised by "active defence" as a preemptive, defensive act.

8. T. D. Joseph, "Military Modernisation in China: Some Implications for India," *AIR POWER* Journal, vol. 3, no. 1, Spring 2006 (January-March), p. 29.

The implications of the change of language from "limited wars under high-tech conditions" to "local wars under the conditions of informationalization" remain to be seen. Further, the extent to which the new concept will gradually replace the old one or if it will mainly augment it also remains to be seen. It is undoubtedly clear, however, that China has made great efforts to introduce high-tech equipment into its armed forces in order to enable the armed forces to undertake extensive joint Services campaigns with information technology capabilities.

Rich Country, Strong Armed Forces

Since the beginning of the 1990s, the Chinese economy has been enjoying rapid growth. At the 17th Party Congress on October 15, 2007, the General Secretary of Chinese Communist Party Central Committee, Hu Jintao, again emphasised the policy objective of "comprehensively being a well-off society" by expanding the Gross Domestic Product (GDP) to $4.4 trillion in 2020, a four-fold increase from 2000 .

Ensuring secure and uninterrupted energy resources is one of the potential bottlenecks in the sustained development of the Chinese economy, and some of the PLA leaders see access to energy markets as a potential role for the armed forces. China's security planning in the Asia-Pacific region highlights the geographic importance of Taiwan, which is located centrally along the Sea Lanes of Communication (SLOCs) connecting Southeast Asia to Japan, South Korea and China. In the event of a conflict or crisis within the Taiwan Strait, some observers in China have expressed concern about the potential for a blockade of these SLOCs, a glaring strategic vulnerability for China. Thus, the Chinese goal of energy security to sustain its energy development can be said to be one of the background factors in the linkage between China's economic development and military modernisation.

ASSESSING CHINA'S DEFENCE FORCES

PLA Ground Forces

The PLA ground forces still dominate the Chinese military structure,

although the air, naval, and missile branches are steadily gaining in strategic importance. Chinese security does not face the same challenges from ground forces on any of its borders that it does in terms of air, sea, and missile forces. China is, however, steadily improving its capability to use ground forces in a clash with Taiwan as well as its ground force rapid reaction and power projection capabilities.

The 2006 DoD report stresses the PLA ground forces' focus on "deep battle" capabilities.

Ground Force Doctrine and Strategy

The 2006 DoD report stresses the PLA ground forces' focus on "deep battle" capabilities. Such operations require the PLA ground forces to master far-reaching reconnaissance and strike capabilities, deploy highly mobile forces, and sustain support lines over an extended territory. This can only be done effectively through joint forces operations.

The 1970s saw the first change in China's long-held concept of a guerrilla style people's war. The updated doctrine was then called "people's war under modern conditions." Under this doctrine, force development towards increased mobility and joint interoperability were the focus.

It is clear that the PLA ground forces do not envision fighting an ideological war of attrition, with mass, low-technology capabilities. Along with the modernisation of human resources and equipment, the PLA will likely conduct military operations in the manner that has evolved over the past 20 years, particularly in the light of US campaigns in the Persian Gulf, the Balkans, and Afghanistan. This means a constant reliance on inter-Service operations with air and sea-based strikes preceding land operations, quick and massive strikes to gain battlefield superiority and fast movement of troops and material, and capabilities to fight asymmetric warfare. How these experiences will play out in a military contingency with Chinese participation depends on the enemy or enemies, the political underpinning of the conflict, the terrain, and the availability of military resources.

Army Aviation

The PLA ground forces aviation branch consists of at least 375 helicopters. Around 10 percent of the total helicopter inventory is made up of attack helicopters (31 WZ-9 and 8 SA-342). The army aviation branch within the PLA has steadily been built up in recent years, totalling 12 regiments plus two training regiments. A major modernisation includes variants of over 150 Mi-17 currently in service with the PLA ground forces aviation.

A new medium helicopter is being developed together with Eurocopter, apparently resembling the Agusta A-129. This advanced attack model is called the WZ-10 or Z-10. Reasonable information about this project is not available, but some observers state that this helicopter will feature advanced flight performance capabilities and cutting-edge ammunition. Also, development for a WZ-11 version has been reported, although details remain unknown. Currently in use as an attack helicopter is the WZ-9, of which 31 helicopters are reported to be in use, with more being delivered. The WZ-9 closely resembles the Eurocopter Dauphin. Any large scale introduction of attack helicopters undoubtedly is going to change the mission of the PLA ground forces aviation branch, as it may shift from a combat support to a partly combat force service.

PLA Navy (PLAN)

The PLAN's traditional and current major mission is to defend China's coastlines. The PLAN is increasingly preparing for combat operations further away from the coast as well as playing a role in a potential conflict over Taiwan. The basis for this information remains unclear, but the PLAN undoubtedly possesses the capabilities to provide means for troop transport to Taiwan as well as to conduct operations around Taiwan. Any meaningful assessment must weigh the actual ability of the PLAN to plan sustain operations in such a contingency as well as how effectively the PLAN is able to operate in cooperation with the PLA ground forces, PLAAF, and Second Artillery Corps. This becomes even more important, should a conflict over Taiwan involve other powers. As in the other PLA branches, the underlying doctrine for China's maritime force is "active defence".

Against the background of this concept, the PLAN has structured its forces according to a three-stage naval deployment. The first stage concerns the immediate coastlines and the so-called first island chain, which together represent the maritime areas most vital to China's national interests, i.e. including Taiwan. The first island chain near China's coast extends up to 200 nautical miles from China's seashores to the Kuriles in the north, following a line through Japan, the Ryuku Islands, encompassing Taiwan, the Philippines to Borneo (brown water navy). The second islands chain roughly follows the same line but extends to up to 700 nautical miles and encompasses all of Indonesia (green water navy). The third level would be represented by a virtually global force, capable of reaching and sustaining battle operations around the world (blue water navy). Apart from the necessary equipment and logistical support infrastructure, there is little indication now that the PLAN can execute operations anywhere near blue water capabilities.

The third level would be represented by a virtually global force, capable of reaching and sustaining battle operations around the world.

Doctrine

Recent developments in the PLAN's modernisation have led to the assignment of the term "sea denial" as a key component of China's naval warfare strategy. This approach centres on capabilities to deter or prevent an enemy by force or to capture and hold a certain area. According to the 2006 DoD report, China attempts to deploy sea denial capabilities as far as the "second island chain". If China employs sea denial operations, they will most likely involve a conflict or the prevention thereof in the Taiwan Strait. A capable submarine fleet is a key ingredient to sea denial. China's White Paper on National Defence of 2004 states that the expansion of naval capabilities is going to be a focus of its overall armed forces development. This has led many analysts to assume that China will develop blue water capabilities. The 2006 DoD report concedes that China's blue water capabilities will materialise in a time-frame described as "over the long term". The trend

in naval modernisation indicates that the PLAN concentrates on acquiring the means to lead and sustain warfare in a contingency involving Taiwan rather than build up a worldwide power projection force

PLAN Aviation

The PLA Naval Aviation Forces (PLANAF) execute air strike and air defence missions and are supposed to provide air support for the PLAN surface ships and submarines, reconnaissance and transportation missions. Currently, about 26,000 personnel are organised into nine aviation divisions. Each fleet command has one or two fighter divisions, a bomber division, one or two independent special mission regiments, and a ship-based helicopter regiment with its helicopters assigned to a specific surface ship. The navy aviation branch in recent years has undergone significant modernisation. Out of its 346 fighter planes, 48 are Russian made Su-30MK2s. These aircraft are arguably the most modern among all Chinese aircraft. The combat strength of 24 of China's Su-30 MK2s is almost equal to a US battle carrier group. Reports indicate that a third batch of 24 Su-30MK2 may be delivered by Russia in the near future. All fighters currently in operation may soon be replaced by the Su-30 MK2 and possibly J-10 fighter aircraft as well as the JH-7, which is a comparatively modern maritime interdiction aircraft. The PLANAF's 130 bomber aircraft, which consist of 100 H-5 bombers and variants, and 30 H-6Ds (based on the Tu-16), are outdated by any standards. Given that production for these series commenced in the 1960s, it is questionable how many aircraft are actually in operation. According to *Jane's*, some H-6Ds have been converted into tankers to provide refuelling support to J-8D fighters. Newer bomber developments apparently still use the H-6 as a platform. Reports indicate that an H-6M version with improved Anti-Ship Missile (ASM) pylons is being produced. If and when any new bombers will enter service remains unknown. Naval aviation holdings of patrol and reconnaissance aircraft remain fairly limited. The International Institute of Strategic Studies (IISS) reports holdings of 7 HZ-5 reconnaissance aircraft, and 4 Y-8X maritime patrol aircraft. Given poor coordination between the PLAN forces and naval aviation, it remains unclear as to what extent PLAN

vessels rely on naval aviation reconnaissance. Eleven reconnaissance aircraft is certainly a comparatively low number, given that South Korea's Navy, which is one-tenth of the PLAN's size, operates 8 reconnaissance aircraft, and Japan, 80. China is also interested in acquiring Su-33 aircraft, a modified version of the Su-27 that is used on Russian aircraft carriers. Besides, China has expressed interest in developing its own aircraft carrier.

Naval Modernisation

Although PLAN modernisation has received countless accolades as a pillar for China's military build-up, the overall picture is mixed. China has certainly demonstrated that it has the capability to launch modern combat vessels. At the same time, an examination of ongoing vessel developments suggests that if completed, the new ships will enhance the PLAN's war-fighting capabilities significantly by the end of this decade. For instance, the completion of the new 094-class submarines has doubled China's sea-based nuclear missile capabilities.

It has become commonplace to equate the procurement of modern naval vessels, especially those for blue water capabilities, with expanded geo-political ambitions. China's blue water capabilities are yet to be developed, though China's ambitions in this regard continue to be fiercely debated. Numerous sources report of Chinese plans to acquire and/or develop an aircraft carrier in the future. Attacking a US aircraft carrier battle group is an objective that leads the PLAN weapons procurement and order of battle considerations.

Apparently, in 2000, Chinese military leaders had devised a plan to build two 48,000-ton aircraft carriers. This plan has also been referred to as the "891 project". No reliable, concrete information on this project is available. It is estimated that China may develop an aircraft carrier in the range of 30,000-40,000 tons displacement within the next 10 years. Estimates about the date of an operational aircraft carrier range from 2015 to around 2020. At this point, China does not possess any aircraft that can be deployed on an aircraft carrier but this may be changed by the purchase of Russian Su-27s. Reports indicate that the PLAN is likely developing a twin turboprop

The primary mission of the PLAAF is to conduct offensive as well as defensive operations, and joint and independent missions under high-tech warfare conditions.

carrier aircraft similar to the US S-1/E-1. Future developments will, of course, rely on ship-building capabilities that use modern technologies and production techniques, available funding, and the determination that aircraft carriers are essential for China.

PLA Air Force

The PLAAF currently has a force strength of about 400,000 personnel and 3,243 combat aircraft. It comprises aviation forces, airborne, surface-to-air missiles, anti-aircraft artillery, and radar forces. The PLAAF is organised along Military Region (MR) lines, with an operational command in each MR, except the Jinan MR. The further command chain includes divisions, brigades, regiments, groups, and squadrons. A bomber division has about 10- 12 bombers.

Doctrine

The PLAAF prepares its training and order of battle for three possible campaign scenarios: offensive, defensive, and blockade missions. The primary mission of the PLAAF is to conduct offensive as well as defensive operations, and joint and independent missions under high-tech warfare conditions. The five PLAAF branches still appear to be relatively independent in terms of operational command. Only recently has the PLAAF begun to fly regiment size units simultaneously during training exercises. However, the Peace Mission exercises in 2005 have shown that the PLAAF tries to employ the full range of its combat aircraft in joint warfare with the other Service forces. Of all PLA Services, the PLAAF still appears to be the last to develop a vision and doctrine of joint warfare. Since 1999, the PLAAF has employed three tactical combat modes, stealth aircraft, cruise missiles, and armed helicopter attacks, for defence against precision air strikes, electronic jamming, and electronic surveillance and reconnaissance. Key changes that have taken place in the development of the PLAAF doctrinal guidelines

are:

- In 1999, the PLAAF revised its campaign strategy, assigning the PLAAF the mission to execute three types of campaigns: air offensive, air defence, and air blockade campaigns.
- In 2001, the PLAAF changed its training guidelines. The new guidelines stress training against assumed enemies and increased reliance on technological applications.
- This was accompanied by a change in its underlying outline for training and evaluation in 2002.

The sea change in doctrine on all levels, in contrast to the 1990s, refers, on the one hand, to an expansion from defensive to offensive and air blockade missions, and, on the other, the ability to perform joint missions with all other PLA branches on a tactical level. In terms of strategic doctrine, the PLAAF was designated in June 2004 to play a strategic role alongside the other two Services of the PLA. The force structure that the PLAAF possesses, in particular modern, long-range bombers, at this time does not meet the demands of this doctrinal shift. The biggest technical obstacle China will face is building a strategic air force. Future Chinese procurement of long-range bombers and/or ballistic missiles will allow more detailed assessments of the kind of warfare that the Chinese strategic air doctrine envisions.

CHINA'S AEROSPACE POWER

The Defence White Paper of 2004, in unambiguous terms, states that China intends to eventually achieve "command of the air and sea" and the ability to "conduct strategic counter-strikes." In order to develop area denial capability, the first aspect is developing a true blue water capability which China lacks at the moment.

The PLAAF is replacing older fighters with third and fourth generation aircraft fitted with long range, precision strike weapons for land attack and anti-ship missions and, in some of these aircraft, in-flight refuelling capabilities, which when fully operational, will extend operating limits. The PLA is negotiating with Russia to buy IL-78MK aerial refuelling aircraft and

has already contracted for the IL-76 based Russian Airborne Early Warning and Control System (AEW&C). In addition, it is also negotiating for the surplus Tupelo Tu-22M3 and Tu-95MS strategic bomber aircraft. Its plans to acquire and produce AWACS aircraft and the purchase of additional refuelling aircraft will significantly extend the range of its air fleet. Some of the weapon systems being acquired/manufactured/ developed towards this are:

- The KongJing-2000 (KJ-2000) is the first AWACS in service with the PLAAF, with four aircraft commissioned between 2006-07 (based on the IL-76 aircraft).[9]
- Su-27SK and Su-30MKK combat aircraft. China has reportedly cancelled the orders for 105 of the 200 Su-27s ordered, citing reasons of outdated technology, and plans to acquire more Su- 30MKKs instead so as to build up to a strength of 400 aircraft by 2015. The Su-30 aircraft is armed with AA- 11/R-73 SRAAMs, AA-12/R-77 BVRAAMs, AS-17or Kh-31 A1 ASMs, AS- 17/Kh-31P-1 anti-radiation missiles (ARMs), AS-18/Kh-59M ASMs, AA- 10/R-27 and R-27E BVRAAMs.
- SAM systems viz. S-300 PMU-1 and S-300 PMU-2, indigenous manufacturing of long range cruise missiles similar to the US RGM -109 tomahawk.
- Restarting production of the indigenous Xian H-6 Badger bomber aircraft in a new configuration capable of carrying four long range cruise missiles.
- The fourth generation combat aircraft, the F-10, which is being developed indigenously. It is, however, reported that the F-10 has a fair share of foreign components, namely, Israeli avionics, Russian engines, European landing gear, etc.
- The PLAAF stealth fighter, the XXJ, as a possible next-generation fighter (FGFA) is under development and likely to enter service in 2015. The PLAAF rolled out for taxi tests its first prototype stealth fighter, the J-20, in December 2010. This was sooner than most analysts had expected and

9. www//http//sino-defence.com, last accessed on February 01, 2011.

introduced the Chinese into the fifth generation stealth fighter arena.[10]

China's modernisation in its strategic missile capabilities has resulted in qualitative and quantitative improvements, providing it with not only a second strike capability which it always professed, but also a credible and survivable nuclear deterrent. China's nuclear capabilities are not being covered in detail in the paper. However, suffice it to state that its missiles are capable of targeting almost the entire Asia and Asia-Pacific theatre, including New Zealand and Australia, and most of the US.

Micro and nano-satellites will increasingly become the mainstay for shaping the battlefield by providing a cheap and affordable option in an operationally responsive space environment.

Another area that has seen rapid progress and modernisation is China's space programme which is critical for building a modern C4ISR capability. The two successful manned space missions, on October 15, 2003, and almost two years later, on October 12, 2005, are only the beginning of more ambitious projects like a lunar probe and a space station in the future. China has two remote sensing satellite programmes capable of digital imagery reconnaissance with worldwide coverage and is estimated to be developing a system of data relay satellites to support global coverage. China is also developing Electronic Intelligence (ELINT) and Signals Intelligence (SIGINT) reconnaissance satellites and also micro satellites (weighing less than 100 kg) for remote sensing, and networks of electro-optical and radar satellites. Beginning in the year 2000, China has already deployed half a dozen nano-satellites namely Tsinghua-1, Chuangxin-1, Tasuo-1 and 2, Naxing-1 and Tsinghua-2. In the years to come, micro and nano-satellites will increasingly become the mainstay for shaping the battlefield by providing a cheap and affordable option in an operationally responsive space environment for carrying out the entire

10. "The Rising Dragon in Asia - 2011," Update by Jeff Head. Last Update: January 11, 2011. Accessed on February 01, 2011.

spectrum of military space missions ranging from "force-enhancement" to "counter-space operations".

IMPACT OF THE GULF WAR

The emergence of the technology-based battlefield, as China's leaders witnessed in the Gulf War, made another impact on the operational doctrine of the military. In the war, military leaders saw the coalition forces pummel the Iraqi military. Since much of the Iraqi equipment was Chinese-made, the leaders saw that a Revolution in Military Affairs (RMA) had truly occurred. Sophisticated weaponry such as precision-guided bombs; stealth technology; airborne command and control systems; space-based intelligence; early warning systems; coordinated naval, air, and surface attacks; and real-time command, control and communications capabilities made the PLA's leaders develop a doctrine of "limited war under high-tech conditions." The Gulf War reinforced the PLA's acceptance of the notion that Mao's doctrine of "people's war" was indeed dead.

Therefore, the PLA shifted its military strategy to one of force projection to defend the country outside China's borders, incorporating advanced weaponry to fight this so-called "limited war under high-tech conditions."

Chinese strategists surmise "a future war would be localised, fought to achieve limited political objectives, and won by whichever side is better able to concentrate high-technology force at some distance from the national borders." To accomplish this strategy, China must incorporate a complete change in the way its military is structured. Therefore, this quest for modern weaponry has become vastly important for the military. In fact, equipment modernisation has become the PLA's most important priority.

ACQUISITION PRIORITIES

These changes to Chinese military strategy shift priorities to acquisition of a force projection capability specifically by acquiring advanced air defence systems, anti-ship defences, and advanced aircraft and naval weapon

systems. The PLA has identified key mission areas and the weapon systems it must acquire to develop this capability:[11]

- Developing anti-submarine warfare.
- Acquiring shipborne air defence.
- Building naval capabilities (ships, submarines).
- Developing equipment for amphibious operations.
- Developing and fielding modern attack aircraft.
- Developing and building strategic airlift and air refuelling capability.
- Building modern precision-guided munitions.
- Developing and fielding modern stand-off weapons such as cruise missiles.
- Developing and fielding modern command, control, and communications capabilities.

Chinese leaders have placed these force projection modernisation efforts at the top of the military's priorities. The PLA leaders recognise that they need robust command, control, and communications systems, coupled with precision munitions, if they are to compete with modern military forces. China's intention is to build these systems indigenously. So Beijing is beginning to allocate additional money to the state-run defence industries in an attempt to convert them into modern weapons producing industries.[12]

China incorporated these new indigenous defence production priorities into their overall military modernisation programme in 1992. China's effort toward self-reliance has been particularly acute. China has traditionally lagged behind other major weapons producers in terms of technological development, in part a function of the country's reluctance to become overly dependent on foreign suppliers. Today, as production goes global and technology spirals upward in cost and sophistication, the Chinese defence industries can ill afford such a parochial understanding of international

11. Richard A. Bitzinger and Bates Gill, *Gearing up for Hi-Tech Warfare, Chinese and Taiwanese Defence Modernisation and Implications for Military Confrontation Across the Taiwan Strait, 1995-2005* (Washington D.C: Centre for Strategic and Budgetary Assessment, 1996), p. 8.
12. Ti Chagchu, "Defence Industries Help Country," *China Daily*, September 16, 1997.

China's military modernisation effort, in contrast to its economic reforms, has been slower than what most Western estimates of the early 1990s had claimed.

relations.[13] Therefore, to enable China to project force as required by the new national defence priorities, it must first modernise its defence industries and manufacturing processes. To become self-reliant in the manufacture of modern weaponry, it must first seek help from other weapons producing nations. However, until the mid-1990s, Beijing had been hesitant to fully seek this "outside" assistance.

CONCLUSIONS ON MILITARY MODERNISATION

China's military modernisation effort, in contrast to its economic reforms, has been slower than what most Western estimates of the early 1990s had claimed. The economic boom and the resulting shift in national priorities from military modernisation to economic reform caused a fundamental change in thinking among both the leaders and much of the population. They now conclude that the key to becoming a regional and world power is not through ideology or military might; it is through a strong, thriving economy. Therefore, they want to avoid any type of conflict short of a direct threat to their sovereignty. Although they are embarking on a robust military modernisation programme to build a force that would be on par with other modern nations, they are not preparing for a superpower conflict. Instead, China's leaders are concerned with internal security and regional influence, specifically blocking Taiwan's independence and laying claims to territory in the South China Sea. Although smaller than originally planned, they have earmarked double digit increases in defence spending to modernise their defence industries and military. Most of the increase in defence spending has gone to salary hikes to the officer corps, to an increase in quality-of-life programmes, and to offset inflation. In addition, they have lost revenue from arms exports following the Gulf War, and the PLA run enterprises are not producing enough income for modernising their industries. Therefore,

13. Bates Gill, "The Impact of Economic Reform Upon Chinese Defense Production," in C. Dennison Lane, et al. eds., *Military Modernization* (London: T.J. Press, 1996), p. 145.

China's indigenous defence production capabilities have not improved. Also, Beijing cannot buy the quantities of foreign high-tech weaponry it needs to have the sustained force-projection capability it desires. The expense of these weapons systems is too great for China to afford. Also, since many spare parts come from other countries such as Russia, these parts are not always available. And whether obtained through domestic production or foreign sources, the absorption of advanced weaponry requires more advanced levels of education than the Chinese military currently possesses.

Impact on Military Capability

Overall, even with the slow pace of military reform, the modernisation effort has improved military capabilities to some extent. The PLA is slowly improving but "doctrinal and financial deficiencies will delay the PLA's ability to conduct sustained force projection for at least a decade." This power projection will be limited to the South China Sea and the Asian landmass. The modernisation of naval forces has enabled China to venture beyond the coastal areas, and may have given it the ability to blockade Taiwan. Therefore, China has accomplished at least one short-term objective of influencing the decisions of Taiwan's leaders. In addition, equipment modernisation of the air force has given the PLAAF the capability to intercept aircraft over mainland China. It is also cautious that even modest improvements in China's power projection capabilities could generate serious instabilities in the region. For example, a breakthrough in just one high-tech system, such as developing accurate cruise missiles, could give China a significant advantage in the region. While the equipment is old, there is a "certain quality to be found in quantity." This means that China is still a formidable force, and if regional countries engage it militarily, and China is able to absorb large losses in men and equipment, then its limitations in high-tech weaponry would be relatively meaningless.

IMPLICATIONS FOR THE UNITED STATES AND THE REGION

While China's defence modernisation efforts have not yet produced a significant offensive force projection capability, it still may make significant

progress in the medium to long term. This would change the balance of power among nations of the region. Will China use this future capability to bully weaker states or use force to absorb Taiwan into the mainland? This question, along with many others, is difficult to answer given the nature of Chinese international relations. Consider the contrast between the China that is the world's fastest growing economy, and the China that is on the verge of peasant rebellion and worker unrest.

The US and the nations in the region should formulate a foreign policy regarding China keeping two factors in mind. First, the US cannot be sure about China's intentions; rather, it must react to, and deal only with China's capabilities. Secondly, accept the fact that the national interests of the regional nations, the US, and China, differ significantly. Sometimes these interests will conflict. As such, the regional actors should not regard China as an enemy, but merely another regional actor, albeit one with a different agenda. Regarding China's future capabilities, it is clear that with continued modernisation efforts, it could develop adequate force projection capability in the coming decades. In addition, China will be able to:

- Conduct low-level exercises and stage at-sea confrontations.
- Set up a naval blockade of Taiwan and other regional islands.
- Perform limited, regional missile attacks.
- Conduct limited offensive air strikes.

The US and regional players must develop a force structure to effectively deal with these increased military capabilities. In addition, they can take measures to ensure the continued peaceful coexistence of countries in the region through diplomatic and economic means.

Regarding the second factor, the best way to ensure continued growth and peaceful coexistence in the region is to engage China in all diplomatic, economic, and regional security concerns. The US should not regard China as its enemy, but as an extremely large trading partner. The policies should involve continued encouragement of China's cultural and economic relationships with neighbouring countries. The regional powers should show a willingness to consider China's objectives as long as Beijing also

respects the interests of other parties. In addition, the US and regional countries should explore the possibility of including China in a multilateral, regional security arrangement. However, all nations should resist advanced technology arms sales to China. This will make the Chinese military modernisation more difficult and will allow additional time for the US and regional actors to establish multilateral diplomatic, economic, and security arrangements.

Transfer of the technologies associated with fourth generation aircraft like the Su-27 and J-10 reaching Pakistan would alter the existing military balance in South Asia.

IMPLICATIONS FOR INDIA

From present indications, apparently China will require until about 2015 for its military modernisation programme to produce a modern force capable of defeating a moderate size adversary. However, that would be cold comfort for a nation like India and other states in the Southeast Asian region, since one needs to plan for capabilities and not intentions. China has repeatedly proclaimed its intentions of peaceful coexistence with all its neighbours and peaceful rise as an economic power for the well-being of its people. But will such intentions lead to economic and military coercion to achieve its goals, and for India, military coercion or conflict, since India's case with respect to China is one of economic competition and not dependence?

China's possession of strategic bombers and long range cruise missiles will enable it to overcome the existing detection capabilities of India. The geographical sphere of influence that would be enabled by a massive build-up of Short Range Ballistic Missiles (SRBMs), Medium Range Ballistic Missiles (MRBMs) and Intercontinental Ballistic Missiles (ICBMs), long range strategic bombers like the Tu-22M, long range submarines, and extended reach of modern combat aircraft through aerial refuelling and space capabilities, is indicative of a long-term aim of becoming a dominant military power in Asia and, subsequently, in the whole world. Of immediate concern to India should be the consequences of increasing Sino- Pak military cooperation. Even though China has refrained from giving Pakistan access

With Indian society becoming increasingly dependent on automated data processing and vast computer networks, India will also become extremely vulnerable to such information warfare techniques.

to the latest technologies available with it, such a restraint may not be given in the future. Transfer of the technologies associated with fourth generation aircraft like the Su-27 and J-10 reaching Pakistan would alter the existing military balance in South Asia, and India would have to cater for two increasing threats, one of short-term implications and another of long-term implications.

Even though China has not invaded another country after the 1979 War with Vietnam, it has a history of territorial acquisitions, beginning with Xinjiang, through Tibet, Indian territories in Aksai Chin and Arunachal Pradesh and occupation of various islands in the South China Sea, which have been claimed by other littoral states of the area. It has also never hesitated to use military force to coerce or intimidate if it feels that its repeated warnings have not been heeded, as in the case of the Indian invasion in 1962, the Vietnam invasion in 1979, and the missile tests over Taiwan in 1995. Based on these assumptions, there are a few questions that the defence planners of India need to address. These are specific to capabilities and are just a few among many.

With regard to cyber warfare, in another five to ten years, China will develop much greater depth and sophistication in its understanding and handling of information warfare techniques and information operations. With Indian society becoming increasingly dependent on automated data processing and vast computer networks, India will also become extremely vulnerable to such information warfare techniques. The fact that it can be practised from virtually any place on earth even during peace-time makes acupuncture or paralysis warfare even more diabolical. India can ill-afford to ignore this new challenge to its security.

The strategy must be defensive to guard India's vulnerable assets, such as military command and control networks and civilian infrastructure dependent on the user of cyber space, as well as offensive to disrupt the adversary's C412SR systems and develop leverages that can be exploited

at the appropriate time. With some of the finest software brains in the world available to India, it should not prove to be an insurmountable challenge.

CONCLUSION

Considering China's military modernisation drive, including its ambitious enhancement of aerospace capabilities, the obvious point that comes to the fore is whether the Indian armed forces at present force levels will continue to deter the PLA in the future. A simple comparison of the force levels as they exist today and the extended sphere of influence that China would acquire through its planned inductions in the future, say by 2020, make it amply clear that based on India's present planned acquisitions, the answer is no.

Taking into account the existing prowess in long range missions, the Indian Air Force (IAF) may be a deterrence in certain areas which are far away from Chinese territories,[14, 15] but due to the fact that China has acquired a far greater number of combat aircraft of the Su-30 class than India and that its rate of acquisition of other modern weapon platforms is also faster than that of India, India's operational potential in the near boundaries of China is increasingly being called into question. A rapid modernisation in the spheres discussed so far will enable China to take a leap ahead of India in extending its influence in most of the areas of interest to it.

The present planned acquisitions of 126 more multi-role combat aircraft as replacement for an ageing MiG fleet and the induction plan of Tejas would eventually see a smaller IAF with about 37 plus combat squadrons by 2020, which may be highly inadequate for future contingencies. Also, the induction of the FGFA, being jointly developed with Russia, is also expected around the same time-frame. Though the recent statement by our Raksha Mantri (RM) does indicate that the government is keen to increase the sanctioned strength up to close to 45 squadrons.

14. Joseph, n. 8, p. 30.
15. Ibid., p. 13.

Also, this induction has to be supported by aerial refuelling aircraft, AWACS, ISR capabilities both space-based and near earth-based [in the form of Unmanned Aerial Vehicles (UAVs) and other surveillance platforms] and greater strategic and tactical lift capabilities.

INDIAN ACQUISITION OPTIONS FOR CREDIBLE DETERRENCE

The acquisitions could be by way of outright purchases, which limits the options in economic and political terms, or through indigenous capabilities which at the moment are nowhere in sight, unless major reorientation and refocussing of our design and development capabilities take place, or probably the best solution of all, a combination of the two till India acquires credible and sustainable indigenous capabilities. The proposed list would be:

- Space, air and surface-based ISR capabilities.
- Systems to enhance C4 capabilities.
- Strategic bombers.
- Heavy and tactical lift aircraft to provide strategic reach.
- Larger number of AWACS than presently planned to provide realistic air space cover in multiple theatres.
- Additional aerial refuelling aircraft.
- Anti-missile defence systems.
- Precision weapons.
- Improved communication systems and networking.
- Long range and silent submarine force armed with cruise missiles.
- Amphibious capability.

Finally, although long periods of peace and stability provide a nation and its leaders the means to concentrate on socio-economic and scientific development and thereby achievement of prosperity, assuming that prosperity and statements of intentions of peaceful coexistence in a cooperative environment would rule out conflicts in the future would be a great folly. India has witnessed the humiliating results of being lulled by blind belief in such declarations of friendship in the past.

CONTOURS OF INDIA'S NUCLEAR SAFETY

SITAKANTA MISHRA

An objective study on the 'safety' of high-technological systems is a difficult enterprise and more so of the nuclear industry. Inadequate social science theories exist to help understand the causes of 'reliability' in this hazardous and complex organisation. Also, important pieces of evidence about past events remain classified; thereby empirical analysis on nuclear safety organisational designs and strategies is circumscribed. One possibility is to assume, on the basis of 14,000 cumulative reactor years of commercial operation in 32 countries, that the danger from nuclear activity is minimal and nuclear energy can be harnessed in a safe and secure manner.[1] This assessment can also be challenged on the basis of nuclear history that has witnessed three severe nuclear disasters – Three Mile Island, Chernobyl and Fukushima Daiichi – in the most advanced nuclear-capable countries.[2] As a case in point, India has more than 260 reactor years of experience in the operation of nuclear reactors and various other applications.[3] Its nuclear plants are claimed to have survived the tsunami and earthquake, though of lesser degree. On the other hand, incidents of fire, construction

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1. "Safety of Nuclear Power Reactors", World Nuclear Association, January 2011, http://www.world-nuclear.org/info/inf06.html.
2. Meltdown of the Three Mile Island reactor (USA) in 1979 and Chernobyl accident (USSR) in 1986 and the recent one in Fukushima (Japan), March 2011.
3. *National Report* to the Convention on Nuclear Safety, September 2007, Government of India, p. 3, http://www.dae.gov.in/press/cnsrpt.pdf.

'Nuclear safety', therefore, is understood as "the creation and application of excellent management, design and operation to protect people and the environment from accidents, plant malfunctions and human error."

mismanagement, and radiation scare have also been reported, thereby the question often raised is: what organisational strategies and safety culture has India devised to prevent nuclear accidents and enhance the security of its nuclear infrastructure?

The sections that follow look into the mores of India's nuclear safe-keeping and operation within the context of a two-front dynamic change in vogue: (1) introduction of new nuclear power plants or rapid expansion of the existing nuclear power programme; and (2) wider use of radioactive sources and ionising radiation. Basically, what organisational model and practice has India evolved over the years in handling nuclear operations? Is it the trial and error method mixed with sheer luck that helped India to manage the nuclear operations or a conscious strategy of nuclear governance that characterises India's atomic energy discourse?

CONCEPTUALISING 'NUCLEAR SAFETY'

Nuclear technology issues are associated with long time commitment for safe possession, handling and security of nuclear material after the decision to embark on a nuclear power programme has been made. The reason being the enormous hazard that a nuclear operation would result in if not handled safely. 'Nuclear safety', therefore, is understood as "the creation and application of excellent management, design and operation to protect people and the environment from accidents, plant malfunctions and human error."[4]

These objectives are generally sub-divided into three categories.[5] (1) The *general nuclear safety objective* is to protect individuals, society and the environment from radiation harm by establishing and maintaining effective defences. (2) The *radiation protection objective* is to ensure that radiation

4. World Institute for Nuclear Security, "An Integrated Approach to Nuclear Safety and Nuclear Security", A WINS International Best Practice Guide, Revision 1.0, 2010, p. 3.
5. Gianni Petrangeli, *Nuclear Safety* (Butterworth-Heinemann, 2006), p. 1.

exposure within the installation or due to any planned release of radioactive material from the installation is kept below the prescribed limits and as low as reasonably achievable and to ensure mitigation of the radiological consequences of any accident. (3) The *technical safety objective* is to take all reasonably practicable measures to prevent accidents in nuclear installations and to mitigate their consequences; and to ensure, with a high level of confidence that all possible accidents are taken into account in the design of the installation to zeroing on the likelihood of accidents with serious radiological consequences. Consistent with the technical safety objective, the International Safety Advisory Group prescribes the target for power plants, to minimise the occurrence of severe core damage, to below about 10^{-4} event per Plant Operating Year (POY).[6] And, stringent implementation of all safety principles should lead to the achievement of an improved goal of not more than about 10^{-5} such events per POY.[7] The objective is to ensure siting and plant conditions complying with adequate health, safety and radio-protection principles. These involve broadly two interconnected aspects of "nuclear governance"[8] – nuclear safety and nuclear security, which also constitute the basis of a strong "nuclear safety culture".[9] As India is envisaging an ambitious nuclear energy expansion programme, it is pertinent to evaluate what general, radiation and technical safety measures India has nurtured and how entrenched the nuclear safety culture in the country is.

THE DYADIC DISCOURSE

Within the organisation theory literature, the debate over the reliability of complex technological systems is dyadic. The optimistic view represented

6. Ibid.
7. Ibid.
8. Nuclear governance comprises the civilian or non-civilian oversight and control mechanisms that encompass the state executive, specialised civilian and parliamentary institutions, the civil society, etc. Hans Born, "National Governance of Nuclear Weapons: Opportunities and Constraints", Policy Paper – No. 15, Geneva Centre for the Democratic Control of Armed Forces (DCAF), 2007.
9. Nuclear safety culture as a generic term is associated with three major factors: viable nuclear management system; widely shared awareness of nuclear hazards; and self-controlled behavioural norms and values regarding nuclear safety. Giovanni Verlini, "The Mindset of Nuclear Safety", http://www.iaea.org/Publications/Magazines/Bulletin/Bull501/NS_Mindset.html

by the "high reliability theory" revolves on the possibility of extremely safe operation of complex technology; on the other hand, the pessimistic view represented by the "normal accident theory" asserts the inevitability of serious accidents with complex high technology systems.[10] Both assertions seem to bear logic; therefore, it is difficult to judge which assertion wins the test.

The High Reliability Organisation Theory

The high reliability organisation approach asserts that extremely safe operation of highly hazardous technologies can be possible if appropriate organisational design and management techniques are followed. According to Joseph Marone and Edward Woodhouse, "Given the challenge posed by modern technologies, the record is surprisingly good" because of the "systematic product of human actions" in the management of toxic chemicals, nuclear power, recombinant DNA research, ozone layer depletion, etc.[11] Aaron Wildavsky, the author of *Searching for Safety*, asserts that the increase in safety occurs due to entrepreneurial activity in complex systems as it shifts the focus from "passive prevention of harm to a more active search for safety".[12] These assertions are based not on the belief that human beings are perfectly rational; rather, on the belief that organisations, properly designed and managed, can be significantly more rational and effective than individuals.[13]

However, the preconditions for ensuring such reliability depend mainly upon four factors as the route of extremely reliable operations: (1) prioritisation of safety and reliability as a goal by the leadership; (2) high levels of redundancy in personnel and technical safety measures; (3) development of a high reliability culture continually practised in decentralised operations; and (4) sophisticated forms of trial and error

10. Scott D. Sagan, *The Limits of Safety: Organisations, Accidents, and Nuclear Weapons* (New Jersey: Princeton University Press, 1993).
11. Joseph G. Marone and Edward J. Woodhouse, *Averting Catastrophe: Strategies for Regulating Risky Technologies* (Berkeley: University of California Press, 1986), p. 5.
12. Aaron Wildavsky, *Searching for Safety* (New Brunswick, N.J.: Transaction Books, 1988).
13. Sagan, n. 10, p. 16.

organisational learning.[14]

When high reliability propositions are examined in the Indian context, obvious questions crop up as to where do India's nuclear related organisations fit in? What are the contours of India's nuclear safety culture? What system does India's nuclear establishment follow in safe-keeping and safe-operation of the technology and resources, starting from the exploration to the safe disposal of waste products? Are redundancy features of Indian nuclear facilities adequate and reliable to withstand unexpected and unforeseen contingencies?

The Normal Accidents Theory

Another set of scholars, by considering the nature and functioning of complex organisations, argue that one may work hard to maintain safety and reliability, but serious accidents are nonetheless a "normal" result or an integral characteristic of the system. According to Charles Perrow, the author of *Normal Accidents: Living with High-Risk Technologies*, "Serious accidents are inevitable, no matter how hard we try to avoid them."[15] He identifies two specific structural characteristics of organisations operating hazardous technologies – (1) interactive complexity; and (2) tight-coupling – which make them highly accident prone regardless of the intent of their operators.

The normal accidents theorists' view is that the nuclear industry as an extremely complex and nuclear energy production process, is not a set of independent and serial steps, rather, it requires many coordinated actions by numerous mechanical components and operators. In this set-up, critical components are kept, by necessity, in close proximity within a containment building, increasing the possibility of 'unplanned interactions'. For example, on the question of whether the zirconium and water outside the fuel rods could interact under extreme heat and produce dangerous hydrogen bubbles, the accident at Three Mile Island (TMI) proved that this was possible.[16] Also, power plant operators cannot directly observe all the

14. Ibid.
15. Charles Perrow, "Accidents in High Risk Systems", *Technology Studies 1*, no. 1, 1992; also *Normal Accidents: Living with High-Risk Technologies* (New York: Basic Books, 1984), p. 3.
16. Sagan, n. 10, p. 33.

Keeping both the theoretical arguments in mind, one may enquire about the extent to which the Indian nuclear industry is susceptible to accidents and equipped to mitigate them.

components involved in the production process—they rely on numerous warning devices, control panel lights, and redundant monitoring systems to manage operations which can be fallible. Such "freakish incidents are inevitable" in organisations with high interactive complexity as per the normal accident theorists.

"Tight coupling", is the second structural condition in the hazardous industries like nuclear energy and is subject to accidents that may escalate a minor accident to a complete disaster. The normal accident theory views nuclear energy production as a highly time-dependent and precise process where planned and unplanned interactions of different parts of the system occur quickly. Because of invariant production sequences and lack of slack in these systems, there is limited opportunity to improvise when things go wrong.

However, the two schools have a common estimate about the probability of dangerous accidents despite the difference in the tone of their conclusions.[17] The current global trend in the nuclear safety discourse seems to be guided by the conclusion of the high reliability logic that rests on the belief that "isolation away from society, intense socialisation, and strict discipline of organisation members," as in the ideal military model, can enhance reliability and safety. The trend in India certainly leaned towards the high reliability logic. In consonance, India has evolved its nuclear safety culture which seems struggling within a vicious circle of misinformation and misinterpretation owing to lopsided management of nuclear information.

PERSPECTIVES ON INDIA'S NUCLEAR SAFETY

Keeping both the theoretical arguments in mind, one may enquire about the extent to which the Indian nuclear industry is susceptible to accidents and equipped to mitigate them. Besides some minor incidents

17. Ibid., p. 48.

of mismanagement, the Indian nuclear infrastructure has not experienced any horrendous accidents beyond Level-3 in the International Nuclear Event Scale (INES).[18] Can one assume that the normal accident theoretical assumptions are inapplicable to the Indian nuclear organisational culture? Then, what is the decision-making and management of the interactive complexity system in India's nuclear energy production process? What model does the Indian nuclear establishment adhere to, to enhance intense socialisation of the operators, strict discipline of the organisation and its members, and warning systems, to early visualise any malfunctioning?

Besides use of radioactive materials in numerous civilian uses across the country, India has currently 20 operational reactors [18 Pressurised Heavy Water Reactors (PHWRs) and 2 Boiling Water Reactors (BWRs)], 8 are under construction [5 PHWRs, 1 Prototype Fast Breeder Reactor (PFBR), and 2 VVERs], and 36 more [6 PHWRs, 2 Fast Breeder Reactor (FBRs), and 28 Light Water Reactors (LWRs)] have been proposed.[19] Whatever may be the pace of these projects at present, India is going to experience increasing nuclear activities in the decades ahead. The strategy is to diversify nuclear energy production by involving several public sector undertakings and private partners, therefore, the safety of reactors, nuclear materials and their operation would be an overriding concern.

The safety record of India's nuclear establishment, though viewed by the majority with pride and respect, is often criticised by a few as "false claims."[20] The second group, like the normal accident theorists, comprises mainly the anti-nuclear activists (some of them with left-leanings) who reject India's exploration of nuclear energy on the grounds of both safety

18. The Narora fire incident of March 31, 1993, was rated by the INES scale at Level-3 (serious incident) mainly on account of the degradation of defence-in-depth of engineered safety features during the incident. The KAPS-1 incident of March 10, 2004, involving failure of the reactor regulating system during preventive maintenance on Power UPS-1 was rated by the AERB at Level-2 (incident) as per INES. Other two Level-2 incidents took place in 1998 and 2002. Many other "anomalies" or "deviations" have occurred during the past decades from which Indian scientists have, in fact, drawn lessons for improving the safety mechanisms in place.
19. Anil Kakodkar, "India's Nuclear Challenges 2010-2020", paper presented at CAPS seminar held on September 29, 2010, at IIC, New Delhi.
20. Buddhi Kota Subbarao, "India's Nuclear Prowess: False Claims and Tragic Truths", *MANUSHI*, no 109. pp. 20-34.

and environmental concerns. For example, Praful Bidwai is of the view, "Nuclear accidents happen because of the nature of nuclear technology. Natural calamities only make them more likely. All reactor designs are vulnerable to core-meltdown accidents."[21] The second category, comprising mainly the former members of the nuclear establishment and academics/researchers and scientists,[22] highlights India's nuclear organisational loopholes and the regulatory framework as "a total farce". For example, A.H. Nayyar, M.V. Ramanna and others argue that "spending more money on safety cannot stop small failures combining to produce a disaster, and may cause new problems…. nuclear reactors and people don't mix. People can cause accidents and accidents affect people. Operator error contributed to the accidents… ."[23] These cynics claim that India's nuclear power stations are "mismanaged", and that innumerable violations of minimal safety standards have been "covered up"; the regulatory body, the Atomic Energy Regulatory Board (AERB), has "no autonomy"; and, "a veil of secrecy" covers the nuclear power programme which "comes in handy to hide from public scrutiny the vast sums that are being wastefully spent to produce a tiny amount of our power requirements."[24]

The third group, resembling the high reliability theorists, consists of the scientific community, government officials, retired military personnel, journalists and some research scholars, who consider nuclear energy as a viable source for meeting India's future energy demands and feel that

21. Praful Bidwai, "Learning from Fukushima: India Must Put Nuclear Power on Hold," http://www.tni.org/article/learning-fukushima-india-must-put-nuclear-power-hold, April 2011.
22. Former AERB Chairman Dr A. Gopalakrishnan claims that he has documentary evidence to prove that "all is not well" with India's nuclear installations. Reportedly, AERB, under his chairmanship, had compiled a list of more than 130 nuclear issues affecting the safety of the Indian nuclear establishment. *The Times of India* (Mumbai) June 18, 1996; M.V. Ramanna, a physicist at the Programme on Science and Global Security, Princeton University (US), argues that the breeder reactors that India is resting its nuclear energy vision on, should be given up. According to him, the history of poor operations, lapses of safety at the many facilities run by DAE and its sister organisations, indicate that the safety of the country's nuclear facilities is indeed a matter of concern. "Safety First? Kaiga and Other Nuclear Stories", *Economic & Political Weekly*, vol. xlv, no. 7, February 13, 2010, pp. 47-54.
23. Zia Mian, A.H. Nayyar, M.V. Ramana, "South Asia's Misplaced Confidence in Nuclear Technology", http://www.tni.org/article/south-asias-misplaced-confidence-nuclear-technology, April 2011.
24. Subbarao, n. 20, p. 20.

India's nuclear establishment is capable of delivering it efficiently and cheaply. This trend is a continuity of the legacy established by India's early political leaders like Nehru and scientists like Bhabha and their succeeding generation, who have always viewed nuclear energy as a remedy for India's energy ailment. This group has been able to tout throughout India's history that nuclear power is a superior solution to India's growing appetite for energy. Responding to the allegation of nuclear accidents and disasters, they assert that disasters occur in all industries but the nuclear industry gets unprecedented attention owing to the negative popular perception of anything nuclear. The reports by the Nuclear Power Corporation of India Limited [NPCIL – which is responsible for the design, construction, commissioning and operation of Nuclear Power Plants (NPPs)] and Atomic Energy Regulatory Board (AERB – which monitors and lays down the safety regulations of NPPs) assert that "safety is accorded overriding priority" in the entire gamut of activities. While the NPCIL official "profile" claims that "no nuclear *accident* as defined by INES of IAEA has occurred so far in about 298 reactor years of operation of Indian nuclear power stations,"[25] the AERB report, "25 Years of Safety Regulation" (2008), reveals a number of nuclear safety *incidents*, the lessons learnt and the corrective measures undertaken.[26]

The reports by the Nuclear Power Corporation of India Limited [NPCIL – which is responsible for the design, construction, commissioning and operation of Nuclear Power Plants (NPPs)] and Atomic Energy Regulatory Board (AERB – which monitors and lays down the safety regulations of NPPs) assert that "safety is accorded overriding priority" in the entire gamut of activities.

However, a realistic evaluation on the claim that "India's safety record

25. "Profile", Nuclear Power Corporation of India Limited, http://www.npcil.nic.in/pdf/NPCIL%20Profile%20English.pdf, p. 5.
26. A. R. Sundararajan, K. S. Parthasarathy and S. Sinha, *25 Years of Safety Regulation*, AERB, Government of India, November 2008.

has been excellent"[27] needs to be undertaken keeping the Plant Load Factor (PLF)[28] in mind as all Indian reactors have not run up to their full capacity yet.[29] The gross life-time capacity utilisation factor of Indian reactors varies between 37 to 60 percent.[30] When more imported uranium reaches India, and more reactors from different operators come online, more safety related issues would emerge, thereby stringent safety measures would be required. To ensure fool-proof safety of nuclear operations, adequate technical expertise and stringent regulatory mechanisms are the preconditions. The question is: how capable is our nuclear regulatory body to identify the loopholes beforehand? The AERB, as viewed by many, "has no autonomy as it depends on DAE (Department of Atomic Energy) for funds, manpower, technical expertise and material resources." It is also expressed that there is a "vacuum of nuclear expertise outside the DAE" for independent criticism for its functioning.[31] Therefore, to assess the safety culture of India's nuclear establishment, one needs to examine mainly the nature of the organisational functioning of the Indian nuclear establishment, the technical capabilities of the regulatory body and the safety principles it adheres to.

NATURE AND FUNCTIONING OF REGULATORY AUTHORITY

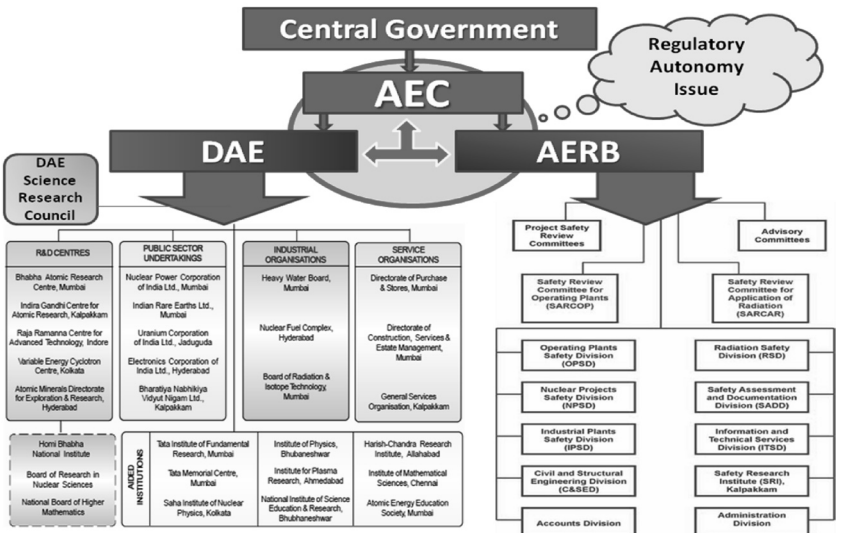
Under the provisions of the Atomic Energy Act (1948), the Atomic Energy Commission (AEC) was constituted in 1948 to frame national policies on nuclear energy production. The DAE, established in 1954, is responsible for the execution of the policies laid down by the AEC. For review and verification of safety related issues, the AERB was constituted on November

27. n.3, p. 3.
28. Plant load factor is the amount of power produced by a generator divided by the engineering capacity of the unit. Usually, load factors are stated for a year. The calculation, then, is the total kilowatt hours of power generated by the unit divided by the capacity of the unit in kilowatts times the number of hours in the year.
29. Five reactors (960 MW) use imported uranium and are being operated at high PLFs. Fourteen reactors are fuelled by domestic uranium which is not available in the required quantity. These reactors are being operated at lower power levels to match the fuel availability, resulting in lower average PLF. The government has taken a series of measures to augment fuel supply from domestic and import sources which have resulted in increase in average annual PLF from 50 percent in 2008-09 to 61 percent in 2009-10. http://indiacurrentaffairs.org, May 6, 2010.
30. A. Gopalakrishnan, "Issues of Nuclear Safety", *Frontline*, vol. 16, no. 6, March 13-26, 1999.
31. Subbarao, n. 20, p. 20.

15, 1983, directly under the AEC as an "independent regulatory authority", "totally independent of the DAE".[32] While the DAE is mainly responsible and coordinates the production and Research and Development (R&D) through its four sectors, the AERB is a unique organisation with great social responsibility that derives its authority from the Atomic Energy Act (1962) and the Environment Protection Act (1986) to ensure that any atomic activity does not cause undue harm to the health of the workers, the public and the environment. The AERB also administers the provisions of the Factory Act 1948 in the units of the DAE under its jurisdiction.[33]

The DAE is the promotional agency and the AERB is the regulatory body.

Fig 1: Position of the Regulatory Body in Government Set-Up



The Issue of Regulatory Autonomy

As per international practice, the regulatory and operational functions of national nuclear energy matters must be separated. Section 8.2 of the

32. *National Report to the Convention of Nuclear Safety*, AERB, September 2007, http://www.dae.gov.in/press/cnsrpt.pdf, p. 6.
33. "Code of Ethics", AERB, Government of India, http://www.aerb.gov.in/t/publications/ethics.pdf, p. 1.

Both the DAE and NPCIL exercise administrative powers over the AERB. Therefore, it is viewed that there are institutional limits on the AERB's effectiveness.

Convention on Nuclear Safety, which India ratified in 2005, says that a member-state should have a nuclear regulatory agency totally independent from the promotional agency.[34] In India's case, the DAE is the promotional agency and the AERB is the regulatory body. Though the AERB proclaims functioning independently and has performed so, the organisational patterns, compositions, and functions of the three units – the AEC, the DAE and AERB – give an impression that this body is a "captive". The mandate of AERB is to put down and monitor the observance of safety standards for siting, design, construction, operation and decommissioning of nuclear and radiological facilities in the country independently. It comprises, and is supported by, eight technical divisions and a number of committees that help oversee implementation of the mandate. However, for most of its overseeing activities, it draws its personnel from the AEC and reports also to the AEC whose Chairman is the DAE Secretary. The Chairman of the NPCIL is also a member of the AEC.

The issue here has been the composition of the AEC. The Managing Director of the NPCIL and the Director of the Bhabha Atomic Research Centre (BARC) are members of the AEC, but the Chairman of the AERB is not a member of the same. Thus, both the DAE and NPCIL exercise administrative powers over the AERB. Therefore, it is viewed that there are institutional limits on the AERB's effectiveness. Normally, both the DAE and the NPCIL are under the regulatory authority of the AERB. The major factors that make the regulatory body subservient to the other bodies are its lack of technical staff and testing facilities. According to A. Gopalakrishnan:

> … 95 percent of the members of the AERB's evaluation committees are scientists and engineers on the payrolls of the DAE. This dependency is deliberately exploited by the DAE management to influence, directly and indirectly, the

34. "Convention on Nuclear Safety", INFCIRC/449, IAEA, July 5, 1994, http://www.iaea.org/Publications/Documents/Infcircs/Others/inf449.shtml.

> AERB's safety evaluations and decisions. The interference has manifested itself in the AERB toning down the seriousness of safety concerns, agreeing to the postponement of essential repairs to suit the DAE's time schedules, and allowing continued operation of installations when public safety considerations would warrant their immediate shutdown and repair.[35]

It is also alleged that all radiation measurements and exposure evaluations are done by the health physics personnel employed by the DAE. These personnel, stationed at the facility, carry out the measurements and the DAE then provides the data to the AERB. These DAE physicists receive a monthly bonus from the NPCIL in proportion to the quantum of energy produced. If a reactor is shut down on the recommendation of a station health physicist, the bonus is lost.[36]

Therefore, the issue of the autonomy of the AERB has been raised, as it depends heavily on the support of, and reports to, the bodies whose modalities it is supposed to oversee. A small committee was set up by Dr Ramanna, Dr Abdul Kalam and others to consider this issue, but they concluded that there was no need for any change.[37] According to G. D. Mittal, a former BARC scientist, "It hardly matters whether the AERB reports to DAE or to the Prime Minister. This is because the people who will head or manage the AERB will be the same. So, the AERB in the present format is quite independent in its functioning."[38]

The merit of the issue should be judged not from the allegations but from any instance of safety compromise that the AERB may ever have committed. The current AERB Chairman S. S. Bajaj says, "We have never compromised on the safety of the plants and the workers, and even went to the extent of shutting down the operating plants till the required safety measures were implemented by the operators on several occasions…. We can quote several occasions when we had suspended the operations of the

35. Gopalakrishnan, n. 30.
36. Ibid.
37. "Complete Independence of AERB and Full Transparency, an Imperative – Interview with A. Gopalakrishnan", http://newsclick.in, March 25, 2011.
38. "Is India's Nuclear Regulator Independent Enough", http://news.in.msn.com, March 21, 2011.

Ensuring safety is a coordinated effort and utilising the expertise of the other wing of the organisation is prudent. Safety in the nuclear industry is paramount and the regulatory body should not be callous about it but too much emphasis on procedural issues can sometimes drive the organisation away from substantive issues.

plant or construction work for not following safety norms at different sites of NPCIL."[39] The AERB has full power to operate its budget which is allocated by the central government in the separate account head of the AERB. The regulatory body has also its own Safety Research Institute at Kalpakkam, Chennai.

It is easy to point fingers instead of understanding the compelling reasons why the AERB has remained associated with the DAE since its inception. For many decades, India was under a technology embargo, therefore all domestic resources and expertise had to be mobilised. A watertight compartmentalisation between two wings of the same establishment could have fractioned our nuclear ambition by generating an unnecessary tussle. Also, safety issues involve a lot advanced research and experiments which the DAE institutions can provide. Ensuring safety is a coordinated effort and utilising the expertise of the other wing of the organisation is prudent. Safety in the nuclear industry is paramount and the regulatory body should not be callous about it but too much emphasis on procedural issues can sometimes drive the organisation away from substantive issues and the integrity gets diluted. The idea of making the AERB independent is mooted in comparison to the procedures of the Railway Safety Commission which does not report to the Railway Board but to the Department of Civil Aviation. The same is the case with the mine safety organisation whose Chief Inspector is part of the Department of Labour. But the question is: should nuclear safety oversight reports and findings be placed in front of a non-nuclear expertise organisation?

The bottom line rather is to strengthen the current power and position of

39. "Legislation can Strengthen AERB's Autonomous Status," http://ibnlive.in.com/generalnewsfeed/news/legislation-can-strengthen-aerbs-autonomous-status/626417.html, March 28, 2011.

the AERB by providing it statutory status through suitable legislation and amending the Atomic Energy Act. The rationale being that when the NPCIL is joining hands with large public sector companies and more power plants are on the cards, the responsibility and functioning of the regulatory body needs to be revamped. Environment Minister Jairam Ramesh has recently proposed the conversion of the AERB into an independent statutory body—something on the lines of the Nuclear Regulatory Commission of the USA—completely delinking it from the DAE and AEC.[40] However, ensuring nuclear safety should not come about by squeezing the progress of nuclear technology and overemphasising the procedural aspects. It needs to be kept in mind that technology misunderstood and mismanaged is development missed. However, the decision to transfer the regulatory and safety review functions related to BARC from the AERB to an internal safety committee structure of BARC in June 2000 is bound to trigger scepticism about the integrity of the nuclear regulatory provisions.

The *Annual Report* of the AERB, the half-yearly newsletter, provides minute details of the activities of the body, and various monographs and guides provide ample perspectives on its functioning.

The Issue of Transparency

As complete opacity prevails around nuclear plants and the functioning of the nuclear establishment, many critics reject the results of the safety audit and oversight by the regulatory body.[41] Secondly, the public is unaware of the safety issues and what the nuclear establishment is doing, the problems they face and the solutions that are applied. However, these allegations do not seem to be based on firm ground for two reasons. First, public perception on anything nuclear is negative; therefore, gradual and controlled information dissemination is prudent, to avoid spreading unnecessary panic and chaos among the public. The government and the scientific community is extra careful to retain the confidence of the public. Second, how transparently the

40. "Jairam: Time for Independent AERB", *The Indian Express*, March 28, 2011.
41. "Need for Independent Review of Indian Nuclear Plants", Roger Reports, http://rogeralexander.worldpress.com, March 30, 2011.

AERB functions and conducts its oversight function can be perceived from the numerous reports and studies it brings out. The *Annual Report* of AERB, the half-yearly newsletter, provides minute details of the activities of the body, and various monographs and guides provide ample perspectives on its functioning. All reports and activities are promptly available on its official website. Especially, the "25 Years of Safety Regulation" (2008), a silver jubilee publication of the AERB, places in the public domain, in great detail, the safety-related issues of the last 25 years of its existence, the challenges faced and the way they were resolved.

In fact, during the last 25 years, the AERB has grown from a handful of scientists and engineers to a vibrant institution of more than 200 personnel now.[42] Its professional strength and quality management system are vindicated by the fact that in 2006 it secured the ISO-9001:2000 certification from the Bureau of Indian Standards. The AERB uses the accredited system for formulating and enforcing its rigorous safety norms, for carrying out in-depth safety review and conducting elaborate and effective regulatory inspections of the nuclear and radiation facilities. All Indian NPPs have been awarded the ISO-14001 and ISO-18001 for their Environment Management System.[43] Similarly, the Quality Assurance (QA) Directorate and Engineering Directorate of NPCIL have been awarded the ISO-9001 for quality assurance and design respectively.[44] As part of this international standardisation, both these directorates have issued policies which have a strong bearing on the safety of NPPs.

At the international level, the AERB has been actively involved in many forums like the CANDU Senior Regulators Group, VVER Regulators Forum, Nuclear Regulatory Commission of the USA, Nuclear Safety Authority of France, Federal Nuclear and Radiation Safety Authority of Russia, World Association of Nuclear Operators (WANO), and International Nuclear Event Scale (INES). However, the issue of transparency and the domestic nuclear safety debate need to be viewed in the overall discourse of the nuclear

42. n. 3.
43. R. Deolalikar, "Safety in Nuclear Power Plants in India", *Indian Journal of Occupational and Environmental Medicine*, vol. 12, no. 3, September-December, 2008, pp. 122-127.
44. *21st Annual Report 2007-08*, NPCIL, http://www.npcil.nic.in/pdf/annual_report07_08.pdf, p. 38.

safety culture that India follows. Perceptibly, India's nuclear establishment has adhered to a limited and selective nuclear information management system which has resulted in gross misunderstanding and confusion.

INDIA'S NUCLEAR SAFETY FRAMEWORK

Right from the early days, a distinguishing feature of the Indian scientific community has been their realisation and consciousness of the utility of atomic energy for national development and, at the same time, they were equally conscious of the hazards of the nuclear industry. When the Indian atomic energy programme was initiated with the formation of the atomic energy establishment in 1954 and the Apsara research reactor was commissioned in 1956, the safety of the plant was ensured through self-regulation. The directive which Bhabha issued on February 27, 1960, considered as the safety mission statement, reads:

> Radioactive material and sources of radiation should be handled in the Atomic Energy Establishment in a manner, which not only ensures that no harm can come to workers in the Establishment or anyone else, but also in an exemplary manner so as to set a standard which other organisations in the country may be asked to emulate.[45]

Nuclear Safety During the Early Years

During the early years, there was no formal regulatory body to oversee the safety aspects of India's nuclear facilities—it was mainly ensured through *self-regulation*. When DAE started the design and construction of its first research reactor Apsara in 1955, there was no formal safety analysis report. The designers of the reactor, on their own, ensured the safety of the system. Bhabha personally reviewed and directed the design. When the second research reactor CIRUS came up, a design and safety report was prepared at the insistence of the Canadian authorities. With the expansion of nuclear activities in India, the necessity of stringent nuclear safety oversight was felt, thus, the

45. Quoted in "Message from M.S.R. Sarma", http://www.aerb.gov.in/T/sj/book/appendix.pdf, p. 229.

Now when independence of the AERB is mooted, it must be kept in mind that the cohesion with which different divisions of the Indian atomic establishment have so far functioned should not be disturbed.

health physicists were assigned nuclear facilities to provide safety surveillance. In 1962, Bhabha set up a formal reactor safety committee with A.S. Rao as the Chairman, and V. Surya Rao, V.N. Meckoni and A.K. Ganguly as members. This committee devised a scheme of multi-level safety review of reactors. In 1963, the Health Physics Division brought out a Manual for Radiation Protection in the Atomic Energy Establishment (AEET, which became BARC in 1966). Bhabha made it mandatory for all the nuclear facilities to follow this manual.

In the same year, the Directorate of Radiation Protection (DRP) was constituted for monitoring the non-DAE radiation facilities, with P.N. Krishnamoorthy as the Deputy Director. In 1969, when the Tarapur reactors were ready for commissioning, there was no such regulatory system in place. Sarabhai set up an independent committee to review the commissioning activities. In 1972, when Unit 1 of the Rajasthan Atomic Power Station (RAPS-1) was about to be commissioned, the committee for Tarapur was renamed as the DAE Safety Review Committee (DAE-SRC) and safety review of RAPS-1 was accorded to it.[46] In 1973, both the Health Physics Division (HPD) and the DRP were brought under the Chemical Group of BARC headed by A.K. Ganguly who played a pioneering role in solving safety-related issues and formulating and setting up a culture of nuclear safety consciousness. The DRP, renamed as Division of Radiological Protection (DRP) in 1972, was responsible for radiation protection surveillance of hospitals, industries and research institutes, authorising users to procure radioactive sources. The HPD of BARC provides safety surveillance of DAE facilities and the Directorate of Radiation Protection is the competent authority to oversee the regulation of radiological safety in non-DAE facilities. The HPD controls the personnel radiation exposures, effluent discharges and radiological conditions within the NPP through Health Physics Units (HPU) established

46. Sundararajan, n. 26, p. 13.

at each nuclear plant.[47] It also carries out environmental surveillance around the NPPs through Environmental Survey Labs.

One finds sufficient interdependence and interconnectedness among the various organs of the nuclear establishment in an evolutionary manner during the early years. However, all these safety departments, irrespective of their name labels, have always functioned as independent units.[48] Now when independence of the AERB is mooted, it must be kept in mind that the cohesion with which different divisions of the Indian atomic establishment have so far functioned should not be disturbed for the sake of making one wing more autonomous than, and from, the other.

Nuclear Safety Framework in Vogue

The current nuclear safety culture of India, described as based on the principles of 'zero tolerance', 'defence in-depth', 'redundancy' and 'diversity', has its roots in the sustained and coordinated efforts by different organs of the nuclear establishment during the past decades. The responsibility to ensure the safety of nuclear facilities, especially nuclear power plants, today rests with the AERB, created on November 15, 1983.

In coordination with its eight technical divisions, Safety Review Committees – the Safety Review Committee for Operating Plants (SARCOP) and Safety Review Committee for Applications of Radiation (SARCAR) – and advisory committees, the AERB has set a tradition of maintaining safety in nuclear facilities as an overriding priority. The codes, guides and standards issued by the AERB are the mandatory basis for the NPCIL's operation of NPPs. Firstly, systematic approaches using well-defined principles are practised in the design of the NPPs. Secondly, during normal plant operation, the ALARA (As Low As Reasonably Achievable) principle is followed to limit the radiation exposure. The operational and maintenance strategies of Indian NPPs are based broadly on two aspects: design basis safety and operational nuclear safety.

To ensure **design basis safety** of the NPPs, the following *design safety principles and procedures* are practised during the process of design,

47. *Annual Report 2009-2010*, AERB, Government of India, p. 25.
48. Sundararajan, n. 26, pp. 10-11.

manufacturing, construction and commissioning of different components.

Defence-in-Depth: The defence-in-depth principle consists of several successive levels like surveillance, protection and safeguards regarding three fundamental safety functions of safe shut-down, heat removal from core and confinement of radioactivity.[49] This is ensured through high-quality design and construction of equipment, comprehensive monitoring and regular testing to detect equipment or operator failures, redundant and diverse systems to control damage to the fuel and prevent significant radioactive releases, and provisions to confine the effects of severe fuel damage to the plant itself. These can be summed up as: prevention, monitoring, and action to mitigate the consequences of failures.[50]

In pursuit of this, both national and international codes and guides are referred to during the design of the plants, with emphasis throughout to produce robust safety designs with sufficient safety margins to ensure safety under all normal operating conditions. To ensure this, strict control on manufacturing and commissioning procedures is maintained to ensure the intended design. To detect abnormal conditions and to control them, the system of 'control-set back-step back' is in place.[51] To mitigate the consequences of accidents, many design basis safety systems and engineered safety features like self-shutdown systems, emergency core cooling systems, and containments are provided. Also, to mitigate probable off-site release of radioactivity, radiation safety measures are in place.

Redundancy and Diversity

All safety systems installed are ensured with adequate redundancy and diversity to achieve specified reliability. Redundant provisions allow a safety function to be satisfied when one or more items (but not all) are unavailable, due to a variety of unspecified potential failure mechanisms. On the other hand, diversity requires having more than one way of doing the same thing so that if there is a generic failure that applies to all of the same type of equipment, then

49. n. 3, p. 159.
50. "Safety of Nuclear Power Reactors", http://www.world-nuclear.org/info/inf06.html
51. n. 3, p. 159.

there is also back-up for it.[52] Diversity particularly provides protection against inherent dependencies and human error related dependencies.[53]

Passive Safety

Traditional reactor safety systems are 'active' in the sense that they involve electrical or mechanical operation on command. Some engineered systems operate passively, e.g. pressure relief valves. "Passive" safety design depends only on physical phenomena such as convection, gravity or resistance to high temperatures, not on functioning of engineered components. In the new designs of Pressurised Water Reactors (PWRs) there is a series of valves and pipes designed to supply an "emergency core cooling system". They rely upon natural means, including gravity fed water from tanks, to transfer heat from the fuel. Passive systems avoid reliance on nuclear operators to deal with emergency situations, and, thereby, try to remove human and emergency power supply errors.[54]

System of Segregation

Despite redundant systems and diverse provisions, the threat of 'common cause failures' particularly from hazards like fire may take place because of complex interaction among varied components and system. This is reduced by system segregation and isolation – physical separation of components by distance or barriers. This principle includes: separation by geometry (distance, orientation, etc.); separation by barriers; or separation by a combination thereof. Also, the functional isolation principle is used to reduce the likelihood of adverse interaction among equipment, components and systems of redundant or connected trains to achieve system independence, particularly in relation to certain common origin events which are not immediately apparent.

Fail-to-Safe Design: In the event of a plant failure, the principle

52. "Nuclear Reactor Safety", *Briefing*, January 2007, http://www.no2nuclearpower.org.uk/reports/Nuclear_Safety.pdf
53. "Diversity, Redundancy, Segregation and Layout of Mechanical Plant", T/AST/036 - Issue 02, http://www.hse.gov.uk/foi/internalops/nsd/tech_asst_guides/tast036.htm
54. "Safety of Nuclear Power Reactors", http://www.world-nuclear.org/info/inf06.html

The degree of safety depends on the quality of design, procurement, manufacture, construction, commissioning and operation of the NPPs.

incorporated into the design of Systems, Structures and Components (SSCs) of the plant is the *fail-to-safe*. This ensures that the plant which fails to operate goes into the safe mode, thus, not hindering the performance of a safety function. In the case of failure of the system or the component, the plant would pass into a safe state without a requirement to initiate any action.

Probabilistic Safety Assessment (PSA): Comprehensive safety analysis by a rigorous deterministic and complementary probabilistic method is followed for building scenarios for hypothetical accidents that might result in severe core damage, and to estimate the frequency of such accidents. This method assesses potential hazards that might be encountered in the absence of any protective measures, and the residual risks that will remain despite the measures taken.[55] India has learnt lessons by analysing incidents like the Three Mile Island and Chernobyl and closely monitoring the Fukushima event.

Quality Assurance: The degree of safety depends on the quality of design, procurement, manufacture, construction, commissioning and operation of the NPPs. The AERB Code of Practice on "Quality Assurance for Safety in Nuclear Power Plants" establishes the requirements for the management principles and objectives to be met in all activities in NPPs. In 2006, the NPCIL, in consultation with the AERB, revised the Topical Quality Assurance document in line with the IAEA Safety Standard GS-G-3.1 on "Application of Management System for Facilities and Activities". The revised document on "Corporate Management System – Quality Management System Requirements" lays emphasis on an integrated approach for the management system for safety, health, environment, security, quality and economic requirements.[56]

Comprehensive Review and Assessment: This principle rests on the objective of emphasis on *prevention of an accident rather than its mitigation*. Prior to the issuance of authorisation for construction, the AERB completes

55. "Probabilistic Safety Assessment", http://nuce.boun.edu.tr/psaover.html. p.3.
56. *National Report*, n. 3, p. 104.

the review of the Preliminary Safety Analysis Report (PSAR). At this stage, the effort is directed at the safety analysis of Design Basis Events (DBEs). The regulatory authority then considers the acceptability of the Postulated Initiating Events (PIEs).

The **operational nuclear safety** practice of Indian NPPs rests on internationally recognised principles and practices. First, the dose limits on radiation exposure for normal plant operation are specified and observed in line with the International Commission on Radiological Protection (ICRP) recommendations. For occupational workers, the AERB has prescribed 20 mSv averaged over five consecutive years and a maximum of 30 mSv in any year. For the public at the exclusion zone distance, the AERB has prescribed an effective dose of 1 mSv per year.[57] The AERB approves the annual collective dose budget for each NNP. Normal natural background radiation in different parts of the country varies from 2.7 mSv/year at Tarapur (Maharastra) to 3.1 mSv/yr at Narora (Uttar Pradesh). But according to the detailed survey, the annual average maximum individual exposure at a plant boundary is less than 0.1 mSv/yr.[58]

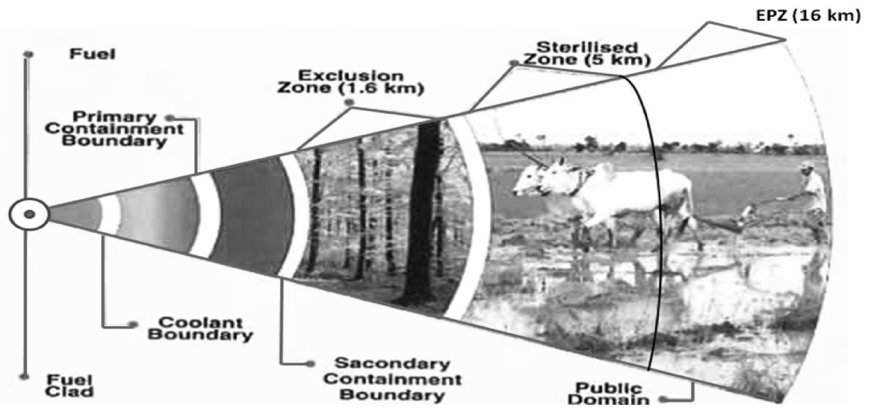
Second, only qualified and licensed staff operate the plants and all activities in the NPPs are carried out as per the operating procedures (AERB/SC/O) laid down by the AERB. Workers are allowed to function with the use of proper protective equipment and radiation work permits.

Third, all equipment and instruments are subject to periodic surveillance and in-service inspections. NPPs are also subject to corporate safety audit, regulatory inspections and peer reviews. Each station is subject to a peer review conducted by a group drawn from other stations owned by NPCIL. In the years 2007, 2008 and 2009, the World Association of Nuclear Operators (WANO) conducted 1 (Rajasthan 5), 2 (Kaiga 4 and Kakrapar) and 3 (Narora, Rajasthan 2, 3 &4, Tarapur 3&4) peer reviews of the Indian nuclear facilities respectively.[59]

57. Ibid., pp. 130, 133.
58. "Profile", Nuclear Power Corporation of India Limited, http://www.npcil.nic.in/pdf/NPCIL%20Profile%20English.pdf, p. 1.
59. "WANTO Review 09", http://www.wano.info/wp-content/uploads/2010/07/Review_2009.pdf, p. 8.

Fourth, all the plants are designed with multiple safety barriers and control zones to manage incidental release of radioactivity. Indian nuclear facilities are designed with a minimum of five successive barriers.

Fig 2: Multiple Safety Barriers



Source: National Report to the Convention on Nuclear Safety, November 2007, Government of India, p. 172.

In case of a radiological emergency, the confinement of radioactivity can be achieved by these independent barriers. They include the ceramic fuel pellet of UO2, fuel cladding of Zircalloy-2, primary system pressure boundary, primary containment and secondary containment. The Exclusion Zone of 1.5 km range radius is fully acquired and cordoned off from the public. The Sterilised Zone ranges 5 km radius from the plant where no new organised habitation is permitted. Beyond this, the Emergency Planning Zone (EPZ) ranges up to 16 km radius where constant monitoring of habitation and traffic is conducted. This zone is meant for the basic geographic framework for decision-making on implementing measures as part of a graded response in the event of an off-site emergency. It is divided into 16 equal sectors to optimise the emergency response mechanism and relief operations.

Fifth, for all significant events, Root Cause Analysis is carried out. The Station Operation Safety Committees (SORC) at each of the NPP review the safety issues. The Quality Assurance group stationed at the facility and the Audit Engineer are the channels of feedback on maintenance and operation of the plants.

Sixth, emergency preparedness plans for both on-site and off-site emergencies have been drawn up at all NPPs and are subject to periodic drills.

Seventh, to enhance the safety tradition, the Assessment of Safety Culture Organisation Team (ASCOT) conducts seminars, team building workshops, leadership development and sessions to improve inter-personnel relationships.

Lastly, as an attribute of robust nuclear safety culture, a Safety Conscious Work Environment (SCWE) is developed where every employee has the freedom to raise safety concerns without fear of retaliation.

India has "not lost even one life that is unambiguously attributable to an accidental *nuclear-emission* from a power plant. In India, more radiation-induced injury/deaths, and even a few genetic mutations, have been caused by malfunctioning/ poorly-handled medical imaging equipment.

"ANOMALIES" AND "INCIDENTS": LESSONS LEARNT

Though India's nuclear safety framework is sound and robust, instances of "anomalies" and "incidents" related to nuclear activities in the country have occurred, resulting in public scepticism about the technical and regulatory systems in place. However, no horrendous radiation hazard has taken place yet, nor is anyone known to have been affected by accidental radiation exposure in the Indian nuclear facilities. According to Dr. V. Siddhartha, the UNSC 1540 Committee Expert, and currently a Distinguished Fellow at the Centre for Air Power Studies (New Delhi), India has "not lost even one life that is unambiguously attributable to an accidental *nuclear-emission* from a power plant. In India, more radiation-induced injury/deaths, and even a few genetic mutations, have been caused by malfunctioning/poorly-handled medical imaging equipment and even perhaps from the low-level natural radiation from the sands of Kerala."[60]

60. E-mail interaction with Dr V. Siddhartha on March 25, 2011. Dr Siddhartha was the Scientific Adviser to the Defence Minister, Government of India.

The AERB maintains a yearly record of events on the basis of the Significant Event Reports (SER) from the operating NPPs. The events are divided into two categories: (1) Events; and (2) Significant Events, considering the gravity of the situation. They are also rated on the INES.[61] So far, the Indian nuclear facilities have faced one 'Level-3' event in 1993 (Narora fire incident) and three 'Level-2' events during 1998-2004. Out of the total reported events, a majority is in the 'Level-0' event category. On average, around 25-45 percent of the total events take place in the 'reactor primary', around 20-35 percent of the total events relate to 'electrical' problems and around 15-30 percent events take place in the 'instrumentation control'.[62] A majority of these are Level-0 events with "no safety significance." And, as Table 1 below shows, these events show a declining trend during the last one decade. This could be owing to the nuclear safety culture that India's nuclear establishment is evolving on the basis of the lessons learnt from past events and consequent corrective measures undertaken.

Table 1: "Events" Recorded by the AERB During 1998-2009

INES level	1993	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
0	--	22	16	42	43	26	21	39	26	34	38	28	23
1	--	5	2	10	2	5	10	4	2	5	8	4	0
2	--	**1**	0	0	0	**1**	0	**1**	0	0	0	0	0
3	**1**	0	0	0	0	0	0	0	0	0	0	0	0
>3	--	0	0	0	0	0	0	0	0	0	0	0	0
Total	--	**31**	21	54	45	32	31	44	28	39	36	24	23

Source: Compiled from AERB Annual Reports.

61. The INES system of the IAEA rates events at seven levels (1-7) depending on their safety significance. Events rated at Level-1 (anomaly), -2 (incident) and -3 (serious incident) are called 'Incidents'. Events rated at Level-4 (accident with local consequence), Level-5 (accident with wider consequence), Level-6 (serious accident) and Level-7 (major accident) are termed as 'accidents'. Events with no significance are rated at Level-0 or below scale. Security related events or malicious acts are not in the scope of the scale. http://www-ns.iaea.org/tech-areas/emergency/ines.asp
62. Compiled from *Annual Reports* during 20012002 to 2009-2010 of AERB.

While judging the frequency of incidents in the nuclear power plants, one needs to keep in mind their average occurrences per megawatt nuclear energy produced. Over the years India's nuclear energy production has increased, though slowly, while occurrences of anomalies in the plants have declined. Nuclear power supplied 15.8 billion kWh (2.5 percent) of India's electricity in 2007. After a dip in 2008-09, production is increasing as imported uranium becomes available and new plants come on line. For the year 2010-11, around 24 billion kWh is expected. For 2011-12, 32 billion kWh is now forecast.[63] However, no complacency is warranted even on a minor irregularity and the Indian scientific establishment is fully aware of, and learns from, these anomalies. From all these incidents, the Indian nuclear establishment has learnt lessons and drastic measures have been undertaken in strengthening safety practices.

Narora Fire Incident

Contrary to the critics' assertion, the Narora turbine fire incident in March 1993[64] has neither been "played down as a minor incident" nor "allowed to be forgotten."[65] There was no radiological impact of the incident but it was an eye-opener that brought a paradigm shift in India's nuclear safety considerations and review procedure. Prior to the NAPS-1 fire incident, there was no systematic programme for carrying out regulatory inspection of facilities by the AERB. The Civil Engineering Safety Committee for Operating Plants (CESCOP) was constituted to look after the civil and structural engineering issues of operating plants. The event was rated in the INES scale at Level-3 on account of the degradation of defence-in-depth of engineered safety features.

On the basis of the recommendations of the investigation committee under S.K. Mehta, modification of the LP turbine blade root design and a spate of

63. "Nuclear Power in India", http://www.world-nuclear.org/info/inf53.html
64. The cause of the fire was failure of two turbine blades in the last stage of the low pressure turbine which resulted in severe imbalance in the turbo-generator, leading to rupturing of hydrogen seals and lube oil lines.
65. Buddhi Kota Subbarao, a former Captain of the Indian Navy and a nuclear scientist, viewed that the Narora incident, "as usual, played down as a minor incident and within weeks of its occurrence, it was allowed to be forgotten". *Manushi*, no. 109, p. 24.

follow-up actions across the NPPs were undertaken. For the first time, the Safety Assessment Report for Renewal of Authorisation (SARRA) reviews for operating NPPs was introduced. This heralded the process of the multi-tier review mechanism. Some other innovative safety improvements made were:[66]

- Installation of a wall on the mezzanine floor of the turbine building.
- Incorporation of the Gravity Addition of Boron System (GRAB) for meeting the requirement of sub-criticality margin during station black-out condition.
- Provisions for reactor trip on "low coolant flow in adjuster rods."
- Incorporation of seismic monitors and seismic trip.
- A thermo-siphon test was conducted on the reactor.
- A sequential loading scheme for emergency power supply was evolved.
- Neutron shielding for the fuelling machine maintenance area was augmented.
- Design provision formulated for purification of the moderator under reactor shutdown, using boron saturated ion exchange columns.

Collapse of Containment Dome in Kaiga

In 1994, a large portion of the concrete from the under surface of the inner containment dome in Kaiga Atomic Power Project Unit-1 fell down. Both the AERB and NPCIL investigated the incident and found that nearly 40 percent of the surface area, that amounted to 130 tons, fell down due to excessive loading and tensioning during pre-stressing operations.[67] A number of tests were carried out on samples collected. The test results indicated that the materials were of acceptable quality and the indentations were not due to the weakness of the concrete in bond strength but due to the effect of split tension.[68] "The induced radial tension, coupled with the effect of membrane compression, was higher than the tensile load carrying

66. Ibid, pp. 36-37.
67. Ibid, pp. 40-41.
68. Prabir C. Basu, Vijay N. Gupchup, L.R. Bishnoi, "Containment Dome Delamination", http://www.iasmirt.org/SMiRT16/H1557.PDF, p. 4.

capability of the Kaiga-1IC dome in a radial direction".[69] Therefore, the V.N. Gupchup Committee recommended a modified dome with the following design improvements:

- Normal dome thickness to increase gradually to the higher value to minimise the induced radial tension in the transition zones.
- To introduce radial reinforcement.
- To avoid congestion.
- All design work should be carried out by independent peer consultants or by in-house experts and implementation of quality assurance programmes.

Flooding of Kakrapar Site

In June 1994, owing to heavy rain for 15 hours, flooding occurred in the Kakrapar site.[70] Water entered the turbine building basement, pump house and cable tunnels from the turbine building and the switchyard which jeopardised several safety systems. After investigation by NPCIL under the review of the AERB, the cause of the flooding was found to be clogging of the discharge sluice gates of the nearby Moticher lake into the Tapi river. Procedures were drawn up for adequate drainage and in RAPP-1&2 a 'flood' DG was installed at a higher elevation. Administrative measures were evolved for adequate draining of Moticher lake by the local authorities. A standard procedure has been evolved since then to assess the flooding potential at all operating plants, and embankments were mandated around all structures. Also, the system of continuous recirculation flow was specified instead of periodic purge flow of the Annulus Gas Monitoring System.[71]

Radiation Exposure Issue

Outcries over radiation leaks in Indian power plants are often reported in the media and seem to be without any basis of reasoning. In 1977-79, TAPS was in the news for exceeding the annual collective radiation dose. At RAPS, a large number of persons received exposure in excess of the prescribed

69. Ibid., p. 6.
70. "Country Report: INDIA", http://members.tripod.com/~no_nukes_sa/overview.html
71. Sundararajan, n. 26, p. 38.

level, which was investigated and it was found that it was due to non-use of protective equipment. A committee chaired by T. Subbaratnam prescribed the limit of collective dose in the new 220 MWe stations to be below 600 man-rem.[72] By implementation of the ALARA programmes, drastic reduction of internal exposure and implementation of chemical decontamination of systems to bring down radiation fields is going on. Due to automation and remotisation of maintenance activities, the current collective dose in TAPS and NAPS is below 500 man-rem, and for all other twin unit stations, it is below 300 man-rem a year.[73] The incident of overexposure of a person at the RAPP Cobalt Facility (RAPPCOF) on October 15, 1999, led to intense scrutiny and safety upgrades of the facility.

Lessons from Other Events

The failure of the zircaloy-2 pressure tube in Canada's reactor cautioned India to phase out all the zircaloy-2 pressure tubes, particularly from the PWHRs for Zirc-Niobium (Zr-Nb) pressure tubes. Seismic reevaluation of existing power plants was carried out in 2003 alongwith extensive modification in the emergency power supply system for the station, including three new diesel generators of higher capacity and unit-wise segregation of power supplies to obviate common cause failures. The tsunami in December 2004 that affected MAPS units located at Kalpakkam caused the water level in the seawater pump house of the plant to rise, and tripping of the condenser cooling water pumps.[74] In the light of this experience, NPCIL augmented the communication facilities of the sites and tsunami warning systems were installed. Relocation of equipment above the maximum flood levels was carried out.

Issue of Ageing NPPs

It is often said that many Indian NPPs are now aged and are still continuing operation, ignoring the safety issues involved. The Tarapur plant has been operating since 1969 whereas its contemporary plants like Dresden-1 in the USA

72. Ibid.
73. Ibid, p. 88.
74. "Nuclear Reactor Hazards", April 2005, http://www.greenpeace.org/seasia/th/PageFiles/106897/nuclearreactorhazards.pdf, p. 119.

have been phased out. It is also alleged that TAPS has now been downgraded to 320 MW due to ageing and excessive radiation level. Downgrading may be true but the real problem is public misperception and opposition for siting new plants that compels continued use of the old facilities. However, the PSR has identified various systems, structure and components requiring ageing management. Detailed review of the ageing management programme is in progress at the AERB. For some non-replaceable components such as Calandra and End Shields, adequate safety margins and operational parameters have been designed.[75] It is also ensured that the number of operational cycles do not exceed the number of permitted stress cycles. The AERB review process confirms that there is no concern in the short-term with respect to ageing.[76]

540 MWe PHWR Reactors

The safe operation and maintenance of large size reactors are extremely important. According to the National Report to the Convention on Nuclear Safety (2007), India has incorporated many advanced design provisions for 540 MWe PHWRs. Firstly, to enable the engineers safety and efficiency, operation of the plant is controlled from a centralised control room and a supplementary control room located away from the main control room to ensure safe shutdown in case of inaccessibility. Secondly, capability for zone control has been provided to take care of xenon-induced flux tilts. Thirdly, a new liquid zone control system has been designed and engineered for this function. Fourthly, a double containment structure is built with pre-stressed concrete designed to withstand internal pressure of 1.44 kg/cm2g.

Safety Features in Fast Breeder Reactors

With the successful operation of the Fast Breeder Test Reactor (FBTR) for 25 years, a 500 MWe Prototype Fast Breeder Reactor (PFBR) was designed and developed with the objective of techno-economic demonstration. This will follow a series of commercial reactors. The DAE is also planning to construct six more FBRs of 500 MWe. However, many scholars and the

75. Ibid.
76. Ibid., p. 47.

media have expressed concerns over the safety of Indian FBRs. According to M.V. Ramanna, Indian FBRs are dangerous for many reasons. First, the containment dome is not as strong as in other reactors. Second, they have a positive 'coolant void coefficient'. And if the coolant heats up and becomes less dense, forms bubbles, or is expelled from the core, reactivity increases.[77] In the same vein of argument, Swaminathan S. Anklesaria Aiyar refuses to "trust safety assurances from the nuclear establishment because it cannot be expected to reveal the skeletons in its cupboard."[78]

In response to these allegations, Baldev Raj, Director, Indira Gandhi Centre for Atomic Research (IGCAR), and Prabhat Kumar, Project Director, Bharatiya Nabhikiya Vidyut Nigam Limited (BNVNL), came out with an explanation on the safety adequacy of Indian FBRs, saying that "safety has been given highest attention in the design of the Prototype Fast Breeder Reactor (PFBR)" and the first reactors have rather "demonstrated robust safety characteristics, inherent safety features and possibility of introduction of passive safety function with less uncertainty and with high confidence."[79] Regarding containment of the PFBR, Raj and Kumar explain that it is designed to withstand "pressure generated due to sodium fire as a consequence of sodium expulsion under a postulated core disruptive accident." The containment function for the PFBR is needed only in the case of a beyond design basis core disruptive accident, and the containment pressure of PFBRs is not similar to that of the PHWRs. Rather, they have been designed with enhanced safety features compared to the early versions. Independent fast acting shut down systems, dedicated decay heat removal systems, and provision of in-service inspection of the main vessel have been introduced. In case of extreme condition of off-site power failure, the decay heat generated in the core will be removed comfortably by a set of dedicated 'safety grade decay heat exchangers' immersed in the sodium pool. Once the temperature is raised in the core, the sodium in the

77. M.V. Ramanna, "Indian Nuclear Industry: Status and Prospects", Nuclear Energy Futures Papers, Centre for International Governance Innovation, Waterloo, Canada, December 2009, p. 15.
78. Swaminathan S. Anklesaria Aiyar, "Fast Breeder Reactors are the Least Safe", *The Economic Times*, March 27, 2011.
79. Baldev Raj and Prabhat Kumar, "Safety Adequacy of Indian Fast Breeder Reactor", http://www.npcil.nic.in/pdf/Article_15april2011_01.pdf, p. 2, 6.

hot pool would be heated up, thereby developing adequate natural circulation without external power supply.

The possibility of coolant leak is a challenging issue. However, in Indian reactors, large leaks are prevented by appropriate actions following the sodium leaks, detected promptly by diversifying "leak detection systems".[80] The Indian nuclear scientists advance that "India's experience with sodium both in the Fast Breeder Test Reactor (FBTR) and various sodium loops over 40 years is benign." The incident of primary sodium leak in the FBTR in 2002 from a valve body in the primary purification circuit into the inerted cabin housing the circuit was "due to a generic manufacturing deficiency."[81] The valves of this genre used in the plant were inspected and rectified wherever found necessary. However, the sodium leak in the FBTR did not result in any fire or safety concern and the reactor was brought back to operation within two months.

No complacency is warranted on nuclear safety matters. Many anomalies relating to nuclear safety have occurred owing to organisational and technical deficiencies. These have been effectively addressed.

Many others believe that while the world has abandoned FBR technology, India has based its nuclear energy programme on this technology. However, the truth rather is that the world has not abandoned FBR technology; countries like China, France, Japan, Russia and South Korea are, in fact, expanding their programmes.

SAFETY CULTURE AND THE 'NUCLEAR VICIOUS CIRCLE'

Undoubtedly, no complacency is warranted on nuclear safety matters and the Indian nuclear establishment is not known to have entertained

80. By providing the inert gas environment for primary sodium piping or guards pipes filled with nitrogen in the inter-pipes and incorporating the safety vessel surrounding the main vessel with nitrogen in the inter-vessel space, direct contact of radioactive sodium with air is prevented.

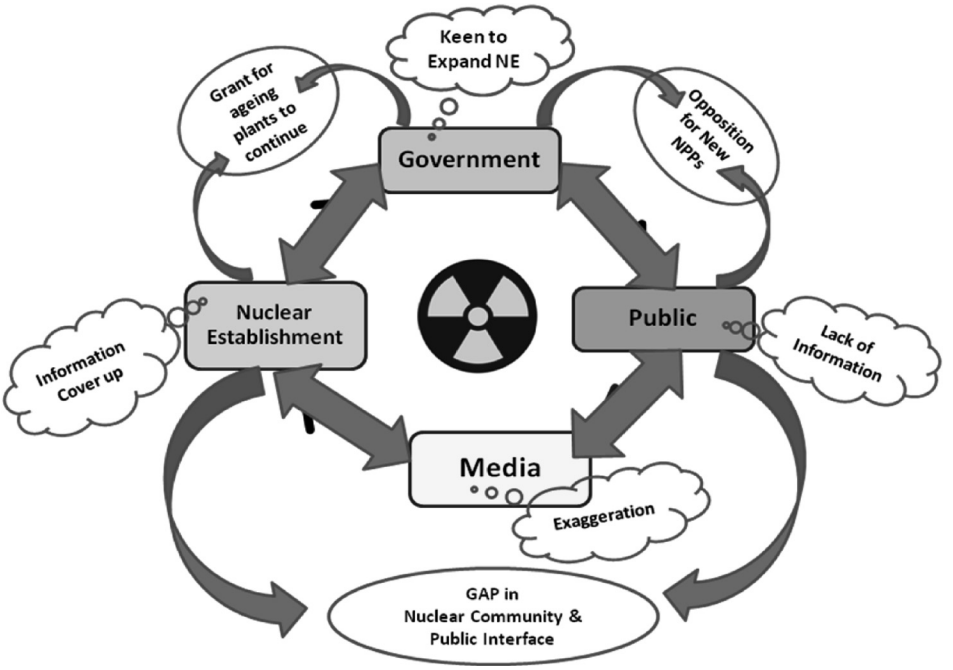
81. "Primary Sodium Leak Event in FBTR", http://www.igcar.ernet.in/lis/nl55/igc55.pdf, p. 5; B. Anandapadmanaba, A. Babu and G. Srinivasan, "Experience in the Maintenance of Sodium Systems of Fast Breeder Test Reactor", http://icapp.ans.org/icapp11/program/abstracts/11069.html.

any such complacency. Many anomalies relating to nuclear safety have occurred owing to organisational and technical deficiencies. These have been effectively addressed and, at the same time, have strengthened India's resolve to ensure judicious utilisation of nuclear resources. However, there may occur many unexpected and unavoidable events, inevitable in any complex industrial undertaking in general and the nuclear industry in particular. In all industries, accidents happen, people die, and pollution spreads but the world has not abandoned all industrial efforts. Rather, everyone studies what went wrong, tries to fix it, and moves on. Of course, a nuclear hazard is unique and its effects far-reaching but the benefits of nuclear energy are equally enormous. The question is how to maximise the benefits while minimising the hazards.

The way out is maintaining a strong *nuclear safety culture* – certain "principles and attributes, when embraced, will influence values, assumptions, experiences, behaviours, beliefs, and norms that describe what it is like to work at a specific facility and how things are done there."[82] It is shared by people and relates primarily not to an individual but to a group, community or organisation.[83] Thus, it denotes three general components: first, the necessary safety framework within an organisation which is the responsibility of the management hierarchy; second, the attitude of staff at all levels in responding to, and benefiting from, the framework; and third, a widely shared awareness of nuclear hazards and consequent patterns of norms and values adhered to. India seems to be evolving the first two components steadily whereas the third component appears blurred as the issue seems to be languishing in a vicious circle characterised by an intricate interplay of complex technology, populism politics and misinformed psychology.

82. "Principles for a Strong Nuclear Safety Culture", http://www.efcog.org/wg/ism_pmi/docs/Safety_Culture/Dec07/INPO%20PrinciplesForStrongNuclearSafetyCulture.pdf, p. i.
83. Giovanni Verlini, "The Mindset of Nuclear Safety", http://www.iaea.org/Publications/Magazines/Bulletin/Bull501/NS_Mindset.html.

Fig 3: Nuclear Power Problematic: A Vicious Circle



While the government and scientific community are keen to expand the nuclear industry, a pocket of the public is sceptical about anything nuclear. While the media exaggerate events and cause panic among the public, the gap between the scientific community and the public is wide. The resulting popular opposition for new nuclear plant sites compels the government to add more plants to existing sites and allow ageing facilities to continue, though with the necessary safety upgradation. This lopsided 'nuclear information management' is the crux of the nuclear vicious circle that India needs to crack while nourishing a holistic nuclear safety culture. A deep-rooted, stable and effective nuclear safety culture involves the entire society where everyone is personally responsible for nuclear safety, not just the placing of the safety apparatus and assigning of responsibilities on a few, and then blaming them for any anomaly.

To conclude, there are three straightforward approaches to a better nuclear future. First, the problem can be managed by adopting policies and by reforming organisations, as suggested by the high reliability theorists;

second, by abandoning nuclear technology altogether; and third, by changing the structure of organisations that control nuclear technology. While the first and third approaches may be explored further, a sensible understanding would discard the second approach as an unrealistic proposition. The bottom line, therefore, is to try eliminate probable risks by implementing the safety — and security — heightened approaches. India, while balancing the domestic public perception by keeping its nuclear safety record high, must avail of the window that the nuclear opportunity has opened.

DOMESTIC POLITICS SURROUNDING THE IRANIAN NUCLEAR PROGRAMME

ASIF SHUJA

The Iranian nuclear programme in itself was not of much significance in the domestic political discourses of Iran until it was caught up in the continuing factional fighting among the clerical elite. The nuclear issue first appeared in the Iranian public domain after the revelations[1] of the National Council of Resistance of Iran (NCRI)[2] on August 14, 2002, and subsequent disclosures[3] to the International Atomic Energy Agency (IAEA) by the Islamic Republic of Iran in October 2003. However, during this time, the intensity of this discourse was not much. It was only after the victory of the current President, Mahmoud Ahmadinejad, in 2005, that the Iranian nuclear programme became central to its domestic political discourses and foreign policy approaches. This was essentially a quest of Ahmadinejad to discredit his domestic political rivals and win the internal political battle. Therefore,

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1. Remarks by Alireza Jafarzadeh, US Representative Office, National Council of Resistance of Iran, "New Information on Top Secret Projects of the Iranian Regime's Nuclear Program," August 14, 2002, *Iran Watch*, Website, URL: http://www.iranwatch.org/privateviews/NCRI/perspex-ncri-topsecretprojects-081402.htm. Accessed on September 4, 2010, 10:04:03 PM.
2. NCRI is the political wing of the People's Mojahedin Organisation of Iran, which was exiled from the country after the Islamic Revolution of 1979.
3. Yonah Alexander and Milton Hoenig, *The New Iranian Leadership: Ahmadinejad, Terrorism, Nuclear Ambition, and the Middle East* (Westport, Connecticut: Praeger Security International, 2008), p. 113.

No matter how important the Iranian nuclear issue may be for the outside world, for the clerical elite, this issue has been reduced to a primary tool to hold onto power – at any cost.

for a proper understanding of Iran's domestic politics surrounding its nuclear programme, we first need to understand this factional fighting, because no matter how important the Iranian nuclear issue may be for the outside world, for the clerical elite, this issue has been reduced to a primary tool to hold onto power – at any cost.

To a naïve observer of Iranian affairs, it may seem surprising that Iran does not bow down to international pressure even after so many sanctions. It may be recalled that until July 2010, the United Nations Security Council had sanctioned Iran four times. These sanctions which were imposed on December 23, 2006[4], March 24, 2007[5], March 3, 2008[6] and June 9, 2010[7] respectively, have further isolated Iran from the international community. Not surprisingly, even those familiar with the art of politics, fail to find a convincing answer to the Iranian conundrum. This is so particularly because their perspectives are largely based on the Western tradition of analysing the West Asian regimes under the scanner of the twin concepts of 'liberalism' and 'authoritarianism.' The Islamic Republic of Iran doesn't properly fit into either category. And those in haste to find a conclusion – branding Iran as an 'irrational actor' or a 'rogue state' – either fall prey to the propaganda machinery of the 'great powers' or the internal contradictions of the Iranian polity itself.

The answer to the Iranian nuclear question lies in the prevalent domestic politics of Iran, especially from the last years of Khatami's Presidency

4. United Nations Security Council Resolution 1737, S/RES/1737 (2006) (*Reissued), Dated: December 27, 2006, URL: http://daccess-ods.un.org/TMP/2448771.74496651.html. Accessed on August 30, 2010, 6:56:43 PM.
5. United Nations Security Council Resolution 1747, S/RES/1747 (2007), Dated: March 24, 2007, URL: http://daccess-ods.un.org/TMP/5809192.06142426.html. Accessed on August 30, 2010, 7:02:08 PM.
6. United Nations Security Council Resolution 1803, S/RES/1803 (2008), Dated: March 3, 2008, URL: http://daccess-ods.un.org/TMP/142237.6.html. Accessed on August 30, 2010, 7:08:09 PM.
7. United Nations Security Council Resolution 1929, S/RES/1929 (2010) (Reissued), Dated: June 9, 2010, URL: http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N10/396/79/PDF/N1039679.pdf?OpenElement. Accessed on September 4, 2010, 9:39:53 PM.

and running through the years of the current President up to the present time. This paper intends to chronicle the domestic political developments surrounding the Iranian nuclear programme during this era, analyse them and find out the linkages among Iran's domestic politics, its nuclear programme, the international posture and the related controversies.

While the Iranian nuclear issue has become a problem of dangerous proportions on the international platform, its cause lies in the domestic political strife. An understanding of the cause of this factional strife, in turn, requires an appreciation of the inherent contradiction of the Iranian political system, which is essentially the reason for such political infighting. Especially important in the political system is the role of the Iranian Supreme Leader and the President. The next important factor for the comprehension of Iranian nuclear politics is the identification of the nuclear decision-makers – institutions as well as individuals.

As we shall see, the main contradiction of the Islamic Republic of Iran lies in the name itself. While the post-revolutionary Iran was sought to be made a republic – where legitimacy lies with the people – it was also left to the guardianship of the Islamic clerics. This predicates an assessment of the role of the Supreme Leader (*Velayet-e Faqih*), who is the centre of all authority, at one end, and the masses (or public opinion) from which the clerical authority derives legitimacy, at the other. Finally, we shall see how President Mahmoud Ahmadinejad – a hardliner – has capitalised on the nuclear issue to wrest power from his reformist rivals, and shall assess the role of the Supreme Leader Ali Khamenei in maintaining the clerical regime despite recurring popular protests from the masses.

THE ROOT CAUSE: LEGITIMACY PROBLEM

Much of what is happening today on the Iranian soil is related to the nervousness of the clerical regime regarding the slipping of power from their hands. How is the regime facing this threat, and why doesn't the opposition prove so substantial as to ultimately uproot the stronghold of clerical control over power? The answer to this question lies in the

"contradiction"[8] inherent in the Islamic Republic's political system, which has been simultaneously made "both an *Islamic* state run by clerics and a republic ruled by popular consent."[9]

The Iranian political system is largely based[10] on the thoughts and beliefs of Ayatollah Khomeini, the grandfather of the Islamic Revolution of 1979. It is noteworthy that the combined forces that brought out the revolution had never imagined[11] the resultant state to be an Islamic one. However, Khomeini went ahead in implementing his grand scheme and systematically consolidated his power[12] over all branches of the government, silencing all opposition. Nevertheless, disagreements did exist, only they could not surface during the time of Khomeini who commanded a charismatic character and acted as the "final arbiter"[13] to the dissenting voices. The political system thus devised[14] was an Islamic theocracy with some traces of republicanism, which proved to be the main cause of political infighting in the later stages.

At the top of the Iranian power structure[15] is the Supreme Leader[16] (*Velayat-e Faqih*) who is vested with wide powers, including the appointment

8. Ray Takeyh, "Iran at a Crossroads," *Middle East Journal*, vol. 57, no. 1, Winter 2003, pp. 42-56, p. 43.
9. Geneive Abdo, "Re-Thinking the Islamic Republic: A 'Conversation' with Ayatollah Hossein Ali Montazeri", *Middle East Journal*, vol. 55, no. 1, Winter 2001, pp. 9-24, p. 9.
10. For an understanding of how the Constitution of the Islamic Republic of Iran (and the resultant political system) is based on the "ideological vision" of Ayatollah Khomeini, see Vanessa Martin, *Creating an Islamic State: Khomeini and the Making of a New Iran* (London: I.B. Tauris, 2003), p. 159.
11. For further insight into this argument, see Homa Omid, *Islam and the Post-Revolutionary State in Iran* (New York: St. Martin's Press, 1994), p. 89.
12. For an insight into Khomeini's approach to power consolidation through the institutionalisation of a "ministate," see Mohsen M. Milani, "Political Participation in Revolutionary Iran," in John L. Esposito, ed., *Political Islam: Revolution, Radicalism, or Reform?* (Boulder: Lynne Rienner Publishers, 1997), pp. 77-93; p. 84. For an appreciation of the progress of this "consolidation of regime power," see Shahrough Akhavi, "Elite Factionalism in the Islamic Republic," *Middle East Journal*, vol. 41, no. 2, Spring 1987, pp. 181-201, p. 182.
13. See Milani, Ibid., p. 87.
14. For more on, this "peculiar political formula", see Baqer Moin,*Khomeini: Life of the Ayatollah* (London: I.B. Tauris, 1999), p. 225.
15. For an insight into the formal and informal power structures in Iran, see Wilfried Buchta, *Who Rules Iran? The Structure of Power in the Islamic Republic* (Washington DC: The Washington Institute for Near East Policy and the Konrad Adenauer Stiftung, 2000), pp. 6-10.
16. The duties and powers of the Supreme Leader are enshrined in Article 110 of the Constitution of the Islamic Republic of Iran.

and dismissal of heads of the armed forces and the Iranian Revolutionary Guards Corps. He can also dismiss the President on the basis of the Supreme Court's ruling or the request of the Iranian Parliament (*Majlis*). Although the democratically elected President formally "represents the second strongest power center"[17] in Iran, in reality, his power is eclipsed by other overlapping power centres, most notably of the Guardian Council. This was clearly evidenced by Khatami's failed efforts to introduce political reforms through his "twin Bills"[18] when the Guardian Council proved to be his primary hurdle.

Although the democratically elected President formally "represents the second strongest power center" in Iran, in reality, his power is eclipsed by other overlapping power centres, most notably of the Guardian Council.

The Guardian Council, a 12-member body of extremely conservative clerics, is entrusted with the responsibility of interpreting[19] the Constitution and supervising[20] the elections. However, the term "supervision," from which the Guardian Council derives its power of vetting the candidates in elections, is highly debatable[21]. It is this power of vetting elections which makes the Guardian Council the most resisting force towards any attempt at development of democracy in Iran[22].

In the present context, two more constitutional bodies are of great prominence – the Assembly of Experts and the Expediency Council. The Assembly of Experts is a body of 86 clerics, entrusted with the responsibility of appointing[23] the Supreme Leader. The Expediency Council was founded[24] by Ayatollah Khomeini in February 1988 for the purpose of breaking the

17. Buchta, n. 15, p. 2.
18. For a detailed analysis of how Khatami failed in his attempts at introducing his 'twin bills,' see A. William Samii, "Dissent in Iranian Elections: Reasons and Implications", *Middle East Journal*, vol. 58, no. 3, Summer 2004, pp. 403-423, pp. 415-418.
19. Article 98 of the Constitution of the Islamic Republic of Iran.
20. Article 99 of the Constitution of the Islamic Republic of Iran.
21. A. William Samii, "Iran's Guardians Council as an Obstacle to Democracy," *Middle East Journal*, vol. 55, no. 4, Autumn 2001, pp. 643-662, p. 645.
22. For more on this argument, see Ibid.
23. Article 107 of the Constitution of the Islamic Republic of Iran.
24. Buchta, n. 15, p. 61.

The extent of real power of the President is directly proportional to the extent of goodwill he enjoys with the Supreme Leader.

deadlock between the Guardian Council and Iranian Parliament. It is ironic that in the Iranian political system, the directly elected President does not enjoy as much power as his unelected counterparts. A study of the history of successive Presidents shows that the extent of real power of the President is directly proportional to the extent of goodwill he enjoys with the Supreme Leader.

Nevertheless, the election of the President becomes important in as much as its result gives the much-needed political input to the clerical regime. The election of the President and its outcome works as the barometer for the clerical regime and they adjust their stance accordingly to strengthen their hold over power. "Since August 1989 and the constitutional reforms of that year, a 'presidential center' has been created at the heart of the executive power structure of the republic."[25] Started by President Hashemi Rafsanjani, this legacy was carried forward by his successors Mohammad Khatami and Mahmoud Ahmadinejad.

Thus, when Khatami won his second term, riding on the wave of his political reforms, this alarmed the clerical regime and they clubbed all their resources together to defeat this force. The result was the election of Mahmoud Ahmadinejad and it is mainly because of this reason that Ahmadinejad has to satisfy his hardline supporters by continuing his radical stance and discrediting his main political opponents – the reformists. Since the government lacks political legitimacy[26], it becomes essential for Ahmadinejad to create an artificial wave of popular support by portraying the nuclear issue as a nationalist one and playing with the sentiments of the people.

25. Anoushiravan Ehteshami, *Competing Powerbrokers of the Middle East: Iran and Saudi Arabia*, The Emirates Occasional Papers – 67 (Abu Dhabi, United Arab Emirates: The Emirates Center for Strategic Studies and Research, 2008), p. 20.
26. For more on the legitimacy crisis, see Olivier Roy, "The Crisis of Religious Legitimacy in Iran," *Middle East Journal*, vol. 53, no. 2, Spring 1999, pp. 201-216.

KEY NUCLEAR DECISION-MAKERS

In terms of all internal and foreign policy matters, the Supreme Leader has the final say. Nevertheless, the Supreme Leader doesn't always act to assert his power and places his hat in the ring only when it is absolutely necessary. This was the strategy of Ayatollah Khomeini and the same has been emulated by his successor Ali Khamenei. In the realm of Iran's nuclear decision-making process too this stance of Khamenei is reflected.

Apart from the Supreme Leader Ali Khamenei and President Mahmoud Ahmadinejad, the "principal players" include chief nuclear negotiator Ali Larijani and former President Hashemi Rafsanjani.

The information on Iran's key nuclear players and nuclear decision-making process was revealed by Dr. Hassan Rowhani, the former chief nuclear negotiator, in an interview with a leading conservative newspaper, *Kayhan*[27]. This revelation[28] was ostensibly made by Rowhani – a reformist – in reaction to the rise of hardliners and militant nationalists associated with the Revolutionary Guards. According to this information[29], Iran's nuclear policy is made by a 'Council of Heads', which includes the Supreme Leader, Expediency Council President, the Defence Minister, the President and the National Security Council Secretary. All major decisions related to the nuclear issue, including the suspension of enrichment activities, are made by this body. At a time of growing criticism by the hardliners, this revelation was made by Rowhani to make his stand clear on the issue and warn the firebrand hardliners that they "should not discard the negotiating strategy lightly."[30]

Effectively, the decisions on the nuclear issue are made in consonance with various constitutional functionaries, including the President. However, the President is not the only actor or the final decision-maker in this regard. By

27. Published in its July 23, 2005 issue, p. 12; Cited in George Perkovich, "Iran's Nuclear Program after the 2005 Elections," in Emirates Centre for Strategic Studies and Research,ed., *Iran's Nuclear Program: Realities and Repercussions* (Abu Dhabi: The Emirates Center for Strategic Studies and Research, 2006), pp. 37-61, p. 43.
28. Ibid., p. 43.
29. Ibid., p. 44.
30. Ibid.

manipulating the nuclear issue and clubbing it with the national sentiment, Ahmadinejad has positioned himself in such a way that it is difficult to bypass him in the nuclear decisions.[31] He has "inserted himself into the debate far more than Iran's previous President, Mohammed Khatami."[32] Apart from the Supreme Leader Ali Khamenei and President Mahmoud Ahmadinejad, the "principal players"[33] include chief nuclear negotiator Ali Larijani and former President Hashemi Rafsanjani. Former President Khatami and former chief nuclear negotiator Hasan Rowhani, who were among the key nuclear players before the election of Ahmadinejad in 2005, are now reduced to a defensive position due to the apportioning of blame on them by their hardline rivals for 'failing' in their national duty.

FACTIONAL FIGHTING AND THE NUCLEAR ISSUE

Due to the contradiction of the Iranian political system, a scope has been created for factional fighting[34], which although intense, never goes out of the overall clerical spectrum. The factionalism and division of opinion that was witnessed in the elite circles during the course of the revolution has continued since then. During the time of Ayatollah Khomeini, the primary conflict was between the hardliners and conservatives. Similarly, during the two tenures of the Presidencies of Rafsanjani, the conflict was mainly between the conservatives and pragmatists. During the Khatami era, this conflict was between the reformists and conservatives and during the Ahmadinejad era, this intra-elite conflict is between the reformists and the hardliners.

Such conflicts are witnessed in the social and political life of Iran. Consequently, the "factionalism and institutional competition"[35] – a hallmark of the post-revolution Iranian political system – is witnessed in all its grandeur in the nuclear decision-making process of Iran. Since the factional fighting over the nuclear issue is largely based on the respective faction's claims over the programme, it is important to first look into the

31. Karim Sadjadpour, "The Nuclear Players," *Journal of International Affairs*, vol. 60, no. 2, Spring/ Summer 2007, pp. 125-134, p. 126.
32. Ibid.
33. Ibid.
34. For an insight into the genesis of such conflicts, see Akhavi, n. 12.
35. Ehteshami, n. 25, p. 20.

genesis of the Iranian nuclear programme to assess the substance of such claims.

Iran's nuclear ambition dates back to the era of Mohammad Reza Shah when he signed the "Atoms for Peace Agreement" with the United States in 1957.

GENESIS OF THE IRANIAN NUCLEAR PROGRAMME

Iran's nuclear ambition dates back to the era of Mohammad Reza Shah when he signed the "Atoms for Peace Agreement"[36] with the United States in 1957 during the Eisenhower Administration. His successive efforts in this regard in the 1960s and 1970s, including nuclear deals[37] with the US and Europe, "laid the foundation"[38] of Iran's nuclear programme. This was made possible because during that time, Iran under the Shah was considered an "island of stability"[39] in the Persian Gulf and a dependable ally of the US.

In this context, it is imperative to note that much of the current debate about Iran's real need of nuclear energy, despite its huge oil and gas reserves, becomes redundant. It is so because in terms of its oil and gas riches, Iran of that time was largely the same when these deals were being worked out. Nevertheless, a look at the Iranian officials' rationale for the need of a nuclear programme is essential in order to understand how such claims are sold by the regime and how well they are bought by the Iranian people; since it is from them that the clerical regime seeks legitimacy.

THE RATIONALE BEHIND THE NUCLEAR PROGRAMME

Effectively, contrary to the claims of the current Administration, the real credit of the Iranian nuclear programme goes to the Shah. In fact, the

36. US Department of State, "Atoms for Peace Agreement with Iran," *Department of State Bulletin 36*, (Washington DC: April 15, 1957), p. 629; Cited in Mohammad Javad Zarif, "Tackling the Iran-US Crisis: The Need for a Paradigm Shift," *Journal of International Affairs*, vol. 60, no. 2, Spring/Summer 2007, pp. 73-94; See pp. 80 and 91 (n. 42). Also see Alidab Mafinezam and Aria Mehrabi, *Iran and its Place among Nations* (Westport, Connecticut, USA: Praeger, 2008), p. 45.
37. For the details of these deals see Zarif, Ibid., p. 80.
38. Mafinezam, Ibid., p. 45.
39. Famous saying by the US President Jimmy Carter, quoted in James A. Bill, *The Eagle and the Lion: The Tragedy of US-Iran Relations* (London: Yale, 1989), p. 233.

An assessment of Iran's international behaviour makes it "likely that considerations of 'prestige' play a much more important part in formulating high-level policy decisions" in the country.

Islamic regime did not give much significance to the nuclear programme after the revolution and stopped it. It was much later that the Islamic regime revived the programme, which progressed well during Khatami's Administration. Contrary to the projected image, the Iranian nuclear programme is not the brainchild of Ahmadinejad. In fact, much of the controversies that now surround the domestic elite circle of Iran regarding its nuclear programme are not related to its substance but to the method of such pursuit.

The consistent official argument in support of Iran's right to its nuclear programme includes "both economic and strategic aspects."[40] Iran claims that it needs to diversify its oil-based energy so that with the nuclear energy in progress, it can export the surplus oil and gas in the future. The strategic imperative includes the nature of nuclear technology, which has the potential of providing any country the scientific edge and national prestige. Indeed, an assessment of Iran's international behaviour makes it "likely that considerations of 'prestige' play a much more important part in formulating high-level policy decisions"[41] in the country than is widely realised. When it comes to Iran's commitment to the nuclear Non-Proliferation Treaty (NPT), it contends that it has not flouted any norm and it has all the rights to develop nuclear energy for peaceful purposes as a signatory of the treaty.

However, it would not be far-fetched to say that this talk of diversification of oil-based energy via the development of nuclear technology has "fronted as a code"[42] to cover Iran's aspirations for regional power status which it hopes to achieve through the acquisition of nuclear weapons. It appears that Iran has "decided to develop the infrastructure to build the bomb but

40. Shahram Chubin, *Iran's Nuclear Ambitions* (Washington, D.C.: Carnegie Endowment for International Peace, 2006), p. 24.
41. Roger Howard, *Iran Oil: The New Middle East Challenge to America* (London: I.B. Tauris, 2007), p. 152.
42. Shahram Chubin and Robert S. Litwak, "Debating Iran's Nuclear Aspirations," *The Washington Quarterly*, Autumn 2003, pp. 99-114, p. 105.

not yet the bomb itself."[43] This fact is substantiated by the claim of former President Ali Akbar Hashemi Rafsanjani who said in 2005, "We possess nuclear technology that is not operationalized yet. Any time we decide to weaponize it, we can do so rather quickly."[44] Nevertheless, the Iranian regime has often contradicted the international claim that it is pursuing a nuclear weapons programme.

On the domestic front, the "principal motive"[45] of the regime behind its adherence to the costly nuclear programme is essentially the legitimisation of the regime. It is argued that the resultant confrontation due to Iran's nuclear stand-off with the West helps the failing regime in garnering popular domestic support and, therefore, works as "political salvation."[46]

PUBLIC OPINION ON THE NUCLEAR ISSUE

While at one end, the Iranian nuclear programme finds broad consensus among the ruling elites, among the masses, it was not very prominent before the NCRI revelations. The Iranian nuclear programme "was never the subject of debate outside elite circles, and then only in general terms."[47] After the revelations, the issue found its place in the public domain, though without much intensity. For want of legitimacy and in order to discredit his opponents, immediately after winning the election in 2005, Mahmoud Ahmadinejad politicised the Iranian nuclear issue by "appropriating an inherited program, claiming it as his own."[48]

Ahmadinejad has made intense efforts to prove that there is a consensus among the masses to follow the nuclear programme. However, under the current state of unemployment and inflation "it is questionable whether they would seek the nuclear fuel cycle at the cost of confrontation with

43. Mohsen M. Milani, "Tehran's Take: Understanding Iran's U.S. Policy," *Foreign Affairs*, July/August 2009, pp. 46-62, p. 51.
44. Ibid.
45. Chubin, n. 40, p. 28.
46. Bennett Ramburg, "Dealing with Iran," *International Herald Tribune*, March 24, 2005, p. 11; Quoted in Chubin, n. 40, p. 28.
47. Shahram Chubin, "The Domestic Politics of the Nuclear Question in Iran," *The Strategic Implications of the Iranian Nuclear Program*, URL: http://www.carnegieendowment.org/static/npp/pdf/chubin-aspen.pdf, Accessed on January 2, 2011, 1:39:09 PM, p. 76.
48. Ibid.

the international community, referral to the UN Security Council, and sanctions."[49] This effort of Ahmadinejad is essentially directed towards deriving legitimacy from the public. Ahmadinejad has played around this issue so much that now it appears anti-national for any Iranian to suggest that the country should not have a nuclear programme at such a heavy economic and diplomatic cost.

Indeed, Iran of today witnesses a suffocating environment due to the lack of basic liberties and a pathetic economic condition due to the political mismanagement and flawed foreign policy of the clerical regime. In essence, the real casualty of this political mismanagement and factional infighting around the nuclear programme is neither the US-West alliance nor the clerical regime, but the Iranian people, who find every effort of theirs to come out of the clerical shackles failing.

FIRST PHASE OF POLITICISATION OF THE NUCLEAR ISSUE

Although Iran's nuclear programme was discussed in the West prior to Khatami's revelations of October 2003, the "inter-elite discussions about Iran's nuclear options entered the public arena"[50] only during Iran's negotiations with the IAEA after such revelations. It was due to the difficult choice posed to Khatami and his reformist allies that the conservatives came in with full force to capitalise on the issue. At a time when Khatami was battling with the international embarrassment due to the NCRI disclosures of August 2002 and successive revelations of October 2003, he saw a new front opening up in the already chaotic domestic political environment. Khatami's decision to negotiate positively with the international community due to the imperatives of his foreign policy and the international situation of that time put him in direct confrontation with his conservative rivals on the nuclear issue.

REVELATIONS OF NCRI AND KHATAMI'S DISCLOSURES

Although the Iranian nuclear programme in itself was in the knowledge

49. Chubin, n. 40, p. 27.
50. Anoushiravan Ehteshami and Mahjoob Zweiri, *Iran and the Rise of its Neoconservatives: The Politics of Tehran's Silent Revolution* (London: I.B. Tauris, 2007), p. 125.

of the international community, its clandestine[51] nature was revealed for the first time on August 14, 2002, by the National Council of Resistance of Iran (NCRI) – an Iranian dissident group living in exile. This revelation compounded by the "axis of evil" speech of George W. Bush in 2002, put Khatami and his reform efforts on a difficult test. While Khatami's rapprochement with the West under his policy of "Dialogue among Civilisations" came under the international scanner, he was criticised on his home turf for being refuted by the United States. In addition, "the mounting international crisis in Iraq, and gentle encouragement from the Europeans, convinced the Iranians that it would be better to be as transparent as possible about their nuclear program.[52]"

Khatami decided to agree by fully revealing the Iranian nuclear programme and this way "the developments in Natanz and Arak were publicly affirmed by Khatami."

Therefore, after the IAEA came out with its report demanding clarification from Iran, Khatami decided to agree by fully revealing the Iranian nuclear programme and this way "the developments in Natanz and Arak were publicly affirmed by Khatami."[53] In addition, Khatami bowed down to the IAEA demand of stopping the uranium enrichment. This cooled down the stand-off to some extent. However, the US, Iran's arch-enemy saw in this a political opportunity to fix Iran in the "legal quagmire"[54] of the NPT. Khatami's problem at home and abroad was now compounded further.

EU-3 NEGOTIATION AND SIGNING OF ADDITIONAL PROTOCOL

By now, seeing a "diplomatic opportunity"[55], the European Union had become a peace-maker with the popular EU-3 negotiations and it was at their behest[56] that Khatami had agreed to sign the Additional Protocol, but not without

51. n. 1.
52. Ali M. Ansari, *Confronting Iran: The Failure of American Foreign Policy and the Next Great Conflict in the Middle East* (New York: Basic Books, 2007), p. 202.
53. Ibid.
54. Ibid.
55. Ibid.
56. Ibid.

"Many hardliners in Iran were arguing that Iran should withdraw from the NPT rather than subject itself to humiliating inspections. After all, Iran, unlike Iraq, had not invaded anyone, nor had it been defeated in war."

intense debate on the domestic platform. It was at this point that the Iranian nuclear issue had become a dominant one in the internal political fighting. Although Iran signed the Additional Protocol on December 18, 2003[57], Khatami faced further problems from the IAEA since it had to be ratified and the conservatives now dominated the new Majlis (Iranian Parliament).

The Additional Protocol is an augmenting element in the overall structure of IAEA safeguards to ensure the peaceful use of nuclear technology. Since its introduction in the 1990s, it has been in much debate because, as applied to a non-nuclear weapon state, it "gives the IAEA access to both declared and possible undeclared nuclear activities and to all aspects of the nuclear fuel cycle. It grants expanded rights of access to information and sites, including unannounced inspections,"[58] thus, providing the IAEA such rights which may impinge on the national sovereignty of the subjected state.

The conservatives fully capitalised on the issue of signing the Additional Protocol and blamed Khatami and his reformist allies for turning weak against the international community and falling for bad bargains. The Additional Protocol in essence "sought to add an element of compulsion to what was a voluntary agreement. Many hardliners in Iran were arguing that Iran should withdraw from the NPT rather than subject itself to humiliating inspections. After all, Iran, unlike Iraq, had not invaded anyone, nor had it been defeated in war."[59]

The Majlis during this time was dominated by the conservatives, which happened as a reaction to the reformist wave, "Khamenei and his

57. Alexander, n. 3, p. 174.
58. Ibid.
59. Ansari, n. 52, p. 203.

inner circle"[60] had "initiated their move to consolidate power"[61] by vetting reformist candidates in the Majlis election of 2004. The issue of the Additional Protocol was debated intensely in the new Majlis and the conservative dominated Majlis declined to ratify the treaty. This opened the whole new course of political infighting and locked the reformists and hardliners into an intense political battle against each other.

The hardliners, in association with the conservatives-dominated Majlis, now started discrediting their reformist rivals by propagating the arguments that the reformists had been too meek before the West's demands and had got a bad bargain in nuclear negotiations, and thus, had compromised with Iran's national interest. The hardliners' "primary criticism of the Khatami Administration's nuclear negotiating teams and chief nuclear negotiator Hassan Rowhani was that they had been far too soft on the West, indeed, that they were more than happy, cynically or naively, to sell Iran's interests in return for Western favour."[62]

By now, the refomists under Khatami had lost much of their sheen due to the uncooperative international stance and stiff opposition of the Guardian Council and other clerical establishments. Further, Khatami's second term was about to end in 2005 and he could not contest the third time due to the restriction of the Iranian Constitution, which allows only two successive tenures in the President's post. In the new Presidential election, there was a lack of credible reformist candidates and the conservative establishment was hell-bent on uprooting the dangerous wave of reforms.

At such a time, Ahmadinejad won the election, backed by the hardliners, especially the Iranian Revolutionary Guards. Falling short of political legitimacy, the new hardline victors needed to shore up domestic support and like always, the anti-West campaign appealed most and the nuclear issue came in handy. This heralded a new era in which the nuclear issue

60. Alireza Jafarzadeh, *The Iran Threat: President Ahmadinejad and the Coming Nuclear Crisis* (New York: Palgrave Macmillan, 2007), p. 189.
61. Ibid.
62. Ali M. Ansari, *Iran Under Ahmadinejad: The Politics of Confrontation*, Adelphi Paper 393 (London: The International Institute for Strategic Studies, 2007), p. 47.

"The most obvious potential agent of change within Iran emanates from its own population and the post-revolutionary demographics that make this a disproportionately young society."

was portrayed as a national issue where anyone expressing opposition would not be tolerated and anyone appearing weak in a bargain with the West – in this case clearly the reformists – would be considered as anti-national.

SECOND PHASE OF POLITICISATION OF THE NUCLEAR ISSUE

Khatami could have never imagined that his successes in establishing grassroots democracy[63] would be instrumental one day in uprooting his whole effort of democracy and political reforms. When Ahmadinejad fought the election for the post of President in 2005, he was a little known Mayor of Tehran. It was the reformists' infighting within the Tehran Municipality, popularised by the conservative-controlled state television, that made the people disillusioned with the political process, brought Ahmadinejad into the limelight and ultimately led to his elevation to the post of President[64].

Ahmadinejad's assumption of office marked the symbolic demise of Khatami's reform movement that had alarmed the clerical rulers. The eight years[65] of Khatami had witnessed many such events, which had the potential of collapsing the clerical regime. The six-day riots on the streets of Tehran on the eve[66] of the closing of the *Salam* newspaper, the

63. It was due to the reform efforts of Khatami that the first nationwide municipal council elections were held in February 1999. This was the first such election since the revolution and in this election, the reformist camp had achieved a landslide victory. The second municipal council elections, held in February 2003, were marked by low voter turnout due to the disillusionment of the people with the reformists. Consequently, in this election, the conservatives enjoyed a sweeping victory.
64. Ansari, n. 52, p. 202.
65. 1997 to 2005, the two successive tenures of Khatami as the President of the Islamic Republic. His successor, Mahmoud Ahmadinejad was elected in June 2005.
66. This happened in July 1999 when the conservatives reacted to the municipal council victory of the reformists by closing a reformist newspaper, *Salam*, triggering six days of university protests and severe rioting.

reelection of Khatami[67] and his attempts to pass the "twin Bills"[68] were all seen as serious threats to the clerical rule. "The most obvious potential agent of change within Iran emanates from its own population and the post-revolutionary demographics that make this a disproportionately young society."[69] It is notable that "today, two-thirds of Iranians are under the age of thirty – too young to harbor meaningful memories of the pre-revolutionary era – and 40 percent are under the age of eighteen."[70]

"Through their omnipresent (though still officially illegal) satellite dishes and burgeoning connections to the internet, younger Iranians are intensely interconnected with the world beyond the Islamic Republic. … Not surprisingly, they are correspondingly frustrated."[71] In the absence of political parties and liberty of the press in Iran, the level of political participation in the reform era can be gauged by the rapidly growing rate of internet usage. "Between 2000 and 2006, internet usage in Iran grew by 2,900 percent, giving Iran 34 percent of the Middle East's total web traffic, a figure that includes Israel and Turkey."[72]

Commenting on the eight years (1997-2005) of the reform movement, Shirin Ebadi[73], the Nobel Peace Prize winner, says: "The reform era, for all its political discontents, did much to relax our daily lives. The morality police were by no means retired, but they went from omnipresent invaders to a periodic nuisance. President Khatami deserves only a measure of credit for this shift. Really it was because my daughters' [at that time 23 years of

67. In June 2001.
68. The two Bills, named respectively as the 'Elections Law Amendment Bill' and the 'Presidential Empowerment Bill,' became popular as the 'twin Bills.' These Bills were presented in September 2002 and were later adopted by the Iranian Parliament (Majlis) in November 2002. However, due to the stiff resistance of the conservatives, particularly by the Guardian Council, these Bills could not be passed and were ultimately withdrawn in March 2004. For a detailed analysis of the 'twin Bills' see Samii, n. 18, pp. 415-418.
69. Suzanne Maloney, *Iran's Long Reach: Iran as a Pivotal State in the Muslim World* (Washington D.C.: United States Institute of Peace Press, 2008), p. 83.
70. UNICEF, "At a Glance: Iran (Islamic Republic of)," URL: www.unicef.org/infobycountry/iran_statistics.html#47, Accessed on April 17, 2008; Cited in Maloney, Ibid., p. 84.
71. Ibid., p. 84.
72. Nathan Gonzalez, *Engaging Iran: The Rise of a Middle East Powerhouse and America's Strategic Choice* (Westport, Connecticut: Praeger Security International, 2007), p. 92.
73. Shirin Ebadi, an Iranian and a lawyer by profession, won the Nobel Peace Prize in 2003 for her extraordinary service of defending the vulnerable people.

age] uncowed generation started fighting back and, through the force of their sheer numbers and boldness, made it unfeasible for the state to impose itself as before."[74]

Under such 'threatening' political atmosphere, Ahmadinejad's election gave the clerical regime the much needed respite and they were now not ready to let go the reins of power from their hands. While it was important to mobilise people under the nationalist banner against a common enemy to derive political legitimacy, it was equally important to discredit their main domestic political rivals – the reformists – for keeping a hold over power.

AHMADINEJAD'S NUCLEAR POLITICS

Ahmadinejad now started implementing his strategy. On the eve of his inauguration, on August 6, 2005, the rejection of the EU-3 proposal was announced[75] and two days later, "the regime broke its November 2004 agreement with Europe and resumed uranium conversion activities at the Isfahan plant."[76] Also, "Ahmadinejad incited things further that same day, August 8, 2005, by naming a new chief nuclear negotiator. Hassan Rowhani [a reformist and Khatami's ally], the head of the team that had been negotiating with Europe throughout the crisis period after August 2002, was out, and Ali Larijani, a former senior commander of the Islamic Revolutionary Guards Corps and a prominent hardline conservative with close ties to Khamenei, was in."[77]

"By handing over the reins to Larijani, Ahmadinejad declared that in the new order, Iran's nuclear negotiations would reflect the most hardline

74. Shirin Ebadi, *Iran Awakening: From Prison to Peace Prize – One Woman's Struggle at the Crossroads of History* (London: Rider, 2006), p. 180.
75. Jafarzadeh, n. 60, p. 190.
76. Ibid.
77. Ibid.

position of the regime."[78] It was at this juncture that the speech[79] of Hassan Rowhani, the former chief nuclear negotiator and Secretary of the Supreme National Security Council was leaked[80] in *Rahbord*[81], in its September 30, 2005 issue, giving clear evidence of the internal fighting among the ruling elite on the nuclear issue.

Rowhani had given this speech to the Supreme Cultural Revolution Council and from the content of the speech, it can be ascertained that it may have been made between October 15 and November 14, 2004[82], during the Khatami Presidency. However, its publication shortly after the election of Mahmoud Ahmadinejad clearly shows the attempts by the reformists to justify their stance on the nuclear issue. This speech gives an insight into "Iran's reasoning and strategies leading up to its October 21, 2003 declaration."[83] In this speech, Rowhani has clarified the reformists' rationale of nuclear declarations to the IAEA, signing of the Additional Protocol and subsequent suspension of uranium enrichment[84].

THE ROLE OF SUPREME LEADER ALI KHAMENEI

In this regard, Ali Khamenei's role needs some elaboration, since he, as the Supreme Leader, and not President Ahmadinejad, is the final arbiter of the political happenings in the domestic turf and foreign policy formulations.

78. Ibid., p. 191.
79. Text of speech by Supreme National Security Council Secretary Hassan Rohani to the Supreme Cultural Revolution Council, "Beyond the Challenges Facing Iran and the IAEA Concerning the Nuclear Dossier," Place and date not given, edited by Musavi-Kho'iniha, published in *Rahbord* (in Persian), September 30, 2005, pp. 7-38, Original Persian text and its English translation are posted on the Web Site: Berlin Information-center for Transatlantic Security, URL: www.bits.de/public/documents/iran/Rahbord.pdf, Accessed on January 8, 2011, 3:22:38 PM.
80. Alexander and Hoenig, n. 3, p. 122.
81. *Rahbord* is an Iranian quarterly journal, published by the Centre for Strategic Research. This Centre – a research arm of the Expediency Council – is headed by Dr. Hassan Rowhani. See Centre for Strategic Research, Website, URL: http://www.csr.ir/Center.aspx?lng=en&abtid=00. Accessed on January 10, 2011, 6:08:43 PM.
82. See Dr. Chen Kane, "Nuclear Decision-Making in Iran: A Rare Glimpse", *Middle East Brief*, May 2006, No. 5, Published by Crown Center for Middle East Studies, Online Web, URL: www.brandeis.edu/crown/publications/meb/MEB5.pdf. Accessed on 3:47:09 PM, Note 3, p. 7.
83. Alexander and Hoenig, n. 3, p. 122.
84. n. 79.

An assessment of the actions of Khamenei since his assumption of office of the Supreme Leader after the death of Ayatollah Khomeini in 1989 depicts him as "a leader averse to both confrontation and accommodation with the West."[85]

This is because he had been holding the office of President[86] for most of the period of the eight-year war with Iraq, and had seen from close quarters the ill effects of any protracted confrontation. Further, his scepticism regarding the West largely mirrors the ideals and worldview of his predecessor Khomeini and likewise he thinks "the relationship between the United States and Iran is similar to that between a wolf and a sheep."[87]

On the domestic platform, Khamenei's primary concern is to save the clerical regime at all costs. Thus, while he was silent in the case of Ahmadinejad's severe criticism of the reformists – a common enemy – he did raise eyebrows when Ahmadinejad's attitude of confrontation reached the critical limit. It is in this context that Rowhani's revelations to *Kayhan* and *Rahbord* in 2005 can be seen. It is "difficult to imagine"[88] that Rowhani would have revealed so much about the Iranian nuclear policy and its decision-making process without the permission of the Supreme Leader Ali Khamenei.

85. Sadjadpour, n. 31, p. 126.
86. Khamenei was elected as the third President of the Islamic Republic of Iran on October 2, 1981. He was again elected for his second term in 1985 and was succeeded by Rafsanjani, who was elected on July 28, 1989. Bani-Sadr and Muhammad Ali Rajaei were respectively the first and second Presidents of the Islamic Republic of Iran, both of whom could not complete their full term. While Bani-Sadr was dismissed, Muhammad Ali Rajaei was killed in a bomb blast. The Iran-Iraq War started on September 22, 1980 and ceasefire was enforced on August 20, 1988.
87. Sadjadpour, n. 31, p. 126.
88. Perkovich, n. 27, p. 43.

AHMADINEJAD'S ANSWER TO KHATAMI'S "DIALOGUE AMONG CIVILISATIONS"[89]

These revelations notwithstanding, Ahmadinejad kept on pursuing his confrontational foreign policy stance, wishing to garner more domestic support. He did this by indulging in great rhetoric against the US, the West and Israel. He surprised everyone by giving a "vitriolic"[90] and "confrontational speech"[91] in September 2005 when he attended the World Summit in New York. Ahmadinejad has been particularly vocal in making rhetorical remarks[92] against Israel. In October, the same year, he went further in his hate-speech and reminded his audience about the statement of Ayatollah Khomeini in which he had said that "the occupying regime [Israel] must be wiped off the map."[93]

Such demonising speeches against the West were intended to portray them as those who were holding Iran back. The audience of such rhetoric, as also that against Israel, comprised the domestic masses.

While Ahmadinejad continued to adopt a policy of animosity with the West, little caring about the successive sanctions of the United Nations Security Council, he also made full efforts to portray the nuclear issue as a nationalist one. Ahmadinejad's government has sought to reap the benefit of the nuclear quagmire in the domestic turf by turning the situation upside down. "By insisting that its nuclear project is essential for the country's domestic energy

89. Khatami had given the call for the "Dialogue among Civilisations" in a speech made to the United Nation's annual Heads of State Summit in 1998. In this speech, he had proposed that the United Nations designated the year 2001 as the "Year of Dialogue among Civilisations." The United Nations General Assembly had unanimously endorsed this proposition on November 4, 1998 and the year 2001 was confirmed as the "Year of Dialogue among Civilisations." See Embassy of the Islamic Republic of Iran, *Dialogue among Civilizations: A Prerequisite for Asian Unity*, Edited by Issa Rezazadeh (Cultural Counsellor at the Embassy of the Islamic Republic of Iran, New Delhi), (New Delhi: Kanishka Publishers, 2002), p. 21. Also see Seyed Mohammad Khatami, *Islam, Dialogue and Civil Society*, (New Delhi: Centre for Persian and Central Asian Studies, School of Language, Literature and Cultural Studies, Jawaharlal Nehru University, 2003), pp. 1-5.
90. George Perkovich, "Iran's Nuclear Program after the 2005 Elections," in the Emirates Centre for Strategic Studies and Research, ed., *Iran's Nuclear Program: Realities and Repercussions*, pp. 37-61, (Abu Dhabi: Emirates Centre for Strategic Studies and Research, 2006), p. 46.
91. Perkovich, n. 27, p. 46.
92. Karim Sadjadpour,"How Relevant Is the Iranian Street?", *The Washington Quarterly*, Winter 2006-07, vol. 30, n. 1, pp. 151-162, p. 154.
93. Perkovich, n. 27, p. 46.

needs and scientific development, Tehran has effectively turned US opposition to its program into a nationalist cause, pointing to it as proof that Washington intends to hold Iran back."[94] The government has even printed the atom symbol on 50,000 Rial bills to "awaken the national pride"[95] of the Iranian people.

THE GENESIS OF ANTI-US AND ANTI-WESTERN SENTIMENTS

Since Ahmadinejad's stance on the nuclear stand-off – largely based on the portrayal of Iran as a victim of the West's bias – evokes huge appeal among the Iranian public, it is imperative to go into the genesis of this phenomenon to understand such appeal.

The genesis of anti-US and anti-Western sentiments in the minds of the Iranian people dates back to the era of Pahlavi dynasty, more particularly, the year 1953. In this year, the United States had "orchestrated"[96] a coup against the nationalist and democratically elected Prime Minister Dr. Mohammad Mosaddeq who was instrumental[97] in the nationalisation of the oil industry of Iran. This memory of immense "betrayal"[98] is never out of the sight of the Iranians. The present clerical regime reminds them of this event whenever they tend to forget it and talk about opening up the present political system and installing democracy. Similarly, whenever there is a pressure from outside to democratise the system, the memory of Mosaddeq and his plight is revived by the clerical regime, emphasising the hypocrisy of the United States in its democratic rhetoric which serves as an excuse to ensure the hold of the authoritarian regime. Even during the course of the revolution, Khomeini had exploited this episode to mobilise the people of Iran under the nationalistic banner.

94. Milani, n. 43, p. 51.
95. Ibid.
96. Ansari, n. 52, p. 27.
97. Dr. Mohammad Mosaddeq had become Prime Minister in May 1951 by leading the campaign for the nationalisation of Iranian oil industry. It was due to this campaign that the National Assembly of Iran had enacted legislation in April 1951 for the nationalisation of the Iranian oil industry. Mosaddeq was overthrown by Gen Zahedi in August 1953 and was "tried and sentenced to three years' solitary confinement for allegedly trying to overthrow the regime and illegally dissolving the Majlis-e-Shura (Consultative Assembly)." See Regional Surveys of the World, *The Middle East and North Africa-2003*, 49th Edition (London: Europa Publication, 2003), p. 352.
98. Ansari, n. 52, p. 27.

The second factor instilling chronic animosity was the affinity of Reza Shah to the United States and other Western countries and consequent Westernisation of Iran. The effort of the Shah to modernise Iran and more particularly, his much popularised "White Revolution"[99] has been described by Khomeini – adopted ultimately from the construct of Jalal Ale-Ahmad — as "Westoxication,"[100] which is a much hated word in the Iranian lexicon. It was in this context that the US hostage crisis[101] occurred immediately after the Islamic revolution of 1979. On the one hand, this crisis was the turning point in the history of the US-Iran relationship, which resulted in the snapping of all diplomatic ties with Iran. On the other, this event has been eulogised by the clerical regime which positions the new republic as US-centric now as it was during the era of the Shah. It is just that the basis of this relationship now is mistrust and not friendship as earlier.

These two factors, in addition to the war with Iraq[102] and consequent destruction of the newly founded Islamic Republic, bring sad memories to the minds of the Iranian people. Whenever the clerical rulers find their domestic legitimacy waning, they fall back upon the exploitation of such anti-US and anti-West sentiments to mobilise people under the nationalistic banner. It is in this context that Khomeini's Rushdie affair may be seen where a life threatening *fatwa* was imposed on the writer in 1989 for his blasphemy against Islam through his book *The Satanic Verses*. At a time

99. The 'White Revolution,' "formulated between 1958 and 1963" and continued until 1978, was essentially directed towards providing "a legitimating myth for the Pahlavi monarchy." See Ali M. Ansari, "The Myth of the White Revolution: Mohammad Reza Shah, 'Modernization' and the Consolidation of Power", *Middle Eastern Studies*, vol. 37, no. 3, July 2001, pp. 1-24, pp. 1-2.

100. Jalal Ale-Ahmad, along with Ali Shariati, has been considered as the most influential intellectual force behind the Iranian Revolution of 1978-79. Jalal Ale-Ahmad's concept of "Westoxication" gives a "powerful critique of hegemonic power of the West." See Ali Mirsepassi, *Intellectual Discourse and the Politics of Modernization: Negotiating Modernity in Iran* (Cambridge: Cambridge University Press, 2000), pp. 96-97.

101. The crisis began on November 4, 1979 and lasted for 444 days.

102. Iraq invaded Iran on September 22, 1980. On July 20, 1987, the United Nations Security Council unanimously adopted the Resolution 598, urging immediate ceasefire. Iran agreed to accept this resolution in July 1988, which finally came into force on August 20, 1988. See Regional Surveys of the World, n. 97, pp. 355-360. For Khomeini, the acceptance of this cease-fire "was worse than drinking poison." See Fred Halliday, *Islam and the Myth of Confrontation: Religion and Politics in the Middle East* (London: I.B. Tauris, 1995), p. 71.

when the eight-year Iran-Iraq War had ended and the Iranian people were about to turn their attention towards their domestic ailments, the Rushdie affair was helpful to the regime in consolidating the Iranian people under one banner and distracting them from the domestic affairs.

The novel, *The Satanic Verses*, published in September 1988 by Salman Rushdie, an Indian-born British citizen, was considered by many Muslims as "a blasphemous insult to Islam."[103] Ayatollah Khomeini issued a statement on February 14, 1989, which said that "the author of *The Satanic Versus*, which is against Islam, the Prophet, and the Koran, and all those involved in its publication who were aware of its content, are sentenced to death."[104] This statement "was soon referred to as a *fatwa*."[105] "Fresh from failures in Iraq," Ayatollah Khomeini was "trying to revive his role as the leader of militant Islam"[106] through this "decree."[107]

Indeed, "the proclamation of Iran's continuing role as leader of the oppressed across the world was important not just for external reasons, promoting the image and prestige of Iran, but also internally as a means of sustaining the morale of the population, distracting then from the domestic economic crisis, and preventing an emergence of 'liberalism', a spirit of compromise or accommodation with the outside world."[108] This decree of Ayatollah Khomeini, therefore, served as "a means of meeting his two main policy goals – mobilization at home, confrontation internationally."[109]

Similar is the context of the recent remarks[110] of the current Supreme Leader Ali Khamenei, urging "the Islamic Ummah to sympathize and provide

103. Nikki R. Keddie, *Modern Iran: Roots and Results of Revolution* (London: Yale University Press, 2003), p. 262.
104. Ibid.
105. Ibid.
106. Ibid.
107. Ibid.
108. Halliday, n. 102, p. 71.
109. Ibid.
110. "Imam Khamenei's Message to Hajj Pilgrims (1431 A.H.)," Dated: November 8, 2010, Official Website of the Supreme Leader Sayyid Ali Khamenei (English Version), Posted on November 15, 2010, URL: http://www.leader.ir/langs/en/index.php?p=contentShow&id=7577. Accessed on January 14, 2011, 6:39:08 PM.

assistance to Kashmir."[111] Addressing the Hajj pilgrims on November 8, 2010, Sayyid Ali Hassaini Khamenei said, "Today, the major duties of the elite of the Islamic Ummah are to provide help to the Palestinian nation and the besieged people of Gaza, to sympathize and provide assistance to the nations of Afghanistan, Pakistan, Iraq and Kashmir, to engage in struggle and resistance against the aggressions of the United States and the Zionist regime, to safeguard the solidarity of Muslims and stop tainted hands and mercenary voices that try to damage this unity, to spread awakening and the sense of responsibility and commitment among Muslim youth throughout Islamic communities."[112]

Khamenei also termed the United States as "the self-styled commandant of the Islamic region and the real sponsor of the Zionist regime."[113] While such remarks against the United States are not new, the wrath against India is a new development, perhaps resulting as a consequence of India's recent closeness to the United States at the cost of its relationship with Iran. Implicit in this message is Iran's anger over India's stance in the IAEA on the Iranian nuclear issue, where India's three times voting against Iran is perceived by it as a consequence of the US pressure. These votes were cast in the IAEA resolutions on September 24, 2005[114], February 4, 2006[115] and November 27, 2009[116] respectively. Nevertheless, such remarks place the Supreme Leader in the ranks of Ahmadinejad in rhetoric politics and are an indicator to Khamenei's tacit support to Ahmadinejad's current foreign policy.

111. **"Khamenei Urges Muslims to 'help' Kashmir,"** *The Times of India*, Online Web, November 16, 2010, URL: http://timesofindia.indiatimes.com/world/middle-east/Khamenei-urges-Muslims-to-help-Kashmir/articleshow/6935375.cms. Accessed on January 14, 2011, 6:50:17 PM.

112. **n. 110.**

113. **Ibid.**

114. **IAEA Resolution, "Implementation of the NPT Safeguards Agreement in the Islamic Republic** of Iran," GOV/2005/77, Adopted on September 24, 2005, URL: www.iaea.org/Publications/Documents/Board/2005/gov2005-77.pdf. Accessed on August 31, 2010, 6:36:06 PM.

115. **IAEA Resolution, "Implementation of the NPT Safeguards Agreement in the Islamic Republic** of Iran," GOV/2006/14, Adopted on February 4, 2006, URL: www.iaea.org/Publications/Documents/Board/2006/gov2006-14.pdf. Accessed on August 31, 2010, 6:54:37 PM.

116. **Report of the Director General, IAEA, "Implementation of the NPT Safeguards Agreement** and relevant provisions of Security Council resolutions 1737 (2006), 1747 (2007), 1803 (2008) and 1835 (2008) in the Islamic Republic of Iran," GOV/2009/74, November, 16, 2009, URL: http://www.iaea.org/Publications/Documents/Board/2009/gov2009-74.pdf. Accessed on July19, 2010, 3:00:09 PM. This resolution was adopted on November 27, 2009.

In essence, "Iran's quest for a nuclear capability is the product of domestic politics and the demands of revolutionary legitimacy rather than a strategic imperative."

Indeed, Ahmadinejad and his hardline supporters have devised this kind of rhetorical strategy to mobilise the Iranian people in the domestic fight against their political rivals. They needed an enemy for mobilising the people and it was not difficult to project the US as one. The US' policy of non-engagement proved quite handy.

AN ASSESSMENT OF AHMADINEJAD'S POLICY AND FUTURE COURSE

Under the impending US threat of invasion and collective opposition of the international community, it is tempting to dismiss Ahmadinejad's vitriolic stance against the West as a case of political pathology. However, it would serve better to understand how well this stance is paying him and his supporters, particularly, the Iranian Revolutionary Guards Corps, in his domestic constituencies. His reelection in 2009 with the full support of the clerical establishment – which came all out to ensure his success by wide scale rigging – gives credence to this fact.

The 'Green Revolution', of which Mir Hussain Musavi became a leader of the time, gives a hint of the popular discontent among the masses due to the prevalent economic condition and lack of civil liberties. Similarly, its forceful suppression illustrates the victory of the hardliners and conservatives in retaining their tight grip over power and maintaining the clerical regime at all costs.

"Both factions [hardliners and reformists] believe nuclear weapons are the best deterrent against external threats, most notably the US and Israel. They know there is a cost associated with it and they are willing to pay, but they may disagree on the price. Hardliners put a lower value on international relations and are more eager to pursue the plan. 'Reformists' value these relations, particularly to the EU. But they both want to get as close to having the bomb or the ability to build it as possible."[117] "Despite

117. Reza Ghorashi, "US, Iran, the Nuclear Bomb and Negotiations," August 12, 2003, Payvand Iran News, Website, URL: http://www.payvand.com/news/03/aug/1072.html. Accessed on: January 10, 2011, 5:27:43 PM.

their many differences, both factions are 'rational' enough to realize they have a common interest in the survival of the Islamic Republic."[118]

However, it is unfortunate that due to "Iran's weak economic structures, the country's foreign policy has come to be held hostage to its security priorities. In this process, economic necessities have influenced foreign policy, but, at the same time, have been unable to generate the appropriate policy responses because of the security and ideological imperatives of the state."[119]

Most evidently, "the contested election of June 2009 revealed a deeply divided society. Differences on the nuclear issue are the tip of the iceberg, reflecting in reality much deeper differences on what sort of state Iran should be, and how Iran should conduct itself internationally, and whether it should continue its revolutionary behavior or settle down."[120] In essence, "Iran's quest for a nuclear capability is the product of domestic politics and the demands of revolutionary legitimacy rather than a strategic imperative."[121]

CONCLUSION

The Iranian nuclear question is a symptom of deep division in the clerical order. Ahmadinejad has given the nuclear issue such a nationalist character that Iran's quest for nuclear capability now appears irreversible. The dynamics of international politics – the US' failure in managing the affairs of Iraq and Afghanistan – has provided Iran the opportunity to progress with its nuclear programme to the extent that it now cherishes the dream of emerging as a regional power. However, Ahmadinejad's uncompromising stance towards the international community is largely motivated by the need of domestic legitimacy for the maintenance of the clerical regime.

Indeed, Ahmadinejad's strategy of delaying the negotiations with the IAEA proved fruitful for Iran in terms of its progress towards nuclear

118. Ibid.
119. Ehteshami, n. 25, p. 21.
120. Chubin, n. 47, p. 73.
121. Shahram Chubin, "Iran: Domestic Politics and Nuclear Choices," in Ashley J. Tellis and Michael Wills, eds., *Strategic Asia 207-08: Domestic Political Change and Grand Strategy* (Seattle, WA: National Bureau of Asian Research, September 30, 2007), pp. 301-340, p. 301.

capability. Consequently, this issue has now taken the shape of national prestige where even the initially reluctant ranks have joined to see Iran as a regional power, in close league with India, which came to international prominence after acquiring nuclear weapons capability.

Ahmadinejad has been successful in defining the Iranian nuclear issue in his own preferred way by portraying Iran as a victim of the West's prejudices, which is depriving it of the necessary technology for the development of nuclear capabilities. Consequently, those people or political groups from the domestic quarters (i.e. reformists) who show any weakness in the nuclear negotiations with the West, are branded as the "agents of foreign powers."[122]

In this context, the words of Mohammad Javad Zarif[123] – an Iranian diplomat – appear quite appropriate, "The interests of Iran and the United States, as well as security and stability in the Persian Gulf region, have long been hostage to an outdated paradigm sustained by mutual mistrust and heavy historical baggage, and nurtured with fact or fiction generated by those benefiting from confrontation and war."[124]

122. Chubin, n. 47, p. 78.

123. Mohammad Javad Zarif, a career diplomat, has served as the permanent representative of the Islamic Republic of Iran to the United Nations; See "Introduction of the Contributors," *Journal of International Affairs*, vol. 60, no. 2, Spring/Summer 2007, p. xv.

124 Zarif, n. 36, p. 88.

NUCLEAR WEAPONS PROLIFERATION IN ASIA: THE TWENTY-FIRST CENTURY PATTERN

YEON JUNG JI

Perceptively, prediction on nuclear proliferation seems to have consistently been wrong.[1] In the current global politico-security scenario that has radically changed with the onset of the nuclear age, disagreement persists among international theorists on how to analyse the world order in vogue. And the concept of security seems still to be in a predicament regarding the presence of nuclear weapons as states wonder how to defend themselves. Tracing the causes of states going nuclear, the nuclear proliferation discourse has been in the public domain for the last half century.[2] It is presumed that many states are likely to acquire nuclear capability to enhance their security against a potential war or as part of an arms race in a given region. The traditional approach analyses the motives of nuclear proliferation taking into account the factors at various levels — international, regional and national — with a perceived form of proliferation — vertical or horizontal. However, normally, a new state starts a clandestine nuclear programme not only by

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1. Jacques E. C. Hyman, "Theories of Nuclear Proliferation: The State of the Field", in Peter R. Lavoy, ed., *Nuclear Weapons Proliferation in the Next Decades* (Oxon, Routledge, 2007), p. 29.
2. Tanya Oglivie-White, "Is There a Theory of Nuclear Proliferation? An Analysis of Contemporary Debate", *The Nonproliferation Review,* Fall, 1996, pp. 43-60.

How can probable proliferators be predicted and what kind of strategy can be put in place for a new proliferator?

following the traditional two-way relationship method of proliferation, but also by creating a new pattern of the proliferation strategy.[3] International efforts are on to determine future proliferators and stop the current and probable proliferators from joining the *de facto* nuclear club. Similar to the changing international security structure and strategy, there is a need to understand the links of states that are attempting to develop nuclear capabilities and motives.

This paper examines four questions: first, what are the motivations and patterns of the proliferators? Second, as the indicators on the motives seem to point to various ways that each level focusses on, how is the trend of proliferation changing with the changing number of participants? Evidence suggests that their postures under the non-proliferation regime are correlated and each participant is stabilised according to its capabilities. Third, particularly relating to Asia, what role do the proliferators play and how does it impinge on the security order? Lastly, how can probable proliferators be predicted and what kind of strategy can be put in place for a new proliferator? Though subsidiary weaponry is developed in many ways, the symbolism and destructive power of nuclear weaponry is not decreasing, even in the small states. As a result, maintaining a critical inquiry on the danger of nuclear weaponry is of utmost importance.

MOTIVES AND PATTERNS OF NUCLEAR PROLIFERATION: A CONCEPTUAL ANALYSIS

Opinions and Theories

The motives of going nuclear are the result of a comprehensive theory-based understanding. Since the beginning of the nuclear age, there have been two approaches for studying nuclear weapon proliferation:

3. Sarah J. Diehl and James Clay Moltz, *Nuclear Weapons and Nonproliferation* (California: ABC-CLIO, Inc, 2008).

the realist and the idealist. There have also been numerous attempts to suggest a new approach. First, there have been attempts to elaborate on the contribution of the realists' analyses regarding 'power' and traditional deterrence theory. Most prominent and frequently used is the view that analyses international politics in terms of *anarchy*[4] and *self-help*.[5] The concept of threat expands the rational deterrence theory that once a state has acquired second-strike nuclear capability, war between nuclear armed states is unlikely to occur due to the fear of a mutual attack leading to catastrophe.[6] Later, the neo-realist theory, which is especially prominent with game theorists, provided a pertinent scenario that developed the motive of proliferation following the stabilised 'equilibrium'. Noticing the nature of international politics, the number of states arguing for sovereignty has increased. In other words, the complexity of the calculation depends on how many state players will attempt proliferation, withdraw, or not bomb; it is also significantly dependent on the equilibrium aspiration. This phenomenon is often expressed as the "Nth-Player Game".[7]

As the motivation to proliferate is rooted in certain circumstances, the global equilibrium and stability, including at the regional level, has become more difficult to maintain. In the context of power politics, the concept of power has different meanings for different countries. In other words, getting the nuclear bomb could imply survival, a desire to maintain the

4. Joseph M. Grieco, "Anarchy and the Limits of Cooperation: A Realist Critique of the Newest Liberal Institutionalism", *International Organization* 42(3), 1988, pp. 485-507.
5. Charles L. Glaser, "Realists as Optimists: Cooperation as Self-Help", *International Security* 19(3), 1995, pp. 50-90.
6. Kenneth N. Waltz, "The Spread of Nuclear Weapons: More May Be Better, "*Adelphi Paper*, No. 171 (London: International Institute for Strategic Studies, 1981). See also, Kenneth N. Waltz, "Nuclear Myths and Political Realities", *American Political Science Review* 84(3), 1990, pp. 731-745.
7. In other words, it is called Nth-person Game in Game Theory. A decision-making approach based on the assumption that players compete rationally under the situation. Each actor tries to maximise gains or minimise losses under the uncertainty, and incomplete information. N-person games include more than two actors or sides. It entails higher possibility of uncertainty to calculate the development of models, especially deterrence and arms race spirals. This concept shows how collaboration among competitive states in an anarchic world can be achieved. Paul Bracken, "The Structure of the Second Nuclear Age", paper on MIT Security Studies Program, November 5, 2003.; P. Viotti and M. Kauppi, eds., *International Relations Theory* (New York: Macmillan, 1987).

In addition to emphasising the significance of a theoretical background, some analysts emphasise the need to pursue the correlation between the national elites' decision-making and its cognition effect on security strategy.

regime or to complete the state-building process. In this case, the nuclear weapon is perceived as an instrument that is used to protect the regime;[8] this is the case with several states like Iran, North Korea and Pakistan. For these countries, the leader's or the administration's desire is to pursue nuclear capabilities following a cost-risk calculation. Balancing asymmetric conventional power depends on the different types of mass destruction capabilities, which strengthen conventional military capabilities, or forge alliances with a superpower.

While realists consider the state's power with a basic hypothesis – "black box" domestic politics — idealists attempt systemic analysis applied to the nuclear weapons problem. Meaning, thereby that if a state pursues nuclear capabilities, it is distinguished by three sub-opinions. Generally, idealists argue that nuclear proliferation needs to be initiated from the 'demand side' rather than the 'supply side', which is insisted upon by the realists.[9] This argument is sub-divided into three categories: international-level idealists who emphasise the international norm on the nuclear issue, the domestic-level idealists who focus on social constituencies, and the individual-level idealists who look at the motivations of the individual decision-maker or leader.[10]

In addition to emphasising the significance of a theoretical background, some analysts emphasise the need to pursue the correlation between the national elites' decision-making and its cognition effect on security strategy. According to Peter Lavoy (2007), understanding the process in the political apparatus depends on these questions: (1) How do national elites provide conviction about their national insecurity (to strategic thinkers and policy-makers)? (2) How do they portray the scenario which is thought to be

8. The regime, referred to here indicates a form of government.
9. n. 1, p. 26.
10. Ibid., pp. 23-34.

the best choice? (3) How do they articulate the political, economic and technological accountability to go nuclear? (4) How are 'these beliefs' (made by the national elites) successfully argued and integrated within current political and cultural acceptability? (5) How do they persuade influential senior decision-makers to take action on this issue?[11] In fact, it is relevant to focus on how high-level policy-makers intend to attain their objectives. The internal process of a bureaucracy or a regime needs to be analysed as a factor of proliferation.

Structure and Indicators

The type of proliferation is based on the theoretical assumptions elaborated above. In the first nuclear age, there were several types of nuclear proliferation, such as *vertical proliferation and horizontal proliferation*. Generally, the nuclear proliferation inspection deals with the two-dimensional type, horizontal and vertical proliferation. Vertical proliferation is the increase in the number of warheads available to the nuclear weapon states. Horizontal proliferation, on the other hand, indicates the increase in the number of states possessing nuclear weapons. No matter how the security environment develops for a state after it acquires an arsenal, proliferation remains the most worrisome issue, for both the regional and global security environments.

The concept of conventional proliferation, the safeguard measures initiated by the five nuclear weapon states and the command and control system, highlight the intricacy of the nuclear arsenal problem.[12] Proliferation issues are concerned about qualitative and quantitative proliferation that might destroy the entire human civilisation. Irrespective of the risk of the nuclear arsenal and unstoppable escalation, actual proliferation cannot be stopped, whatever efforts may be advanced by the major nuclear powers with their non-proliferation policy. The spread of nuclear weapons is monitored by the nuclear infrastructure, research centres and organisations, military movements

11. Peter R. Lavoy, "Nuclear Proliferation Over the Next Decade: Causes, Warning Signs, and Policy Responses", in Lavoy, ed., n. 1, pp. 2-3.
12. K. Subrahmanyam, "The Real Proliferation" in K. Subrahmanyam, ed., *Nuclear Proliferation and International Security* (New Delhi: Lancer International Press, 1985), pp. 54-64.

The monitoring of proliferation activity has continuously involved improvement of the deterrence tactics and tools in order to check the states attempting proliferation.

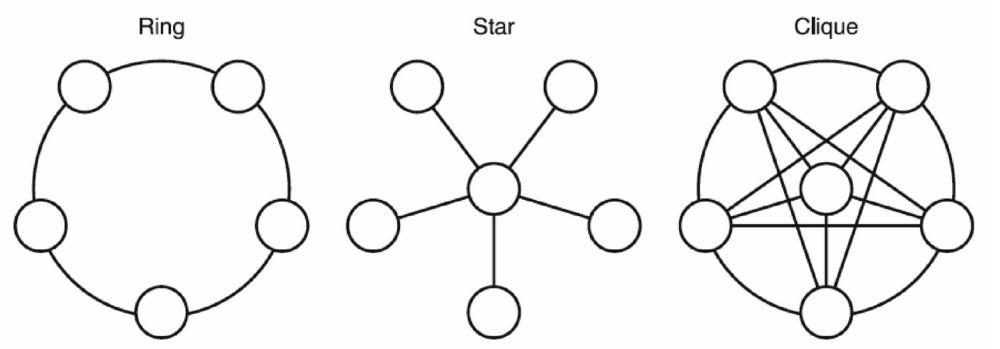
and extra facilities under the developing nuclear programme. In reality, the process of the nuclear programme — the technology transfer and the export of fissile materials — is not clearly classified as vertical or horizontal proliferation, but is a three-dimensional one. For example, one aspect of nuclear proliferation is based on the nuclear infrastructure. It is only one measurement of how nuclear forces operate in a given environment for a specific purpose.[13] Nuclear infrastructure is an important measurement of scientific-technological advances; it ensures the complete preparation of usable nuclear materials through the trade network. Based on the established nuclear facilities, proliferation may possibly impact the quick exchange of advanced technological information without considering an appropriate revision of international safeguards. At that point, other states deliberately follow the pattern of nuclear proliferation. That is why the danger of horizontal proliferation is emphasised with the limitation of nuclear safeguards.[14]

The nuclear proliferation issue has been in circulation in the international arena for quite some time. There have been significant efforts to deter the unrevealed attacks through various sanctions such as the freezing of financial assistance, export control, diplomatic pressure, arms control and disarmament agreements. So far, the monitoring of proliferation activity has continuously involved improvement of the deterrence tactics and tools in order to check the states attempting proliferation. The academia and policy-makers have analysed the nuclear proliferation chain as *proliferation rings* to show which state is in what position or which is more proactive with regard to proliferation.[15] Proliferation has been examined by Braun and Chyba to show that the

13. C. Raja Mohan, "Global Nuclearisation" in Subrahmanyam, ed., Ibid., p. 135.
14. Michael Rebehn, "Another Casualty of War: Proliferation Controls and Verification Protocols," 2003. http://www.opendemocracy.net/theme_9-wmd/article_1128.jsp
15. Chaim Braun and Christopher Chyba, "Proliferation Rings: New Challenges to the Nuclear Non-proliferation Regime," *International Security,* 29(2), 2004, pp. 5-49.

optimal tactics applicable to the second-tier proliferation take place among the developing countries. The structural analysis seeks to get rid of the proliferation linkage aimed at key connections. There are three basic proliferation network structures.

Fig. 1: Types of Nuclear Proliferation Ring



Source: Alexander H. Montgomery, "Ringing in Proliferation: How to Dismantle an Atomic Bomb Network," *International Security*, 30(2), 2005, p. 170.

The first ring type is a circle where one hub is connected to another. The second is a star type with a central hub located with all the nodes. The third structure depicts that all the linkages are directly connected with each other. The strategic assumption is to search for the optimal way to make disconnections or eliminate the proliferation network. Compared with the others, the star structure has the highest possibility of being cut off easily. Once the number of nodes is followed to the centre, it is easier to eliminate the hub and prevent new connections among the nodes making the hubs. However, the elimination of a single connection is not likely to be effective for the ring or clique type of proliferation; for these two networks, finding the crucial point is required. In reality, distinguishing which state is in which position and its diversity is somewhat vague.

NUCLEAR WEAPON PROLIFERATION AND NWS

It is a truism that the arms race and proliferation always increase when there is rivalry. Globally, nuclear weapons have been considered significant

The most dangerous case related to nuclear proliferation is the "anticipation of such proliferation rather than its actuality."

ever since the time of the superpower rivalry during the Cold War. During this period, much of the increase in the transfer and deployment of strategic nuclear weapons was due to the two blocs, both of which had little to do with the Third Word. Generally, the competitive situation caused by the Cold War rivalry is not condemned, but is accepted as inevitable. However, it is pertinent to follow-up this view with the view that enduring force contains competitive and dynamic features that have encouraged and are still currently, encouraging, the proliferation race and system.[16] In this case, actual nuclear weapon transferring needs to be distinguished from military and high technology weapon production and sales that occurred concurrently within this historical period. These needs show a highly hierarchical structure that is different from the planar picture of nuclear proliferation which is assumed within same-tier proliferation states. Hence, nuclear weapon proliferation is inevitable insofar as it is the result of an identified set of circumstances from both the supply and demand sides.

The most dangerous case related to nuclear proliferation is the "anticipation of such proliferation rather than its actuality."[17] After the mid-1950s, the pragmatic situation of the N^{th}-player game became an issue when Russia transferred its unfinished nuclear technology and samples of materials to China under the Sino-Soviet agreement of 1957. According to the available information, Russia was reluctant to attribute the spread of nuclear weapons to China which essentially mattered to it in the long-term period.[18] However, China is known to be the only country to receive directly applicable nuclear technology and material from the Soviet Union, its Communist ally.

16. David Kinsella, "Rivalry, Reaction, and Weapons Proliferation: A Time-Series of Analysis of Global Arms Transfers," *International Studies Quarterly*, 46(2), 2002, p. 210.
17. Bruce Bueno de Mesquita and William H. Riker, "An Assessment of the Merits of Selective Nuclear Proliferation," *The Journal of Conflict Resolution* 26(2), 1982, p. 304.
18. Oran R. Young, "Chinese Views on the Spread of Nuclear Weapons", *The China Quarterly*, 26, 1966, p.137.

Following this trend, the initial nuclear posture of China was limited to protection of its sovereignty and was not concerned with building up a strong nuclear weapon-based defence posture. China's argument on nuclear possession started after the mid-1960s. Initially, according to the Oran R. Young (1966), China's proliferation arguments favoured Communist states rather than its neighbours. Stressing the rivalry between the two blocs, China established a positive channel with other Communist countries in order to encourage national nuclear capabilities against imperialist countries such as the US and its Western allies.[19] Apart from the logic of deterrence in regard to superpower rivalry, China's argument uses a different logic of defence which is pertinent to the periphery states. First, following the argument, the Communist countries have to obtain the retaliatory capability against a possible first strike from the US or one of its allies. They also need to overcome the periphery position. Secondly, by observing the situation which increases a probable nuclear attack between two powers, it would be difficult to wait-and-watch, depending on Soviet nuclear capability, without knowing in which direction a nuclear missile will be aimed.[20] Regarding China's supportive posture on proliferation to the Communist countries, Chinese analysis seems to encourage the overall strength of Communism.

The dilemma China raised is a long-standing discussion for Western scholars as well. Bueno and Riker's paper states:

> Those facing such threats, and requiring a nuclear capability to secure themselves, probably will have to rely in the short run on the direct transfer of nuclear security by a friendly nuclear power. This means that one short-run vehicle for attaining security through nuclear symmetry may be carefully selected nuclear defence agreements. Such a strategy, however, must be short-term insofar as it is unreasonable to expect any nation to rely for long on the loyalty of another nation for its security.[21]

19. Ibid., pp.136-170.
20. Ibid., pp.141-142.
21. de Mesquita and Riker, n. 17, p. 305.

Like the US-UK relationship, the French-Israeli nuclear cooperation also reveals the logic of assistance in a nuclear programme against a grand enemy.

An argument that is similar to this one is that the nuclear weapon states' approach, such as the US' approach, toward proliferation, tends to be based on whether to strike or assist. It has been reluctantly, or unwillingly, accepted that assisting in proliferation is one of the options towards a friendly country in a convergence of strategic calculation. Laying out this trend, the US-UK special relationship, often referred to as Anglo-American nuclear weapon, includes involvement of a nuclear weapon state and technology transfer. The Mutual Defence Agreement (MDA) signed in 1958 and revised and extended several times, is a clear example of nuclear blueprint sharing.[22] It shows an intimate and comprehensive relationship between two friendly countries, providing and exchanging special nuclear materials and components for their nuclear weapon policy. It covers an entire framework of a developing trade system and nuclear reactors. According to Richard Wagner, a former US Assistant Secretary of Defence, the US-UK collaboration has been enlarged since the 1980s.[23] The friendly country, a major ally in this case, has reiterated the importance of upgraded political cooperation in regard to expansion of the policy scope, exchange of technology and scientists. Unlike the rise and fall of other partners, both sides desired an enhanced discussion after 1992, a moratorium on nuclear tests, swapping of experimental nuclear data and sampling on specific topics. The secret meetings between the two countries have not emerged in the public domain in the nuclear Non-Proliferation Treaty (NPT) regime.

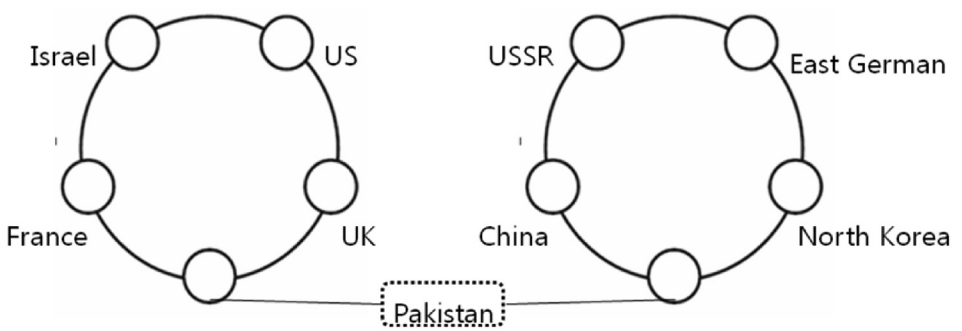
Like the US-UK relationship, the French-Israeli nuclear cooperation also reveals the logic of assistance in a nuclear programme against a grand enemy. The Israeli government maintains a strategic ambiguity, neither announcing the existence of a nuclear weapon, nor denying its possession.[24] However, this cooperation, which began in 1949, comprised

22. http://www.reachingcriticalwill.org/resources/books/BAC/chapter3.pdf
23. Ibid.
24. http://www.fas.org/sgp/crs/nuke/R40439.pdf

two-way assistance, due to the counterweight of Egypt and other Middle East countries.[25] Both governments invited each other's nuclear scientists to their countries. Israeli scientists helped in the construction of France's initial plutonium production reactor, heavy water production and low-grade uranium enrichment.[26] France and Israel signed the first nuclear agreement in 1954. The relationship was extended in 1956 with the sale of a large research reactor. Experts argue that French assistance in providing nuclear engineers and specialists has helped Israel attempt a nuclear test. Moreover, the intimate relationship between France and Israel resulted in the French government inviting an Israeli scientist in February 1960 to share information on detonation data and receive separated plutonium.[27]

Hence, the initial spread of nuclear weapon technology and materials is based on the bilateral linkage, whether the ring type or the star type, as well as on the security calculus from nuclear weapon states. The logic of sharing nuclear technology and materials implies that my strategic calculus, with garnered national interest, can be compromised when my friend attempts to transfer this to another friend of mine. The pattern of proliferation activity during the Cold War is shown below (Fig. 2).

Fig. 2: Linkage of Nuclear Proliferation in Grand Rivalry



25. http://www.nuwinfo.se/files/20090511MycleSchneiderNuclearFranceAbroadCIGI-V5.pdf
26. Ibid.
27. Ibid.

THE ASIAN NUCLEAR ORDER

Asia is at the centre of the developing nuclear proliferation linkage with its own characteristics. After the initial phase of spreading nuclear weapon-grade technology, non-nuclear weapon states have become a hub of proliferation linkages. Viewing the nuclear proliferation activity within a regional boundary, this period can be called the second phase of proliferation. The proliferation followers, helped by the superpowers, have become a centre of proliferation linkages. In this regard, Asia has placed much value upon the nuclear weapons problem that is related not only to state-centred issues but also to the regional security chain. In spite of the concept of security that dealt with either the state or global level, one needs to understand the regional security perception, called regionalism, in the security domain.

Both neo-realist and neo-liberalist scholars have paid attention to regionalism because they know that a region is vivisected by natural boundaries and cultural differences. In other words, a region has not been a dominant actor of the sub-system since the modern state concept was conceived and the world began to be dominated by major players.[28] First, the majority of states worry about their neighbours at the regional level; although the security dilemma is already applicable, these theories are mainly based on the hegemonic players. Second, there is a tendency that regional actors are likely to cooperate with, or deter, the neighbour's power when global power comes to the region. Third, regionalism generally reflects anti-imperialism and de-colonialism sentiments. The effort of regional integration is not only the end of regional confrontation but also encourages strong normative construction.[29] Some global issues, like nuclear proliferation, have embraced the homogeneous wave. Therefore, regionalism has expanded beyond a simple layer into the multi-

28. After end of the Cold War, the concept of region, whether it comes from a natural boundary or of artificial recognition, was intensified by the new regionalists. The regionalists advanced several arguments pointing out that international theory is not wrong but not complete to look into the regional activities and impacts. Robert E. Kelly, "Security Theory in the New Regionalism," *International Studies Review*, 9, 2007, pp. 197-229.
29. Miller Lynn, "Prospects for Order through Regional Security" in Richard A. Falk and Saul H. Mendlovitz, eds., *Regional Politics and World Order* (San Francisco, 1973).

characteristic or the so-called 'multi-dimensionality' one.[30]

The linkage between the Pakistani and North Korean nuclear programmes is well-established.

Some scholars point out that states have either chosen to be a part of nuclear states or not for various reasons such as regime survival, stability of regional security, and so on. A state's behaviour is determined not only by international politics and its national interests, but also by its desire to not be isolated from the political elites.[31] For example, North Korea is well-known for its proactive nuclear debating and negotiating between pro-nuclear states and countering states. The linkage between the Pakistani and North Korean nuclear programmes is well-established. The nuclear network, the so-called 'Khan' network, has been evaluated for many years for inclusion in the NPT and export control regimes.[32] Since 1970, Khan and his associate networking system have been effective in establishing an illicit procurement network through import-export operations. Interestingly, North Korea initially became one of the customers in Khan's network and this network helped North Korea to become one of the key proliferators. The implications of understanding the North Korea-Pakistan connection reflected a differentiated characterisation of proliferation activity. Initially, while the former Soviet Union-related illicit network was not on the main table, the small proliferators' linkage was paid great attention. The Khan network, especially with North Korea, suggests that it has been most successful in bringing a *fait accompli* nuclear status for both countries. Second, as seen in the various types of nuclear proliferation in the previous section, this proliferation connectivity has lent weight to the argument, in terms of establishing an additional proliferation linkage. In other words, North Korea and Pakistan are assumed to remain as individual hubs that operate

30. Ibid., pp. 50-74. "Multi-dimensionality" indicates that regions are also based on dimensions such as economic linkages, regional identity (regionness), trans-national interactions. Robert E. Kelly, "Security Theory in the New Regionalism," *International Studies Review*, 9, 2007, pp. 197-229.
31. Richard K. Betts, "Paranoids, Pygmies, Pariahs and Non-proliferation Revisited," *Security Studies*, 2 (3/4), 1993, p. 100-124.
32. http://www.twq.com/05spring/docs/05spring_albright.pdf, p. 112.

In contrast to Sino-Pakistan cooperation, North Korea's case is rather ambivalent in regard to regime survival, as well as financial source.

their network sharing among key consumers.[33]

The strategic posture of *de facto* nuclear states has widened and deepened since China's involvement with small proliferators has been strengthened in this region. The volatile climate in this region tends to depend on China's commitment to providing, or assisting with, security assurance to neighbouring countries, especially Pakistan and North Korea. Particularly, the China-Pakistan nuclear linkage is analysed to create "great unease" in the non-proliferation regimes in recent years.[34] While the India-US nuclear deal has been criticised for deviating from the non-proliferation regime mandate, its spillover effect has resulted in a similar nuclear deal between China and Pakistan. Certainly, the US decision to make an exception in India's case is strengthened by Pakistan's argument.

However, the China-Pakistan nuclear deal contains differences in tracing Pakistan's proliferation activity. The worrisome issue popped up when China and Pakistan concluded a deal in secrecy and hindered the transparency. In addition, according to Ashley J. Tellis (2010), the position of the Nuclear Suppliers Group (NSG) is likely to be weakened since the Chinese government is not willing to stick to its obligations. Moreover, China and Pakistan are able to approach a "short-cut with" the NSG, following an unprecedented nuclear deal — the US-India one.[35] Monitoring of Khan's network is obviously to exclude Pakistan from being granted a waiver. China's help to Pakistan makes the Western side believe that China's nuclear assertiveness is growing.[36]

In contrast to Sino-Pakistan cooperation, North Korea's case is rather ambivalent in regard to regime survival, as well as financial source. Initially, North Korea's nuclear research reactor which was provided by the Soviet

33. Sheena Chestnut, "Illicit Activity and Proliferation," *International Security*, 32(1), 2007, pp. 81-82.
34. Ashley J. Tellis, "The China-Pakistan Nuclear Deal," *Policy Outlook*, Carnegie Endowment for International Peace, 2010. http://www.carnegieendowment.org/files/china_pak_nuke1.pdf
35. Ibid.
36. Ibid., p. 5.

Union in the 1960s, was not directly meant for a nuclear weapon programme. However, the Soviet Union assisted in the training of North Korean scientists when the Cold War rivalry ended and continued to do so throughout the 1990s under the Russian government. Since 1999, China's involvement in supplying missile-related materials and components has been reported.[37] North Korea has become one of the leading countries in terms of proliferation after its first nuclear test. A clear connection between North Korea-Iran, and North Korea-Syria has been observed. In 2006, an Iranian scientist reportedly visited North Korea to share the data of the test under the new agreement.

In Southeast Asia, while the prospect of nuclear proliferation has not attracted as much attention as other neighbouring regions in Asia, this region contains its own importance.

In 2009, another Iranian delegation from the Iranian Revolutionary Guards and the Iranian Atomic Energy Organisation was invited to a high-level meeting for the second nuclear test.[38] Syria is another country friendly with North Korea that has been promoting nuclear collaboration since the late 1990s. According to the US intelligence agency, the Syrian nuclear reactor is evidence of North Korea's involvement in the design because the reactor is similar to North Korea's. The North Korea-Iranian cooperation with Syria is continuously monitored by the international community. In recent years, North Korea has provided nuclear technology for a planned reprocessing plant in Iran.

In Southeast Asia, while the prospect of nuclear proliferation has not attracted as much attention as other neighbouring regions in Asia, this region contains its own importance. It is a periphery station of the proliferation link that can help potential nuclear aspirants in other regions. It is known that Southeast Asian countries generally cannot afford to go nuclear. The reason for this is a lack of technological feasibility of military purposed nuclear research. Moreover, all member countries

37. Larry A. Niksch, "North Korea's Nuclear Weapons Development and Diplomacy," CRS Report for Congress, 2010. http://www.fas.org/sgp/crs/nuke/RL33590.pdf.
38. Ibid., pp. 20-25.

of the Association of Southeast Asian Nations (ASEAN), except East Timor, signed a treaty to establish South Asia as a nuclear weapon-free zone in 1995. The harmonious cooperation among the member countries does not seem to hamper the regional security, driven by the nuclear ambition. Hence, the traditional theory-building on nuclear ambition does not fully apply to Southeast Asia.

In recent years, however, there have been reports of a Malaysian company manufacturing centrifuges for the A.Q. Khan network, and the North Korea-Burma nuclear tie is viewed as developing continuously. Since the mid-1990s, the Burmese military regime has overtly and repeatedly sought nuclear technology for both peaceful and military purposes. The only difference in Burma is that the diplomatic channel discussing and transferring nuclear technicians is assumed to include formal channels such as the International Atomic Energy Agency (IAEA) in 1999.[39] On the other hand, Burma has intended to acquire nuclear weapons in reflection of the changing internal and external political environments. The desire of the Burmese military junta to acquire a nuclear weapon appears to have increased enormously, especially after the US invasion in Iraq in 2003. International experts argued that regime change in Iraq by the US would certainly have an impact on Burma. It could lead to a defence strategy similar to that of other status quo nuclear states, akin to North Korea, in order to protect its military regime.[40]

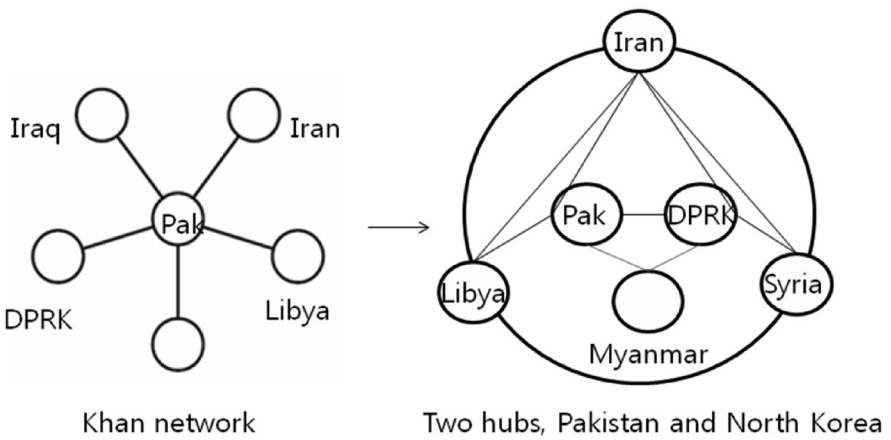
Indonesia too received a call from the Iranian government for nuclear-generated electricity.[41] These countries do not wish to possess the nuclear bomb, but they provide the linkage between other third-party proliferators. Among these, most significantly, Burma — though it is not yet fully into proliferation activity — seems to be the most likely country in this region. Some experts have argued that the North Korea-Myanmar defence cooperation comprises only conventional arms technology, rather than

39. Michael S. Malley, "Prospects for Nuclear Proliferation in Southeast Asia, 2006-2016," in Lavoy, n. 11, pp. 173-184.
40. Ibid., p. 175.
41. Ibid., pp. 173, 176.

high-technology weaponry.[42] However, Burma needs to pay attention to its changing strategic posture.

Nuclear proliferation in Asia is not only dependent on the classic bilateral network, but also forms a nuclear linkage under a new centre. A small proliferator is not able to set up shop without political back-up. Overall, a couple of small proliferators have succeeded in becoming part of more sophisticated linkages, which the non-proliferation regimes and sanctions have failed to address.

Fig. 3: Fission of Proliferation Centre



NUCLEAR NON-PROLIFERATION INITIATIVES: SOLUTIONS

The global restrictions on nuclear non-proliferation are based on the nuclear technology, materials and scientists.[43] According to Trevor Mcmorris Tate (1990), in the first phase, from 1953 to 1974, it was observed that the nuclear policy had shifted from a secret one to an openly debated one due to the strong desire among the states which want to adopt nuclearisation for various reasons, mainly security and defence issues. The second phase was from 1975 to 1980 and emphasised that the

42. Bertil Linter, *Asia Times*, July 19, 2006, http://www.burmanet.org/news/2006/07/19/asia-times-myanmar-and-north-korea-share-a-tunnel-vision-bertil-lintner/
43. Trevor Mcmorris Tate, "Regime-Building in the Non-Proliferation System," *Journal of Peace Research* 27(4), 1990, pp. 399-411.

If nuclear proliferation is inevitable, like many say, then it needs to be part of well-planned security cooperation.

proliferation of nuclear technology would cause significant danger to the world. The states, led by the P-5, have tried to prevent the spread of nuclear technology. This has continued in the third phase, from 1981 to the present. The world is concerned about both nuclear technology proliferation and those who can develop new nuclear technology quickly. The current period is focussed on the efficient restraint of non-proliferation of the technological basis of the nuclear fuel cycle, especially the enrichment phase or separation of plutonium, and accumulation of plutonium. This is an exceedingly sensitive issue related to the acceptance of international safeguards and controls of nuclear exports. Since the 1990s, the global concern with regard to managing proliferation activity has focussed on the non-proliferation regime and counter-proliferation policy, rather than on the traditional deterrence theory.[44] So far, 188 countries, including the P-5 countries, have joined the discussion on this issue through the NPT Review Conference.

However, academics, strategic thinkers and policy-makers have differing perceptions of the danger of the situation. Barry R. Schneider argues that theorists and policy-makers have different kinds of opinion on the nuclear proliferation danger regarding two questions: whether nuclear proliferation is inevitable and whether nuclear proliferation will lead to a good or bad outcome?[45]

Accordingly, as shown in Table 1 below, the groups are divided broadly into two, based on their viewpoints on the question of whether nuclear proliferation is inevitable. Those who agree that nuclear proliferation is inevitable are sub-categorised in what will come after it happens. Pro-proliferationists believe that the international security environment can be stabilised if the entire world possesses equal nuclear capability. The

44. Barry R. Schneider, "Nuclear Proliferation and Counter-Proliferation: Policy Issues and Debate," *Mershon International Studies Review,* 38, 1994, pp. 209-234.
45. Peter D. Feaver and Emerson M. S. Niou, "Managing Nuclear Proliferation: Condemn, Strike, or Assist?", *International Studies Quarterly* 40(2), 1996, pp. 209-233.

proliferation optimists say that the worst case would be an all-out war. But that can be managed by the states' rational choice, even though nuclear proliferation is unavoidable. However, proliferation pessimists have a different opinion on this issue. They argue that the spread of nuclear weapons is fatal and would ultimately lead the world towards apocalypse or a nuclear winter. However, they also feel that nuclear proliferation is unstoppable, unmanageable and unavoidable.

Table 1: Different Viewpoints on Nuclear Proliferation

		Is Proliferation Inevitable?	
		Yes	No
Probable Outcome	Good	Pro-proliferationists (will lead to deterrence)	Non-proliferation optimists (can win over proliferation)
	Mixed	Proliferation optimists (worst outcomes can be managed)	Selectivists (prevent/punish rogue states, but permit stabilising spread)
	Bad	Proliferation pessimists (will lead to use of nuclear weapons with disastrous results)	Universalists (must prevent all further nuclear proliferation)

Resource: Barry R. Schneider, "Nuclear Proliferation and Counter-Proliferation: Policy Issues and Debate", *Mershon International Studies Review*, 38, 1994, p. 209-234.

On the other hand, those who disagree about the inevitability of proliferation are also sub-categorised into three groups. The non-proliferation optimists predict that nuclear proliferation can be stopped and rolled back based on the appropriate negotiations among governments. They give the example of those states which are developing nuclear weapons and have agreed to halt their nuclear programme for the maintenance of the international order. The selectivists offer different solutions to different states. They argue that the proliferation sanctions will apply only to those states already pointed out as being proliferators, and against international peace. Finally, the "universalists" oppose all kinds of nuclear proliferation

acts and feel nuclear proliferation should be totally stopped, since the world will be in danger.

If nuclear proliferation is inevitable, like many say, then it needs to be part of well-planned security cooperation. In other words, there is a couple of troublesome issues because of the approach of, and regulations under, the non-proliferation regime. It actually needs to monitor potential proliferators and focus on who can and will develop dangerous arsenals which can cause another link of proliferation. If other conditions remain the same, then clearly no proliferator will go in for identified proliferation activity. Yet it is better to keep predictable proliferation under surveillance, rather than ignore it.[46] The non-proliferation regimes hinder international consensus-based norms, treaties and trans-national policies.

In fact, the nuclear non-proliferation regime aims to arrest the main drive that instigates a nation to attempt developing nuclear weapons. Based on several aspects on nuclear proliferation, it is suggested that distinct diplomatic pressure should be applied to different states. According to the proliferation determinists, only extreme measures on this issue can work against actual proliferation activities. With the end of the bipolar world order and the emergence of multipolarity, the possibility of traditional deterrence has been uncertain mainly owing to the increase in the number of state and non-state actors. Both regionally and bilaterally, the way to cooperate has changed in the changing environment. However, it is clear that 9/11 was a watershed in international security. One interesting argument is that "current proliferators are neither as 'dead set' on proliferating nor as advanced in their nuclear capabilities as the determinists claim"[47]. In other words, the US' grand bargain is positive to boost civil nuclear cooperation between the US and those that are either accepted by the US or condoned by the international community. Yet, it is criticised as an indication to others who are defiant of the US, that they would not be listened to, or offered such a status as long as they remain adamant. Irrespective of all this bargaining, a few states follow an ambiguous standard in which the atomic weapons

46. Ibid., p. 210.
47. Alexander H. Montgomery, "Ringing in Proliferation : How to Dismantle an Atomic Bomb Network," *International Security*, 30(2), 2005, pp. 153-154.

programme is camouflaged under the name of peaceful nuclear technology.[48]

In fact, the major reason why the non-nuclear states have followed the international restrictions by giving up the nuclear option is that they expect to profit from the cost-benefit and security considerations in a threatening and pressurising international environment. Some states which do not have nuclear weapons but have the capability to acquire them within a short time also have refrained from doing so due to the political cost-benefit calculus which makes it reasonable to do so.[49] In other words, we cannot say that these countries have compromised on their national security — rather they have opted for a different type of security guarantee: collaboration through diplomatic channels, alliances or under the nuclear umbrella. However, this regime is only intended to freeze global nuclear development, accumulation and proliferation for military purposes (though there are several distinguishable cases), which is opposed by the *de facto* nuclear states as well as the nuclear club. For example, one of the arguments on the NPT is that this treaty has been ambiguous when its provisions have been applied to the development of a nuclear facility for states unilaterally termed as "pariah" or "rogue".[50]

Some states which do not have nuclear weapons but have the capability to acquire them within a short time also have refrained from doing so due to the political cost-benefit calculus which makes it reasonable to do so.

The two cases — proliferation in a grand ally and proliferation in the small states — reveal the differences of approach in the non-proliferation regime. Moreover, while several major powers are determined to deny states like North Korea and Iran (termed the 'axis of evil' or 'rogue states'), almost all are enthusiastic to offer NPT members their support in their

48. William Walker, "Nuclear Order and Disorder," *International Affairs,* 76(4), 2000, pp. 703-724. See also, Jack I. Garvey, "A New Architecture for the Non-Proliferation of Nuclear Weapons," *Journal of Conflict & Security Law,* 12(3), 2008, pp. 339-357.
49. Michael Ruhle, "Enlightenment in the Second Nuclear Age," *International Affairs,* 83(3), 2007, pp. 511-522.
50. S. Robert Litwat and Robert Litwak, *Rougue States and U.S. Foreign Policy: Containment After the Cold War* (Baltimore: The Johns Hopkins University Press, 2000), p. 198.

endeavour to develop civil nuclear programmes, despite their criticism of the biased standard of the NPT. To many scholars, the differential attitude of the major powers towards different states is simply based on hegemonic interests.[51] In another example, UN Security Council Resolution 1540 calls for all states to criminalise proliferation to non-state actors and to manage and modify the export control regime effectively. It was proposed in 2003 by the US government, to alarm the UN member states to fill the loopholes in the NPT regime.[52]

However, it cannot be said that the nuclear non-proliferation regime has not achieved anything. The nuclear non-proliferation regime has had partial success. Initially, the targets of the nuclear proliferation regime were China, West Germany and Japan.[53] After the non-proliferation regime evolved, a number of issues were raised, such as how to assuage the fears regarding security, to stop proliferation activity. A survey of the literature on the monitoring of nuclear proliferation shows how the counter-proliferation policy can be evaluated in order to determine whether it has been successful, has failed or is pending.[54] Success implies a decrease and a rollback of proliferation, or successful global efforts in deterring proliferation. For example, the establishment of NATO, implementation of the NPT, discouragement of South Korea's and Taiwan's nuclear initiatives, establishment of the MTCR (Missile Technology Control Regime), rollback of Argentina's and Brazil's nuclear programme, reduction of the US-Soviet nuclear arsenal under Article VI of the NPT, etc. Therefore, in this view, there has been no nuclear war since 1945. These initiatives are regarded as successful ones to check global nuclear proliferation. In spite of these successful efforts, some cases have proved unsuccessful. According to Dunn, nuclear starters such as France, UK, China, Israel, India and Pakistan fall in

51. William Walker, "The Breakdown of WMD Order," *Strategic Studies,* 44(370), 2004, pp. 47-59.
52. http://www.twq.com/05spring/docs/05spring_albright.pdf
53. Oran R. Young, "Chinese Views on the Spread of Nuclear Weapons," *The China Quarterly*, 26, 1966, p. 138.
54. Lewis A. Dunn, "Countering Proliferation: Insight from Past Wins, Losses, and Draws" in Lavoy ed., n. 11, pp. 47-58.

the unsuccessful category. Also, at a later stage, two countries known as violators – North Korea and Iran – are still striving for a nuclear arsenal. Lastly, some other cases are pending in the "draw" category. For example, the United Nations Security Council (UNSC) engagement on Iran and the Cooperative Threat Reduction agreement with Russia. Some countries are argued to have brought some kind of expectation for the non-proliferation regime. Owing to the stringent IAEA safeguards and international reaction over the nuclear weapons programme, it is hoped that the proliferation process would slow down.

As is pointed out, a security dilemma is an inevitable problem that every state faces. It is difficult to maintain constant stability between rivals. There are more variables since a region is the unit between the state system and the international system where a constant intersection of security interests of different nations takes place. Regardless of the concept of stability-instability where a region is viewed as a subordinate piece of international politics, it is clear that rivalry in a region is considered a prominent factor in nuclear proliferation. It is of prime importance to understand how environmental concerns affect nuclear decision-making. The regional angle of the nuclear issue comprises one package of the global nuclear proliferation debate. For this reason, it is relevant to further analyse and compare nuclear proliferation issues within the context of Asia in the future.

CONCLUSION: FUTURE OF NUCLEAR PROLIFERATION

The issue of nuclear proliferation is not a stand-alone phenomenon; rather, it has given rise to other related issues, such as counter-proliferation, restraint regimes, and so on.[55] Owing to increasing nuclear stockpiles with the new nuclear weapon states, over nuclear proliferation concern seems to be as widespread as it was earlier and the danger of further spread has not faded. Especially, the pattern of proliferation, where the proliferation centre is moving, needs a fresh look. No doubt, both the USA and Russia have mutually reduced their stockpiles but the proliferation pattern may become more complex owing to the expansion of the weapons programmes among

55. Montgomery, n. 47, p. 181.

As seen, transfer of nuclear technology and material has been initiated from the nuclear-capable countries. During the initial period, nuclear information was shared by the superpowers secretly through bilateral linkages on ideological lines.

new proliferators. Therefore, in future, the hub made by small proliferators would be intensive and would expand.

As seen, transfer of nuclear technology and material has been initiated from the nuclear-capable countries. During the initial period, nuclear information was shared by the superpowers secretly through bilateral linkages on ideological lines. It was effective to maintain a circle of allies against a focussed enemy. This strategy saw the emergence of the small proliferators but now they have been put out of the orbit in the post-Cold War period, with the disintegration of the USSR. However, the nuclear non-proliferation regime has evolved and partially succeeded in containing the spread of nuclear weapons technology, even though a few states have managed to cross the threshold. Partly, both the superpowers are responsible for either helping, or turning a blind eye towards, the new nuclear weapons activities of their client states. Many countries that were not part of the blocs followed an independent path by resisting pressure from the regime as well as the major powers.

The second phase of proliferation demonstrates how small proliferators have become organised into a group, and developing a linked assembly line. The Pakistan and North Korea connection is an example in this case, in that one customer of the Khan network has become a new hub. Now, the new periphery around the North Korean nuclear hub consists of Myanmar, Syria and Iran. It is a matter of speculation whether these countries would really defy the non-proliferation norms and come out successful in reaching the nuclear threshold. Regarding the pattern of proliferation of this new hub, it is not clear how the next proliferators will grow, who they will be and where they will go.

Danger of Imitated Strategy

Historically, it is observed that nuclear aspirants may adopt a strategy similar to that of the other nuclear weapon states, by posturing nuclear ambiguity and secrecy. They have been successful in achieving a level of nuclear weapons capability. Israel's status is still shrouded in mystery as it has never tested a device nor has it openly declared its nuclear weapon status. India, on the other hand, has maintained an ambiguous strategy for long even though it tested its first device in 1974. It has always maintained that it is not interested in acquisition of nuclear weapons. But in 1998, it overtly declared itself a nuclear weapon state by testing more devices. Pakistan, as was expected, followed India's actions by testing five devices. Two other countries with potential to cross the threshold are South Korea and Japan that have substantial nuclear capabilities and the regional situation is complicated enough for them to consider a nuclear deterrent. But what method or model they will follow is unknown. Whether they will follow the security compulsion justification and go nuclear overtly or maintain an Israeli-type of strategy is a matter of speculation.

Two other countries with potential to cross the threshold are South Korea and Japan that have substantial nuclear capabilities and the regional situation is complicated enough for them to consider a nuclear deterrent.

Innovative Strategy

However, it is certain that the future proliferators would not follow the same methods that have so far been followed by others. Each country devises its own strategy and method to initiate, and move on for, the acquisition of nuclear weapons. When Pakistan intended to acquire them, it followed the route which the non-proliferation regime was not aware of. Particularly those countries that are considered irresponsible and have built up an image as future proliferators in the comity of nations would follow innovative ways to acquire nuclear weapons to avoid the prevailing restrictions. The question is whether the non-proliferation regime is equipped to visualise and address those loopholes which the future proliferators would exploit.

This study assumes that if small countries or a third party helping nuclear aspirants decide at some point to go for nuclear weapons, they would not follow the path followed so far by others. But to sustain their efforts and successfully acquire nuclear weapon, two conditions must be present: (1) the new hub they are linked to must be strong enough to sustain the supply; (2) they must have the wherewithal to sustain the pressure exerted by the international regime and the system. Whether this scenario is likely and how quickly it will take place is a subject of academic analysis only.

As a matter of fact, though the issue of nuclear proliferation is subject to speculation and value judgement, the intention to acquire nuclear weapons is linked to psychology as well as security. Of course, the "advent of new nuclear weapon states will remain a rare occurrence"[56] but it may take place in two sets of countries, as identified above. The first group comprises the relatively responsible actors of the international community, and if they decide to go for nuclear weapons, they would face a relatively mild international reaction, whereas the other group would face a punitive reaction. However, the assertion that they "will be identified in time and thus, potentially, contained"[57] will remain a subject of an idealistic world view. Non-proliferation is unsustainable till such time all nuclear weapon states accept universal disarmament.

56. Jacques E. C. Hymans, "Theories of Nuclear Proliferation: The State of the Field," in Lavoy ed., 2007, No. 11, p. 30.
57 Ibid.

UNDERSTANDING CHINA'S MILITARY STRATEGY: A STUDY OF THE PLAAF

SHIKHA AGGARWAL

As the air force continues to develop, its functions in modern warfare will continue to increase. It not only can influence and change campaign and battle conditions, but can influence and change strategic conditions.

— Kenneth W. Allen, Glenn Krumel and Johnanthan D.Pollack, *China's Air Force Enters the 21st Century*

National security strategies are embedded in a country's historical experiences and it geo-political perceptions, as they shape a country's view of its security environment, and thereby guide its national security objectives. These strategic security objectives are further expanded by a country's ever growing national interests, and the degree of its engagement with international politics. Capabilities—existing as well as intended—constitute a crucial element of national security strategies, as they guide the operational as well as aspirational component of a military doctrine. Therefore, it can be deduced that national security strategies offer an interplay among historical experiences, geo-political perceptions, expanding national interests and capabilities of countries.

The doctrine of people's war that dominated Mao's China was

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predominantly defensive in nature and relied on defending China from attacks by using large numbers of troops armed with low-tech weapons to overwhelm an adversary through quantity rather than quality of personnel and weaponry.[1] In such a war, the army, along with the paramilitary forces, would work with the populace to engage in both conventional and guerrilla operations to overextend adversary forces. Once this occurred, conventional troops would attack and destroy isolated groups of enemy soldiers[2]. Mao's dictum of 'luring the enemy in deep' did not entail any scope for the air power missions of anti-access, area denial, and forward projection. As such, it can be assumed that during the initial years of its formation, China did not have an effective air power strategy.

The Cultural Revolution (1965-76) and the Sino-Soviet split (1960) further had deteriorating effects on China's defence modernisation. With the launch of Deng Xiaoping's "Four Modernisations" strategy in 1978, defence modernisation was formally recognised as the fourth priority sector in China's reconstruction. The acute interdependence between the priority areas of this strategy for the first time linked China's defence modernisation to its economic progress, and advancement in science and technology. The emphasis on science and technology laid the foundations for Research and Development (R&D) in the defence sector to enable China to achieve self-reliance in military hardware. Post 2003, China's defence sector moved into profit, and is now recognised as one of the most profitable sectors of the Chinese economy[3]. Therefore, it can be deduced that the "Four Modernisations" provided China with a platform to develop a modern warfare strategy.

The Gulf War of 1991 demonstrated to the world the air power advantages of initiative, rapidity, and surprise, and enthused the Chinese with their own need for advanced military technologies, especially combat

1. *Annual* Report to Congress on the Military Power of the People's Republic of China (Washington, DC: Department of Defence, 2006), p. 17.
2. Handbook on the Chinese Armed Forces, 1-7. Here cited from Erik Lin-Greenberg, "Offensive Air Power with Chinese Characteristics: Development, Capabilities and Intentions," *Air and Space Power Journal*, September 2007.
3. *The Military Balance 2010*, IISS.

aircraft and airborne command and control capabilities.[4] Since the 1990s, the air force has been in a phase of rapid development. At the strategic level, the People's Liberation Army Air Force (PLAAF) now aspires to evolve into a modernised strategic air force, capable of conducting offensive air power missions of air-strikes, long-range precision attacks, and strategic projection[5]. In order to achieve its desired objective, the Chinese Air Force has begun deploying third generation combat aircraft, third generation ground-to-air missiles, and a series of relatively advanced and computerised weapons and equipment.[6]

The increasing importance of the air force in China's military hierarchy can also be traced through these political developments[7]: since 2004, the Commander of the PLAAF (along with the Commander of the PLA Navy and Second Artillery) has been a member of the Central Military Commission (CMC), In 2003, PLAAF Lt Gen Zhengn Shenxia became the first air force officer to be appointed as the head of the Academy of Military Science (AMS), In 2006, PLAAF Lt Gen Ma Xiaotian became the first air force officer to be appointed as the Commandant of the PLA National Defence University (NDU), In 2007, Ma became one of the Deputy Chiefs of the General Staff with the portfolio of intelligence and foreign affairs for the PLA. Further, in the last few years, PLAAF general officers have also been appointed to various positions in the General Political Department (GPD) and General Logistics Department (GLD). Hence, they are being involved in developing PLA policies to a greater degree than in the past.

In order to develop a comprehensive understanding of the PLAAF's strategy, this paper shall endeavour to determine the close relationship between the PLAAF's historical foundations, strategic evolution (with

4. Kenneth W. Allen, Glenn Krumel and Johnanthan D.Pollack, *China's Air Force Enters the 21st Century* (Santa Monica: RAND, 1995), Ch.2, p. 32.
5. *China's National Defence in 2008,* White Papers on national defence published by the Government of the People's Republic of China, issued by the State Council, Beijing, www.china.org, January 2009
6. *China's National Defence in 2010,* White Papers on national defence published by the Government of the People's Republic of China, issued by the State Council, Beijing, www.china.org, March 2011
7. Facts for this section are taken from *People's Liberation Army: Air Force 2010,* National Air and Space Intelligence Centre, Wright-Patterson Air Force Base, Ohio.

respect to key security concerns), and its force modernisation.

Air power and precision strikes would be the primary means of conducting warfare, with ground operations playing a secondary role.

LOCATING AIR POWER IN CHINA'S MILITARY STRATEGY

China's current military doctrine is referred to as "local wars under informationized conditions."[8] Under this doctrine, the Chinese believe that the future wars would be limited, regional conflicts, rather than all-out or total wars. Information superiority is regarded as the most crucial element of these wars. Such conflicts will be governed by the following characteristics:[9]

- Such a war will be fought with *highly trained joint forces using mostly long-range, precision-strike weapons*.
- The objective in such warfare is to defeat the enemy by *inflicting strategic and operational paralysis through attacks on his weaknesses*. In fact, *it may be possible to defeat the enemy with one strike.*
- This multi-dimensional war will unfold in all dimensions (air, sea, ground, space, and the electromagnetic spectrum) simultaneously, and *the battlefield will be extremely fluid and dynamic.*
- Air power and precision strikes would be the primary means of conducting warfare, with ground operations playing a secondary role.[10]

Further, according to this doctrine, there are five types of local wars on which the PLA should focus:[11] (1) small-scale conflicts restricted to contested

8. *China's National Defence in 2004*, White Papers on national defence published by the Government of the People's Republic of China, issued by the State Council, Beijing, www.china.org, December 2004.
9. This section draws from Lt. Col Thomas R. McCabe USAFR, "The Chinese Air Force, Air and Space Power," *Air and Space Power Journal*, Fall 2003, September 2003.
10. In December 1995, the Central Military Commission—the Communist Party organisation that oversees the military— concluded that the ground battle was now secondary to the air battle. See Mark Stokes, "China's Missile, Space, and Conventional Theater Missile Development: Implications for Security in the Taiwan Strait," in Susan M. Puska, ed., *People's Liberation Army after Next* (Carlisle Barracks, Pa.: Strategic Studies Institute, US Army War College, 2000), 109. Here cited from R. McCabe n. 9.
11. Allen, et. al., n. 4, Ch.2, p. 29.

border territory; (2) conflicts over territorial seas and islands; (3) surprise air attacks; (4) defence against deliberately limited attacks into Chinese territory; (5) "punitive counter-attacks" launched by China into enemy territory to "oppose invasion, protect sovereignty, or to uphold justice and dispel threat."

A successful resolution of any of these conflicts would critically depend upon rapid power projection, precision strikes, and long-range assaults, and application of an effective air power strategy aimed at achieving air supremacy.

In terms of defence planning, **this conceptualisation of war scenarios translates into three major theatres of operation**: **Taiwan** (to uphold sovereignty); **South China Sea** (to uphold claims on contested seas and islands); and **India** (to restore China's claims on the Indian state of Arunachal Pradesh. Here India forms the only category as China has peacefully resolved its territorial disputes with other neighbouring countries). In all these future conflicts, air power would be the preferred mode of military engagement, as owing to the distance factor and the difficulty of the terrain, it is more time-consuming to move and deploy large ground formulations. **A successful resolution of any of these conflicts would critically depend upon rapid power projection, precision strikes, and long-range assaults, and application of an effective air power strategy aimed at achieving air supremacy.**

As contained in the Defence White Paper 2006, the PLAAF is now moving from territorial air defence to both offensive and defensive operations, and increasing its capabilities for carrying out reconnaissance and early warning, long-range precision strikes, air and missile defence, and strategic projection. All these mission statements entail air combat roles of strategic air defence, close air support, interdiction, strategic bombing, and tactical or strategic airlift.

The strategy of active defence is primary to the Chinese warfare doctrine. Active defence emphasises on "*taking the initiative to prevent and defuse crises,*

It can be concluded that any air power strategy that entails active defence as its basic concept, and aims to achieve command of the air, would be essentially offensive in character.

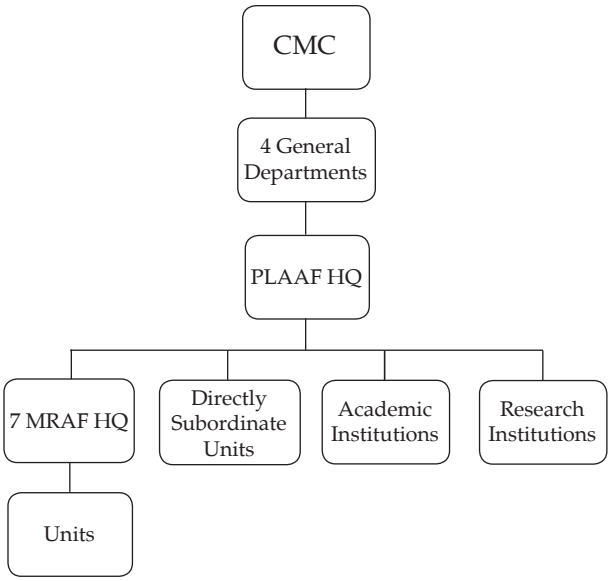
and deter conflicts and wars."[12] A reflection on China's involvement in the Korean and Vietnam Wars, and its attacks on India (1962) and Vietnam (1979) further guide us towards the prevalence of the element of preemption in Chinese strategic thinking. However, it should be noted that the 2010 National Defence White Paper, issued by the Chinese government categorically states that China pursues a military strategy of "attacking only after being attacked."

The 2004 National Defence White Paper declares that China is building its capabilities to *"win both command of the sea and command of the air."*[13] **Therefore, it can be concluded that any air power strategy that entails active defence as its basic concept, and aims to achieve command of the air, would be essentially offensive in character.**

The PLA and consequently the PLAAF use the concept of *campaigns,* to define their roles and missions. A campaign is defined as a series of battles fought under a unified command to achieve a local or overall objective.[14] The PLAAF describes a campaign as "using from one to many aviation, air defence, or airborne units to carry out a series of combined battles according to a general battle plan to achieve a specified strategic or campaign objective in specified time."[15] The basic concept of the air force campaign is "active initiative," which focusses on turning a passive posture into an active posture and defence into offence.[16]

12. *China's National Defence in 2006*, White Papers on national defence published by the Government of the People's Republic of China, issued by the State Council, Beijing, www.china.org, December 2006
13. *China's National Defence in 2004*, White Papers on national defence published by the Government of the People's Republic of China, issued by the State Council, Beijing, www.china.org. December 2004\
14. Wang Houquing and Zhang Xingye, eds., *The Science of Campaigns* (Beijing: National Defence University Press, 2000), especially chap. 1. Cited here from McCabe, n. 9.
15. Allen, et. al., n. 4, Ch. 6. p. 107.
16. Ibid., Ch.2, p. 29.

Fig 1: Organisational Structure[17]



As depicted in Fig. 1, the PLAAF is under the leadership of the Central Military Commission (CMC), and the four General Departments (General Staff Department, General Political Department, General Logistics Department and General Armament Department). The PLAAF Headquarters is the highest leadership organisation in the PLAAF. The headquarters is located in Beijing, and is organised into four first-level departments— Headquarters Department, Political Department, Logistics Department, and Equipment Department.

The PLAAF Headquarters leadership consists of the following personnel:

- Commander.
- Political Commissar.
- Four Deputy Commanders.
- Two Deputy Political Commissars.
- Chief of Staff, who is the director of the Headquarters Department.

17. This section draws from *People's Liberation Army: Air Force 2010,* National Air and Space Intelligence Center, Wright-Patterson Air Force Base, Ohio.

- Director, Political Department.
- Director, Logistics Department.
- Political Commissar, Logistics Department.
- Director, Equipment Department.
- Political Commissar, Equipment Department.

The Headquarters Department is the highest level functional and administrative organisation within the PLAAF Headquarters. Its primary responsibilities include managing air force unit deployments, battlefield development, and combat command. It is also responsible for the PLAAF's organisational structure, personnel management, enlisted force personnel records, intelligence, communications, radar, air traffic control, and weather support, as well as researching air force military theory, and managing education and safety. The leadership of the PLAAF's Headquarters Department includes the Chief of Staff, who is the department Director, and several Deputy Chiefs of Staff. The Headquarters Department's primary **second-level departments** are:

- General Office.
- Directly Subordinate Work Department.
- Operations Department.
- Intelligence Department.
- Communications Department.
- Military Training Department.
- Military Affairs Department.
- Ground-based Air Defence Troops Department.
- Electronic Countermeasures and Radar Department.
- Air Traffic Control Department.
- Military Theory Research Department.
- Pilot Recruitment Bureau.
- Technology Bureau.
- Weather Bureau.
- Flight Safety Bureau.

The Political Department is the highest level functional and administrative organisation within the PLAAF Headquarters for political work. The Political Department is responsible for officer personnel records, propaganda, security, education, cultural activities, civil-military relations, Party discipline, and Party organisations within the PLAAF. The leadership of the Political Department includes the Director and several Deputy Directors. The main **second-level departments** are:

- Headquarters Department.
- Organisation Department.
- Cadre Department.
- Propaganda Department.
- Security Department.
- Discipline and Inspection Department.
- Liaison Department.

The Logistics Department is the highest level functional and administrative organisation within the PLAAF Headquarters for logistics work. Its work includes overseeing transportation, finances, materials and supplies, and medical care. The leadership of the PLAAF's Logistics Department includes the Director, Political Commissar, Deputy Directors, Deputy Political Commissar, Chief of Staff (i.e., director of the Headquarters Department), and the Director of the Political Department. The **main second-level departments** are:

- Headquarters Department.
- Political Department.
- Finance Department.
- Quartermaster, Materials, and POL Department.
- Health Department.
- Military Transportation Department.
- Airfield and Barracks Department.
- Directly Subordinate Supply Department.
- Air Force National Defence Engineering Development.
- Command Department.

- Audit Bureau.
- Real Estate Management Bureau.
- Air Force Engineering and Design Research Bureau.

The Equipment Department is the highest level functional and administrative organisation within PLAAF Headquarters for equipment work, which comprises management, repair, and maintenance of all PLAAF weapon systems and equipment. The leadership of the PLAAF's Equipment Department includes the Director, Political Commissar, Deputy Directors, Deputy Political Commissar, and Director of the Political Department. The **main second-level departments** of the Equipment Department are:

- Comprehensive Planning Department, which also serves the function of a Headquarters Department.
- Political Department.
- Field Maintenance Department.
- Scientific Research and Procurement Department.
- Air Materiel Department.
- Aviation Engineering Management Department.
- Armament Common-Use Equipment Department.
- Air Force Armament General-Use Equipment Military Representative Bureau.

The seven Military Region Air Force (MRAF) Headquarters constitute the second tier of the organisational hierarchy. Each MRAF has subordinate air divisions Surface-to-Air Missile (SAM) brigades or regiments, and Anti-Aircraft Artillery (AAA) regiments, as well as radar, communications, and support units and sub-units.

The next tier consists of PLAAF units. The PLA defines units as organisations at the corps, division, brigade, and regiment levels. For example, air divisions and regiments, SAM brigades, and communications regiments are units.

The final tier includes sub-units. The PLA defines sub-units as organisations at the battalion, company, and platoon levels. Sub-units

can be either permanent, or they can be ad hoc organisations. Examples include communications, radar, vehicle, maintenance, or launch/firing sub-units. The PLA identifies this tier as the "grassroots" level.

From April 1950 to November 1952, the air force opened up 25 navigation routes across the Tibetan plateau; flew 1,282 sorties; and dropped 51 tons of supply.

PLAAF: COMBAT EXPERIENCE[18]

Experiences gained during combat situations are always critical to a military's strategic evolution, and its capabilities development. The PLAAF's combat history can broadly be divided into five broad periods: the struggle over Tibet (1950), engagement in the Korean War (from1950 to 1953), struggles with the Nationalist and US aircraft over the Taiwan Strait (1954-55, 1958, 1995-96) engagement in the Vietnam War (from 1965 to 1969), and the struggle with Vietnam (1979).

THE TIBETAN CAMPAIGN: 1950-52

In January 1950, the Military Commission ordered the PLA to send troops into Lhasa to 'liberate' Tibet.

As a result, the PLAAF established its transportation aviation troops, but only had one unit with 12 C-46 and C-47 transports located in Beijing with the capability to air-drop the supplies. Eventually, the air force deployed six of these aircraft plus four others from the Chengdu region to carry out the air-dropping operations. This unit soon acquired several II-12 transports from the Soviet Union and changed its name to the 13th Air Division. From April 1950 to November 1952, the air force opened up 25 navigation routes across the Tibetan plateau; flew 1,282 sorties; and dropped 51 tons of supply

THE KOREAN WAR: 1950-53

China refers to its engagement in the Korean War as the "war to resist

18. This section draws from an in-depth study of Allen, et. al., n. 4, and Ken Allen, "PLA Air Force Organization", available at http://www.rand.org/pubs/conf_proceedings/CF182/CF182.ch9.pdf

America and aid Korea." China refers to the PLA units that participated in the war as the Chinese People's Volunteer Air Defence Force (formed in 1950 and formally recognised as the fourth arm of the PLA in 1955 and christened the PLA Air Defence Force). The Chinese "volunteers" entered the Korean War in mid-October 1950 to defend China's interests on the frontier of its northeastern industrial base, and to solidify its alliance with the Soviet Union. The PLAAF was one of the primary air forces involved in the Korean War from the Communist side.

During its involvement in the Korean War, the PLAAF suffered major manpower casualties. The losses demonstrated that China needed to overhaul its military structure, and introduce modern concepts of war-fighting in its strategic thinking. Therefore, China's leaders decided to organise the military along the Soviet lines. As a result, by 1954, China established the National Defence Council, the Ministry of National Defence, and 13 Military Regions (MRs): Guangzhou, Chengdu, Fuzhou, Kunming, Lanzhou, Nanjing, Beijing, Shenyang, Jinan, Wuhan, Inner Mongolia autonomous region, Xinjiang autonomous region, and Tibet autonomous region. The number of MRs was reduced to eleven in 1970 and to seven in 1985. The war enabled the PLAAF to establish a command organisation, and to repair and build suitable airfields.

Most importantly, as a result of the structural streamlining, the Air Defence Force was merged with the PLAAF in 1957. The war also enabled the PLAAF to recognise its inability to provide support to the ground forces.

The PLAAF inventory expanded very rapidly, following its foray into the Korean War. By late 1952, the PLAAF had acquired 1,485 aircraft opposite Korea, including 950 jet fighters, 165 conventional fighters, 100 Il-28 jet bombers, 65 conventional light bombers, 115 ground attack planes, and 90 transports. These combat aircraft were largely provided by the Soviet Union.

THE TAIWAN STRAIT CRISIS: 1958

Though the PLA was not able to exert control over the Quemoy or

Matsu Islands, it now had a permanent presence opposite Taiwan as a result of the crisis. Further, the Nationalists no longer controlled the air space over Fujian, and eastern Guangdong.

One of the major reasons for the failure of the PLAAF during the crisis was attributed to the lack of coordination between the fighter forces and the ground-based defence forces.

In spite of this huge deployment, the PLAAF was not able to provide direct support to the ground forces or to gain air superiority.

Despite its developing friction with the Soviet Union, China continued to receive military assistance from Moscow. In 1958, China received its first SA-2 missiles from the Soviet Union.

SINO-VIETNAMESE BORDER WAR: 1979

The PLAAF established two fronts, northern and southern, for the border war with Vietnam. The northern front included the Shenyang, Beijing, Jinan, Lanzhou, and Xinjiang MRs. The southern front was composed of the Guangxi, Guangdong, and Yunnan MRs.

The Chinese stationed approximately 948 aircraft at the 15 air bases in Yunnan, Guangxi, Guangdong, and Hainan. In spite of this huge deployment, the PLAAF was not able to provide direct support to the ground forces or to gain air superiority. As a result, the PLAAF restricted its missions to early warning along the border, helicopter rescue missions, and air transport missions. The PLAAF did not fly any ground attack aircraft or bomber sorties during the conflict.

Further, the Chinese lacked in modern logistics supply mechanisms, and suffered from severe communication problems between the different units because of the deficiencies of the equipment.

The war with Vietnam enabled China to recognise the need for combined warfare operations and training, and to improve the effectiveness of its command and control set-up. Further, the Chinese also realised that the obsolete nature of the weaponry and equipment possessed by their armed forces severely restricted their combat capabilities.

DETERMINING A STRATEGY FOR THE PLAAF

According to Liddle Hart, a strategy can be defined as the "art of distributing and applying military means to fulfill the ends of a policy." In the case of China, these ends can be described as the attainment of its core national security interests[19]. Consequently, the PLAAF describes its responsibilities as safeguarding the country's territorial air space, protecting territorial sovereignty, and maintaining a stable air defence posture nationwide.[20]

The PLAAF has five branches under its command: aviation division, ground-to-air missile division (SAMs), anti-aircraft artillery (AAA), radar and communication[21]. The aviation branch is regarded as the basic tactical unit of the air force. It is composed of fighters, attackers, fighter-bombers, bombers, transports and combat support aircraft.[22] The PLA's airborne troops belong to the air force, but are not considered a branch.[23]

Inclusion of the SAMs and AAA under the PLAAF's responsibilities indicates that the Chinese Air Force is entrusted with the twin missions of aerial combat, as well as ground-based air defence of China. Further, all National Defence White Papers issued by China so far, posit an increased thrust on the development of joint warfare capabilities, as well on establishing a unified command and control system. These developments indicate that the PLAAF is building its capabilities to be able to provide direct or close air support to the ground and naval forces in future warfare scenarios. Though, as mentioned earlier, it needs to be

19. As contained in the Defence White Paper, 2006, China's core national objectives are described as: resisting aggression and promoting national reunification; to defend national sovereignty, territorial integrity and maritime rights of China ; to promote economic growth and thereby steadily increase the overall national strength of China
20. *China's National Defence in 2008*, White Papers on national defence published by the Government of the People's Republic of China, issued by the State Council, Beijing, www.china.org, January 2009
21. *China's National Defence in 2008*, White Papers on national defence published by the Government of the People's Republic of China, issued by the State Council, Beijing, www.china.org, January 2009
22. *China's National Defence in 2006*, White Papers on national defence published by the Government of the People's Republic of China, issued by the State Council, Beijing, www.china.org, December 2006
23. Allen, et. al., Ch. 6. p. 101.

noted that the PLAAF has not provided successful direct support to the ground forces in any of the battles that China has fought till date. Most scholars attribute this failure to the limited capabilities of the Chinese attack and bomber force, and a lack of communication coordination with the ground forces.

Furthermore, establishment of a unified command and control would enable the PLAAF to conduct independent operations by facilitating combined operations within the various branches of the PLAAF.

The air force has an air command under its control in each of the seven MRs of Shenyang (northeast), Beijing (north), Lanzhou (west), Jinan (centre), Nanjing (east), Guangzhou (south) and Chengdu (southwest). A military area command is mainly in charge of formulating programmes and plans for combat readiness and operations of troops in the theatre and for the reserve force build-up of the theatre, organising and commanding joint theatre operations involving different Services and arms, and providing joint logistical support[24]. A closer scrutiny of these MRs reveals that they all are located within close proximity of China's potential conflict zones: Shenyang near the Korean peninsula, Lanzhou in Xinjiang, Jinan near the Yellow Sea, Nanjing near Taiwan, Guangzhou near the Hainan Islands in the South China Sea, and Chengdu near India. It is critical to note that the Chengdu Military Region was involved in the Indo-China War of 1962, though both sides refrained from employing the air force or the navy in the battle.

24. *China's National Defence in 2006*, White Papers on national defence published by the Government of the People's Republic of China, issued by the State Council, Beijing, www.china.org, December 2006.

Fig 2

Source : http://upload.wikimedia.org/wikipedia/commons/e/e9/China_military_regions.jpg

This kind of military planning serves in the development of a rapid reaction strategy in the Chinese military-strategic thinking. Development of rapid reaction forces is also consistent with the strategy of active defence. More importantly, the airborne forces of the PLAAF are trained as 'fist' units or rapid response units that are capable of being deployed anywhere in China within 12 hours.[25] In order to carry out missions in distant territories, the rapid reaction units would need to develop advance airlift and air refuelling capabilities.

25. Allen, et. al., n. 4, Ch.2, p. 30.

As part of the rapid reaction strategy, the PLAAF trains for three kinds of air force campaigns[26]: The **offensive air campaign** employs air strikes on enemy territory to suppress or destroy enemy air defences and to attack both strategic and campaign level targets. The **air defence campaign** seeks to establish air superiority over the war zone through several measures, including deterrence based on denial, resisting attack by targeting hostile intelligence and service platforms, and launching timely counter-strikes against enemy air bases and support assets. The **air blockade campaign** is designed to effect political coercion against the enemy via means such as air strikes that target ports and navigation routes. In addition, the PLAAF has major roles in two joint Service campaigns: the *joint anti-air strike campaign* and the *airborne campaign*.[27]

The PLAAF has major roles in two joint Service campaigns: the *joint anti-air strike campaign* **and the** *airborne campaign.*

Further, according to Teng and Jiang (1990)[28], the air force plans to establish a rapid-reaction force within each theatre of operation. At the operational level, this would entail establishing an aviation division in each battle area. Each division would have three fighter regiments dispersed along the main attack routes, plus one ground attack regiment, one bomber regiment, one airborne early warning aircraft, one electronic counter-measures aircraft, and reconnaissance aircraft. These can change according to the battle situation.

As discussed by Kenneth W. Allen, Glenn Krumel and Johnanthan D. Pollack, as part of the rapid reaction strategy, the PLAAF has developed the concept of deploying its air defence forces according to the concept of **"light at the front and heavy at the rear"** along with the principle of deploying in three rings. Under this principle, the air force states that it should organise a small quantity of its interceptors, SAMs, and AAA as a combined air defence force into "three dimensional, in-depth, and overlapping" firepower rings.

26. Phillip C. Saunders and Erik Quam, "Future Force Structure of the Chinese Air Force," Project Muse, available at muse.jhu.edu/journals/asia_policy/v004/4.saunders.pdf
27. Ibid.
28. Cited in Allen, et. al., n. 4, Ch.2, p. 30.

Maintaining air superiority would be a critical factor in determining the outcomes of future conflicts. In order to gain air superiority in future conflicts, China would need to launch a sustained offensive air campaign against the enemy's capability to wage an air war.

Each weapon system would be assigned a specific air space to defend—high, medium and low. In-depth rings mean assigning each weapon system a specific distance from the target to defend—distant, medium or close. Overlapping rings means organising each weapon system into left, middle or right firepower rings facing the most likely avenue of approach. The elements of the ring should be deployed as follows:

- Interceptor units should be stationed at airfields on the left and right wings along the front tier and in depth, so that they can begin intercepting enemy aircraft as they cross the border and can continue to intercept them as they approach the target.
- The SAMs should be organised into fan-shaped rings, where they can operate independently and can concentrate firepower against attacking aircraft before they reach their bomb release points.
- AAA should be deployed into firepower rings in front of SAM placements, between SAM units, and between AAA and SAM units, to make up for blind spots.

Maintaining air superiority would be a critical factor in determining the outcomes of future conflicts. In order to gain air superiority in future conflicts, China would need to launch a sustained offensive air campaign against the enemy's capability to wage an air war. This realisation has begun to find resonance in the Chinese strategic thinking. An increased thrust on developing capabilities to execute strikes by long range precision guided munitions, and strategic projection reflects that in future warfare scenarios, China plans to conduct strategic paralysis of the adversary by launching precision strikes at the strategic installations/ centres (economic, military and political bases, command centres, communication and transport hubs, and troop concentration) of the enemy. These attacks would serve to delay

retaliation by the enemy forces, and thus provide China with the first strike advantage.

Further, in consonance with the operative military doctrine of "local wars under informationized conditions", the Chinese Air Force would aim to achieve information superiority by the induction of advanced air-surveillance systems into the force. As a move towards this direction, the 2010 Defence White Papers elaborates that the PLAAF has stepped up the development of new types of radar and command information systems.

Strategic projection would enable China to conduct successful area denial operations, and to project power beyond its borders. In operational terms, this can actually lead to acquisition of air bases by the PLAAF beyond the Chinese mainland. Such bases would also enhance China's tactical air capabilities, and reduce the dependence on air refuelling for long-range assaults. However, a closer scrutiny of the National Defence White Papers does not indicate any such immediate plans by the PLAAF.

According to Lt. Col Thomas R. McCabe[29], in future operations, any PLAAF strategy can either stand alone as an independent air force effort or, become part of an integrated joint campaign of surface-to-surface missiles, special operations forces, electronic and information strikes, and attacks by aircraft. The People's Republic of China (PRC) could aim such a campaign at either strategic-level or campaign-level enemy target systems.[30]

Therefore, the objectives of China's offensive air power strategy can be deduced as: defence of strategic territories, acquiring advanced technology to be able to *achieve air supremacy*; *creation of rapid reaction forces* to be able to end the conflict on desired terms; creating capabilities that allow *defence of 'strategic' territories.* Any force modernisation of the PLAAF would be sourced from these core objectives of China's air power strategy.

CAPABILITIES DEVELOPMENT

The Chinese offensive air power strategy intends to exploit air and space power's advantages of initiative, surprise, and rapidity. In order to conduct

29. McCabe, n. 9.
30. Ibid.

successful air operations, the PLAAF needs to develop an effective air intelligence network, including automated intelligence transmission facilities, a unified command and control, an effective airborne early-warning system, and high-tech weaponry, especially precision-guided weapons. Further, the PLAAF intends to modernise the air force along the lines of a rapid-reaction force.

The PLAAF's acquisition of aircraft can be divided into five periods[31]. The first period is derived from China's association with the Soviet Union. At the time of its birth in 1949, the PLAAF possessed a collection of 159 mixed vintage aircraft (remnants of the civil war) and 202 pilots[32]. With the signing of the Sino-Soviet Treaty of Friendship, Alliance and Mutual Assistance (1950), the PLAAF acquired some 3,000 aircraft by 1954.[33] The second period is marked by the disruptions in the Sino-Soviet alliance in 1960, and the Cultural Revolution phase that severely hampered the growth of the PLAAF.

The third period began following the 1979 border conflict with Vietnam. During this period, the PLAAF realised the shortcomings of the F-6 aircraft, and finally terminated the F-6 programme. Simultaneously, China started pumping in money into the F-7 and F-8 programmes. This led China to begin negotiations with the United States, resulting in a foreign military sales contract (known as the Peace Pearl Programme) in the late 1980s to upgrade the fire control system on the F-8II, with F-16 class avionics.[34]

The fourth period occurred during the 1990s. During this period, the PLAAF purchased Su-27s, Su-30s, and Il-76s from Moscow. The Shenyang Aircraft Corporation also began assembling and producing the Chinese-licensed copy of the Su-27, known as the F-11. The PLAAF deployed its first F-11s to an operational unit in 2000[35].

31. n. 17.
32. Air Cmde Ramesh V. Phadke, working Paper on "People's Liberation Army Air Force (PLAAF):Shifting Airpower Balance and Challenges to India's Security," Centre for International Security and Cooperation, Stanford University, 2002
33. Allen, et. al., Ch.3, p. 39.
34. n. 17.
35. Ibid.

The fifth period covers the 2000s. During this period, the PLAAF has deployed Chinese-produced FB-7s, F-10s, and K-8s, as well as modified B-6 bombers capable of carrying air-launched cruise missiles. Although China produces all of these aircraft, most of them either are based on foreign aircraft and technology or include key foreign components, such as the engines[36].

Today, China possesses 1,617 combat aircraft. These include 73 multi-role Su-30MKK aircraft, 116 J-11 (the Chinese assembled version of the Su-27) and some 120 Su-27 air superiority fighters.

Today, China possesses 1,617 combat aircraft. These include 73 multi-role Su-30MKK aircraft, 116 J-11[37] (the Chinese assembled version of the Su-27) and some 120 Su-27 air superiority fighters.[38] The Su-27 fighters, along with the employment of conventional Short-Range Ballistic Missiles (SRBMs), can be used for coercion or intimidation of enemy forces[39]. The Su-30MKK is the first PLAAF combat aircraft that is capable of delivering precision guided munitions in all weather conditions[40]. The Su-30MKK possessed by China are equipped with Phazotron ZHUK-M-S, which enables them to detect a destroyer at 300 km, a railway bridge at 150 km, and a group of moving tanks at 25 km[41]. These capabilities facilitate air-to-ground operations.

The PLAAF also operates more than 120 J-10 aircraft.[42] The J-10 is a multi-role fighter, equipped with aerial refuelling capabilities, which significantly improve its range and flexibility.[43]

36. Ibid.
37. n. 3.
38. n. 32.
39. Ibid.
40. Richard Fisher, Jr. "PLAAF Equipment Trends," Paper presented at the National Defence University Conference, on "PLA and Chinese Society in Transition" 2001, International Assessment and Strategic Centre.
41. Ibid.
42. n. 3.
43. Cited in Phillip C. Saunders and Erik Quam, "Future Force Structure of the Chinese Air Force," Project Muse, available at muse.jhu.edu/journals/asia_policy/v004/4.saunders.pdf\

At present, China possesses, more than 4,500 tactical missiles, comprising Anti-Aircraft Missiles (AAMs), Anti-Radar Missiles (ARMs), and Long Range Cruise Missiles (LRCMs).

The air-ground integrated operations are further complemented by the possession of over 600 SAMs[44] by the PLAAF. In order to conduct successful tactical air operations, the PLAAF is building up its artillery of tactical weaponry. At present, China possesses, more than 4,500 tactical missiles[45], comprising Anti-Aircraft Missiles (AAMs), Anti-Radar Missiles (ARMs), and Long Range Cruise Missiles (LRCMs).

Further, the PLAAF's inventory comprises up to 82 H-6/H-6E/H-6F/H6H bombers. Several scholars are of the view that owing to their vulnerability to modern warfare techniques, the H-6 bombers will be employed primarily as a stand-off platform to deliver cruise missiles from outside the reach of enemy air defence systems.

To maintain information superiority, China is planning to purchase 50 Airborne Warning and Control System (AWACS) planes from Russia.[46] The AWACS would provide the PLAAF with the necessary information dominance to better control and coordinate offensive air campaigns in the future. As per the *Military Balance 2010*, China possesses more than 8 Airborne Early Warning Systems (AEWs). These include the KJ-2000, and KJ-200. The KJ-2000 system has reportedly made significant progress, but the programme was set back by the crash of a prototype in June 2006 that killed some 40 technicians involved in the R&D effort.[47]

The PLAAF is also developing cruise missiles, including air, surface, and ship-launched versions with ranges from 600 to 1,800 km. These are likely to be dual role missiles i.e. nuclear as well as conventional.[48]

44. n. 3.
45. Ibid.
46. *Jane's Defence Weekly*, August 2000; Phadke, n. 33, p. 12.
47. Joseph Kahn, "Crash of Chinese Surveillance Plane Hurts Efforts on Warning System," *New York Times,* June 7, 2006; Michael Sheridan, "China's Hi-Tech Military Disaster: Bid to Copy Israeli Electronics Kills Experts," *London Sunday Times*, June 11, 2006, cited in Phillip C. Saunders and Erik Quam, "Future Force Structure of the Chinese Air Force," Project Muse, available at muse.jhu.edu/journals/asia_policy/v004/4.saunders.pdf
48. *Jane's Defence Weekly*, January 2000, as quoted in Phadke, n. 32, p. 864.

On the training front, the Defence White Papers maintain that the PLAAF is focussing on accelerating the inter-disciplinary training of the personnel to enable them to conduct air operations under conditions of informationisation. Combined arms and multi-type aircraft combat training is also being intensified to improve the capabilities in operations like air strikes, air defence, information counter-measures, early warning and reconnaissance, strategic mobility and integrated support.

The PLAAF is also developing cruise missiles, including air, surface, and ship-launched versions with ranges from 600 to 1,800 km.

CONCLUSION

China recognises the determining role air power would play in future conflicts. Therefore, at the strategic level, China aims to achieve 'command of the air'. In order to accomplish its objective, the PLAAF is now moving from territorial air defence to development of capabilities to conduct offensive air operations. The Chinese Air Force is also developing its capabilities for strategic projection. A renewed thrust on developing joint warfare capabilities indicates that in future warfare scenarios, the PLAAF would be able to conduct joint operations with the other Services. All these developments indicate that the PLAAF is developing into a high-technology force able to engage most modern air forces.

INDEX

VOL. 2, NO. 2. SUMMER 2005 (APRIL-JUNE)

VOL. 2, NO. 3. MONSOON 2005 (JULY-SEPTEMBER)

VOL.3 , NO. 3. MONSOON 2006 (JULY-SEPTEMBER)

VOL. 1, NO. 2. WINTER 2006 (OCTOBER-DECEMBER)

VOL. 2, NO. 1. SPRING 2007 (JANUARY-MARCH)

VOL. 2, NO. 2. SUMMER 2007 (APRIL-JUNE)

VOL.2 , NO. 3. MONSOON 2007 (JULY-SEPTEMBER)

VOL. 2, NO. 4. WINTER 2007 (OCTOBER-DECEMBER)

VOL. 3, NO. 1. SPRING 2008 (JANUARY-MARCH)

VOL. 3, NO. 2. SUMMER 2008 (APRIL-JUNE)

VOL. 3, NO. 3. MONSOON 2008 (JULY-SEPTEMBER)

VOL. 3, NO. 4. WINTER 2008 (OCTOBER-DECEMBER)

VOL. 4, NO. 1. SPRING 2009 (JANUARY-MARCH)

VOL. 5, NO.1. SPRING 2010 (JANUARY-MARCH)

VOL. 5, NO.2. SUMMER 2010 (APRIL-JUNE)

VOL. 5, NO. 3. MONSOON 2010 (JULY-SEPTEMBER)

VOL. 5, NO. 4. WINTER 2010 (OCTOBER-DECEMBER)

VOL. 6, NO.1 SPRING 2011 (JANUARY-MARCH)

Note: For current issue see Contents Page.

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