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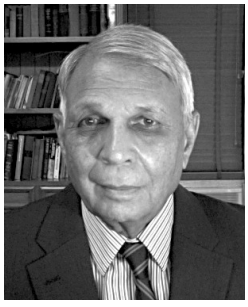

MK Mangalmurty, IFS (Retd)
President, CASS

Centre for Advanced Strategic Studies
Pune University Campus
Ganeshkhind Road
Pune 411 007, INDIA

Message

This has been a watershed year for India. After a long time we have a single party majority in Parliament. The old political equations are changing and the appeal of development and good governance has trumped slogans of secularism and caste.

The people of India are looking forward to a functioning government that will accelerate economic growth and take firm and quick decisions in matters of Defence and Foreign Policy. Prime Minister Modi has made a great impact during his recent foreign visits.

The CASS Journal is a year old and has made a great debut. In the coming year we expect to do even better in terms of the range and quality of articles. The aim is to inform our reader about the strategic and defence issues as well as promote fresh thinking on them.

I wish all our readers as well as contributors to our Journal a Happy New Years and all success in their endeavours.

- MK Mangalmurti,
IFS (Retd.)

25th December 2014

Air Marshal BN Gokhale (Retd)
PVSM, AVSM, VM
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Editor's Note

'An optimist stays up until midnight to see the New Year in and
A pessimist stays up to make sure old year leaves.'
-Bill Vaughan

At the outset I extend my warm greetings on the New Year to all the esteemed authors and readers of the CASS Journal. The Journal has completed one year since its inception and as we step into the next year with our 5th issue, I wish to thank all of you for the wholehearted support.

2014 has been a momentous year both domestically and globally. In the month of May one witnessed world's largest democracy bringing about a change of Government by the ballot, recording some of the highest turnouts mainly from large numbers of young voters. The elections have been followed by a series of challenges, be natural calamities like the unprecedented flooding of the Srinagar valley and unseasonal rains in Maharashtra with its detrimental effect on agricultural output or the renewed indiscriminate firing by Pakistan belying the hope for better relations after a brief visit to India by their Prime Minister at the swearing-in ceremony of our new Government.

The challenges facing the country are daunting but there is renewed optimism, vigour and hope.

In the neighbourhood, Pakistan continues to slide towards anarchy leading to being considered as a 'failed state', especially having to pay a huge price for the Frankenstein of their own creation the 'state sponsored nursery for global

terrorism'. USA has therefore been cautious in withdrawing large numbers of troops from neighbouring Afghanistan, planned initially for December 2014. India's northern neighbour, China continues to build on its robust economy, flexing muscles in South China Sea and one can witness more active Chinese role in the International affairs.

It is often mentioned that 'best of the friends make bitterest of the enemies'. We have witnessed the events in Russo-Ukrainian relations, which have brought apprehensions of return of the Cold War between USA and Russia. The Russians have even updated their military doctrine including for the use of nuclear weapons. Adding to this is the worsening situation in Syria and Iraq resulting in power struggle in the Middle East. Apart from its impact on stability of oil price, India has concerns over her large Diaspora working in these countries. While the sub-equatorial Africa shows signs of healthy economic growth, many countries are also witnessing unprecedented rise in ethno-religious violence alongwith epidemic like Ebola.

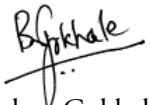
In today's interdependent and interconnected world all these events do impact India's security and development.

This issue continues to bring out a bouquet of articles on varied aspects of National Security and National Development. In tune with the scheme of 'Make in India', there is in article on our own indigenous AEW&C project, a feat achieved after in- depth research and lot of toil. In the context of indigenous manufacturing, an article on Ship Building within India has been co-authored by two naval experts. In keeping with our laudatory Magalyaan mission, there are articles on Space Security by two experts in this field. There are well analysed articles on our neighbours and on nuances of the current nuclear policy of India. The issue also carries an article on Armed Forces Tribunal for better awareness of this scheme and a Book Review-cum-article on 'Siachen', the world's highest battlefield but steadfastly held by India with supreme sacrifice by her brave soldiers and air-warriors.

I thank you again for the support and encouragement in bringing out the CASS Journal.

Wishing you all a Very Happy 2015 and also wishing you Happy Reading

Jai Hind



25th December 2014

(Bhushan Gokhale)
Air Marshal (Retd)
Director, CASS

India Achieves AEW&C Capability

Dr. S Christopher

Introduction

An *Airborne Early Warning and Control (AEW&C)* system is an airborne radar system designed to detect aircraft and ships at long ranges and perform control and command functions in an air engagement over the battle space by directing fighter interceptions and attack-aircraft strikes. When used at high altitude, the radar on the AEW&C system allows operators to detect and track targets and distinguish between friendly and hostile ones much farther away compared to a similar ground based radar. Modern AEW&C systems are capable of detecting targets at ranges up to 400 km away. One AEW&C aircraft flying at 30,000 ft (9,100 m) AMSL can cover an area of 312,000 square km on ground. Two or three such aircraft in an overlapping flight formation can cover a substantially wide tactical zone and provide data on threats and targets, facilitating countermeasures by friendly air- ground- and marine- forces.

The AEW&C capability has emerged progressively in advanced countries of the world with increasing realisation of its usefulness combined with advancements in surveillance radar technologies and platform aircraft characteristics.

India did well to think of getting into indigenous development of an AEW&C system just at the moment Active *Electronically Scanning Array (AESA)* radar appeared on the horizon. This paper traces the growth of this capability in advanced countries of the world and elaborates how India caught up with the rest of the world indigenously developing the AEW&C

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technology and tailor-made its own state-of-the-art and cost-effective *AEW&C India* to strict specifications of Indian Air Force. This has placed India in its rightful place in the international map amongst the three other nations: Sweden, USA and Israel, who have developed this technology.

Early History

In the history of military warfare, victory always depended upon the *early warning* that one side got of the other's movements. Instinctively, man has relied on elevated positions to get a clear view of things happening at a distance.

A kite-designer named *Mu Zi* is known to have developed a man-lifting kite in China. The kite is understood to have been used for spying on enemy positions during the Chu-Han War of 203-202 BC.

Figure 1: Tethered Balloons of World War 2

Reconnaissance balloons have been deployed from coal barges to gather tactical information during the American Civil War of 1861-1865. Tethered balloons are also known to have been used for reconnaissance to spy on enemy movements during the World War 2.

Airborne Early Warning Systems

When radars came to be used to detect intruding aircraft in early years of the 20th Century, it did not take long to realise that airborne radars could see beyond the horizon and capture low-flying aircraft that were undetectable by ground radars. Aircraft carrying surveillance radars, christened *Airborne Early Warning (AEW)* systems, soon came into being.

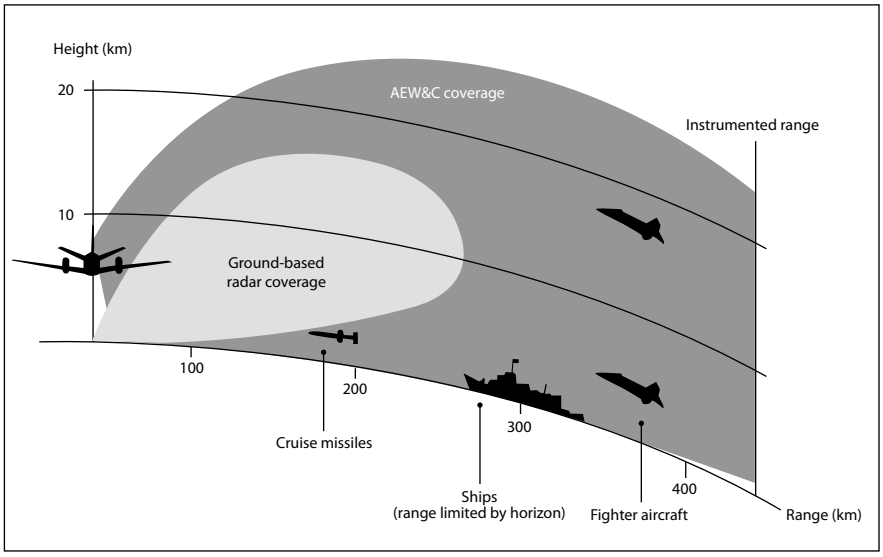

Figure 2: Airborne radars have Range and Coverage advantage over ground-based radars

The AEW aircraft appeared for the first time during World War 2 to extend the range of ground based radars. The AEW systems with only *Detection* and *Warning* functions were the precursors to the later *Airborne Early Warning and Control (AEW&C)* systems that added *Command* and *Control* functions to capabilities of the surveillance aircraft.

The United States of America and the United Kingdom were the major developers and suppliers of AEW systems that dominated the field for four decades from 1945 to 1985. The Soviet Union was the other producer accounting for less than 2 per cent of the AEW systems that went into operation. A list of the historical AEW systems produced and operated is placed at Table-1.

Table 1: Historical AEW Operators			
Operator	**Aircraft**	**Date**	**Number**
Soviet Air Forces	Antonov An-71	1985-1991	3
Royal Air Force	Avro Shackleton AEW.2	1972-1991	12
US Navy	Boeing PB-1W Flying Fortress	1946-1955	22
Royal Air Force	British Aerospace Nimroad AEW3	1982-1986	11
US Navy	Douglass A-1W Skyraider	1950-	368
Fleet Air Arm	Douglass Skyraider AEW.I	1951-1962	50
Fleet Air Arm	Fairey Gannet AEW.3	1959-1978	44
US Navy	Grumman AF-2W Guardian	1950-1955	153
US Navy	Grumman TBM-3W Avenger	1945-1950	40
Aeronavale	Grumman TBM-3W Avenger	1952-1960	40
JMSDF	Grumman TBM-3W Avenger	1954-1961	?
Marine Luchtvaart Dienst	Grumman TBM-3W Avenger	1954-1960	24
Royal Canadian Navy	Grumman Avenger Mk.3W2	1952-1959	8
Fleet Air Arm	Grumman Avenger AEW	1952-1959	?
US Navy	Grumman E-1 Tracer	1951-1955	88
USAF	Lockheed EC-121 Warning Star	1958-1977	82
US Navy	Lockheed WV-2/EC-121 Warning Star	1956-1982	172
Soviet Air Forces	Tupolev Tu-126	1965-1984	12
Royal Air Force	Vickers Wellington	1944-1945	2+
			Total: 1131

Notable among the AEW systems was the *Lockheed EC-121, Warning Star,* that flew first in 1949 and provided support to USAF fighter forces during the Vietnam war. Tupolev Tu-126 that was launched by the Soviet Union in 1965 remained in service with the Soviet Air Forces till 1984.

Figure 3: Lockheed EC-121, *Warning Star,* with Radar Domes above and below Fuselage.

Figure 4: Tupolev *TU-126* AEW, with Rotating Randome and In-Flight Refuelling Probe.

Airborne Early Warning and Control Systems

The Airborne Early Warning and Control (AEW&C) systems allow operators to detect, track and identify target aircraft at long ranges as well as determine their altitude. The system can be used offensively to direct fighters to target locations and defensively for intercepting incoming threats. The AEW&C systems have indeed turned out to be effective Force *Multipliers* in today's warfare scenario.

Mechanically Steered Array Radars

The traditional systems that ushered in the AEW&C era came with *Mechanically Steered Array (MSA)* radars. Northrop Grumman *E-2 Hawkeye* that entered service in 1965 and Boeing *E-3 Sentry* that entered operation in 1978 are the two AEW&C systems to be operated by a large number of countries worldwide. Both the aircraft were equipped with MSA radars their antenna being housed in circular 'roto-domes' mounted on top of the fuselage. The victory in *Gulf* War of 1991 was attributed to the roles played by these two AEW&C aircraft

Figure 5: Northrop Grumman *E-2 Hawkeye* (1965)

in *battle management, close air support, data and communication relay* and *search and rescue control.*

Table-2 lists out the MSA-based AEW&C systems that are currently in operation with Air Forces worldwide.

Figure 6: Boeing *E-3 Sentry* (1977)

Table 2 : MSA- based AEW&C/ AWACS Operators

Operator	Aircraft	Number
Chilean Air Force	Boeing 707-385C	1
Egyptian Air Force	E- 2C Hawkeye 2000T	6
French Air Force	Boeing E-3F Sentry	4
French Navy	Grumman E-2C Hawkeye	3 or 4
Japan ASDF	Boeing E- 767 Grumman E- 2C Hawkeye 2000T	4 13
Korean People's Air Force	Antonov An-24	1
Mexican Air Force	Fairchild C-26A	4
NATO	Boeing E-3A	17
Pakistan Air Force	Shaanxi ZDK-03 Karakoram Egle	4
Russian Air Force	Beriev A-50	16
Royal Saudi Air Force	Boeing E-3A	5
Republic of China Air Force	Grumman E-2T/K Hawkeye	6
Royal Air Force	Boeing Sentry AEW.1	6
United States Air Force	Boeing E-3B/C Sentry	32
United States Navy	Grumman E-2C-I/II Hawkeye	55
		Total : 178

Active Electronically Steered Array Radars

With the advent of *Active Electronically Steered Array (AESA)* radar, it became possible to scan electronically without any mechanical rotation of the antenna. The AESA technology resulted in lighter and more compact

radars that could fit into even smaller aircraft.

The first of the sytems to sport an AESA radar was developed by M/s Ericsson and fitted on the Swedish *Saab-340 aircraft to have the first AESA based AEW&C* system that entered service in 2002. *Saab-340 AEW&C* carried a rectangular antenna unit on top of the fuselage that enabled 120° of radar coverage in azimuth for its 'S'-Band 'Erieye' radar on either side of the aircraft.

Figure 7: *Saab-340 AEW&C* (2002)

The AESA antenna lends itself well to a variety of configuration design as demonstrated by systems that followed the *Saab-340 AEW&C* in quick succession.

A consortium of companies including M/s Embraer of Brazil built the *EMB-145 AEW&C* aircraft for Air Forces of Brazil, Mexico and Greece with the 'Erieye' AESA radar of M/s Ericson.

Northrop Grumman's Multi-role Electronically

Brazilian *EMB-145 AEW&C* (2004)

***Boeing-737 AEW&C Wedgetail* (2010)**

Steered Array (MESA) radar mounted in a rectangular 'T'-structure atop the fuselage of *Boeing-737 AEW&C* provides 240° coverage in 'L'-Band on the sides and 120° limited coverage in the forward and aft directions. *Boeing-737 AEW&C Wedgetail* has been built for Air Forces of Australia, Republic of Korea and Turkey.

The Conformal Airborne Early Warning (CAEW) radar design was developed by Israeli Aircraft Industries' ELTA Systems Group on the Gulfstream G-550 aircraft. The 'L'-Band radar provides coverage on the LH and RH sides. In the forward and aft directions, independent radars mounted on the nose and tail work on 'S'-Band to provide limited coverage rangewise.

Israeli *G-550 CAEW* (2011)

Indian *IL-76 AWACS* (Ilyushin A-50EI) (2012)

Indian *AEW&C India* (2014)

Figure 8: Diversity in AESA Antenna Configuration

The Indian *IL-76 AWACS* was realised jointly by Israel and Russia for India combining the ELTA radar and the IL-76 aircraft. The radar, with a set of three phased arrays placed in a triangular configuration inside a non-rotating circular radome operates in 'L'-Band and scans 360° in azimuth. The *IL-76 AWACS* is the first AESA radar system to have uniform coverage in range all around in azimuth.

While AEW&C systems with the MSA radar are still holding their sway, it is notable that a substantial number of systems with the AESA radar have come into operation in a decade's time.

Table-3 lists out current AEW&C systems with AESA radar in operation with various Air Forces of the world. These, numbering about 50,

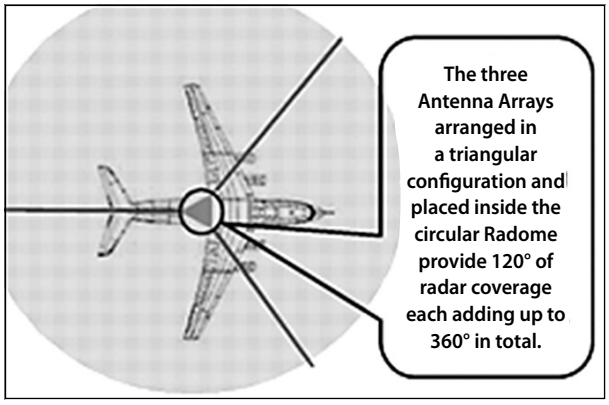

Figure 9: IL-76 AWACS Radar provides 360° coverage

co-exist with nearly 180 systems with MSA radars that remain in operation. The number of AESA based systems should be expected to swell, when the MEA based systems undergo their mid-life upgradation and adopt AESA radars.

Table 3 : AESA- based AEW&C/AWACS Operators

Operator	Aircraft	Number
Royal Australian Air Force	Boeing 737 AEW&C, Wedgetail	6
Brazilian Air Force	Embraer EMB-145, Erieye	4
PLAAF	KJ-2000	4
Hellenic Air Force	Embraer EMB-145, Erieye	4
Indian Air Force	IL-76 AWACS (IIyshin A-50EI)	3
Israeli Air Force	Gulfstream G-550 CAEW	3
Republic of Korea Air Force	Boeing 737 AEW&C, Wedgetail	4
Mexican Air Force	Embraer EMB-145,	3
Pakistan Air Force	Saab 2000, Erieye	3
Republic of Singapore Air Force	Gulstraeam G-550 CAEW	4
Swedish Air Force	Saab S100B	6
Royal Thai Air Force	Saab S100B	2
Turkish Air Force	Boeing 737 AEW&C	3
		Total : 49

AEW&C India

AEW&C India, the indigenous Airborne Early Warning and Control surveillance system, is progressing through its final phase of development at the Centre for Air-Borne Systems (CABS) and is due to be inducted into Indian Air Force by early 2015.

AEW&C India is capable of detecting, identifying and classifying threats in the surveillance area and also act as a Command and Control Centre to support air operations. The surveillance system with its multiple Communication and Data Links can alert and direct fighters, while providing Recognised Air situation Picture (RASP) to commanders through Ground Exploitation Stations (GES) on ground. AEW&C system thus can support offensive strike missions as well as assist forces in the tactical battle area.

Electronic and Communication Support Measures that are part of the Mission System can intercept, identify and classify non-friendly radar transmissions and communication signals and help initiate counter operations.

Figure 10: *AEW&C India:* Maximum Operational Capabilities in an Optimum Platform

Maximised Mission System

Deliberate choice of sub-systems that make up the AEW&C Mission System was meant to pack up as much of mission capabilities, add redundancies to foolproof operations, and provide self-protection against ground missile attacks.

An additional Auxiliary Power Unit (APU) takes care of the enhanced power needs of the radar sub-system and also as redundant APU in case of failure of the first one.

The network-centric sensor system enables joint battle management from air, land and sea.

Table-4 gives a comparison of AEW&C systems mounted on similar *EMB-145* platform being operated by a few countries of the world. As can be seen, *AEW&C India* has packed in more functionalities compared to systems of its class and is operationally more versatile.

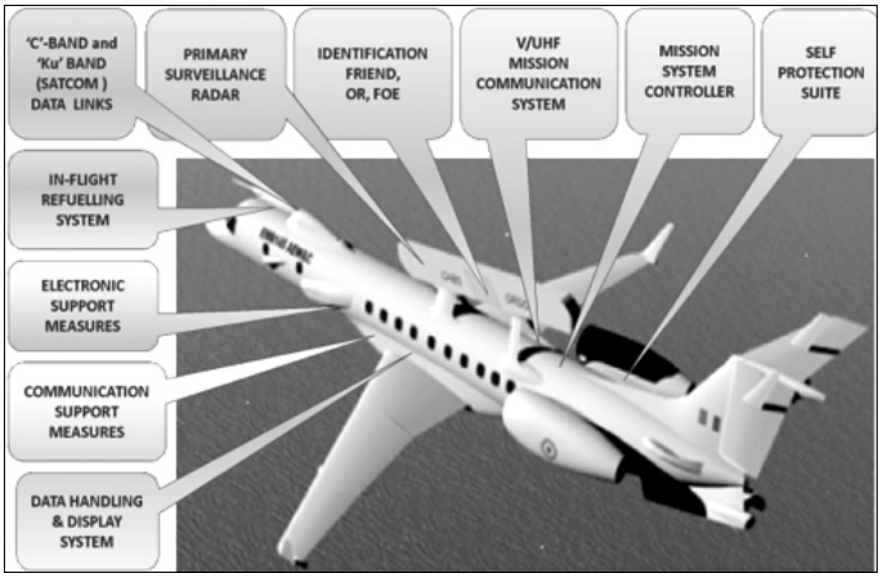

Figure 11: Mission Sub-systems

Table 4 : AEW&C Systems on brazilian EMB-145 Platform Aircraft					
Systems On Board	**Operating Country**				**Remarks**
	Brazil	**Greece**	**Mexico**	**India**	
Active Aperture Radar	Yes	Yes	Yes	Yes	
IFF	Yes	No	No	Yes	
ESM	Yes	Yes	No	Yes	
CSM	Yes	No	No	Yes	
C-Band Data Link	No*	No*	No*	Yes	*Link 16/11 (?)
Ku band SATCOM	No	No	No	Yes	
V/UHF/HF	NK	7V/ UHF 2HF	3V/UHF 1 HF	7 V/ UHF 2 HF	*Data and Voice VHF+HF
Self Protection	No	Yes*	No	Yes	***MAWS (?)**
OWS	4 - Front Facing	5 - Side Facing	4 - Front Facing	5 - Front Facing	
IFR	No	No	No	Yes	
Additional Seats	No	No	No	Yes (5)	
Relief Crew	2	NK	Nk	1	

Primary Surveillance Radar

The primary sensor for the AEW&C is an AESA Radar with long-range, multi-target, and multi-mode capability. Two radiating planar arrays assembled back-to-back in an Active Antenna Array

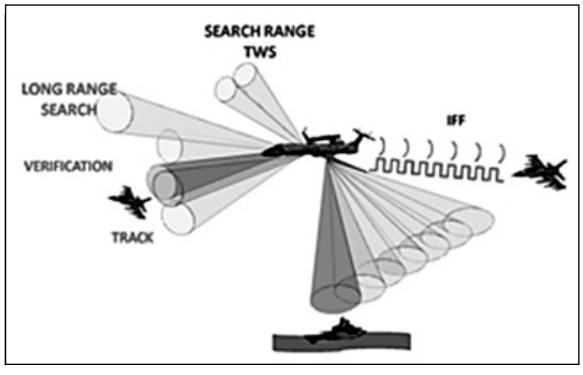

Figure-12: Primary Radar

Unit (AAAU) and mounted on top of the fuselage provide 120° coverage on either side of the aircraft. The important modes of the radar operation are Air Surveillance and Sea Surveillance. The radar can track air- and sea- targets simultaneously through concurrent use of different waveforms.

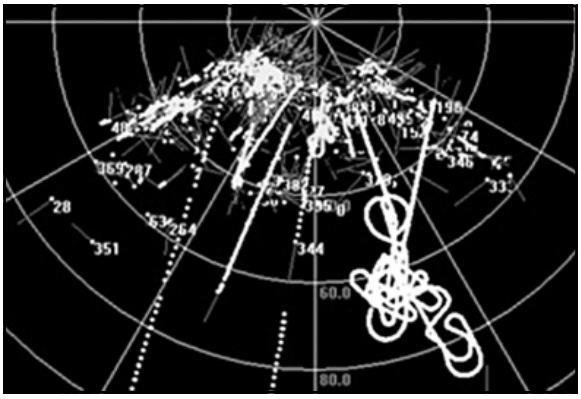

Figure 13: Radar capture of manoeuvring target

The sensor has the ability to do *search, track-while-scan, priority tracking, high performance tracking, etc.* In *priority tracking,* the targets will be placed in full track mode, ensuring, thereby, a faster update against manoeuvring targets. In *high performance tracking,* additional measurements are made to improve tracking accuracies.

The AESA radar block diagram is shown, where a low-power coherent source feeds several (thousands) of amplifiers to generate the required

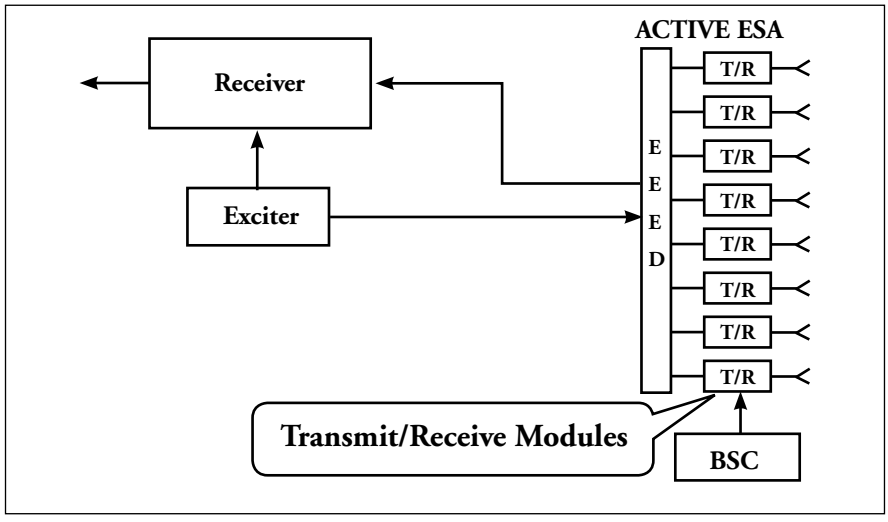

Figure 14: AESA Radar Block Diagram

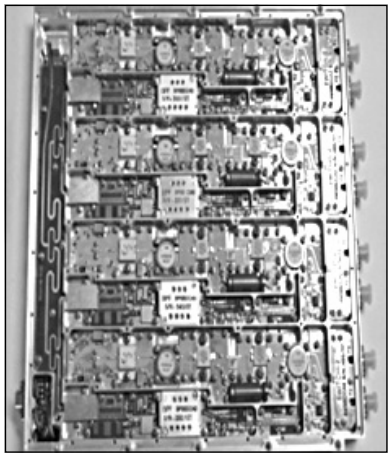

Figure 15: TRMM

power. This increases the reliability and reduces the RF power loss.

Main advantage of the AESA radar is that it provides enhanced beam agility with higher reliability as it is not a mechanically steered system. The energy management is, therefore, efficient with graceful degradation of performance with cumulative component failures. The AESA radar has elevation scanning and has a number of TR modules, several times as that of its comparable systems. Lower power distributed TR module makes the system robust and reliable with efficient cooling through ram air. The primary radar is a robust advanced system.

The two building-block components of the radar, the *Transmit-Receive Multi-Module (TRMM)* and the teflon-clad ultralight *Antenna Panel* are notable Indian innovations in the radar sub-system.

Identification Friend or Foe

The Secondary Surveillance Radar, or, the Identification Friend, or, Foe (IFF), determines whether the target detected by the Primary Radar is a 'friend' or 'foe'. The interrogator emits a message querying the target in a particular sector. Replies from the target are automatically associated with the Primary Radar detections. This information is then used by the Mission System to identify locations of friendly and non-friendly aircraft in the area and deal with them appropriately.

Figure 16: IFF Equipment

The Identification Friend or Foe (IFF) is Mark XII and Mode-S system with a very powerful transmitter.

Integrated RWR, ESM and SPS System (IRESS)

The Electronics Support Measure (ESM) supports detection and classification of hostile air defences by providing the bearing and the range of such hostile emitters. Towards this, the ESM system operates a wide range of frequencies with complete coverage of 360° in azimuth and a wide coverage in elevation. The system is capable of analyzing and identifying the emitter characteristics with a very high frequency- and Directional-accuracy. An easy search method to scan through a database library of a large number of emitters is a feature of ESM. The system has provision to record and save data for post-flight analysis.

The Self Protection Suite (SPS) comprises Radar Warning Receiver (RWR), Missile Approach Warning System (MAWS) and Counter Measures Dispensing System (CMDS). RWR function is augmented by ESM and the Receiver includes a Warning Library and Display. The MAWS is a passive UV based system and is augmented with the RWR giving necessary warning to the pilot and prompting activation of the CMDS and initiation of escape manoeuvres.

Communication Support Measures

The Communication Support Measures (CSM) intercepts communication signals over a wide range of frequencies and performs the required analysis for in-flight operations. A multi-channel RF and audio recording of communications is possible on-board for post-flight analysis.

Mission System Controller

The Mission System Controller (MSC) is the central node of the AEW&C system doing the C4ISR operations. It provides the commander and operators the full *Air Situation Picture (ASP)* and helps them manage the operations by carrying out Multi-Sensor Data Fusion (MSDF), Identification, Classification

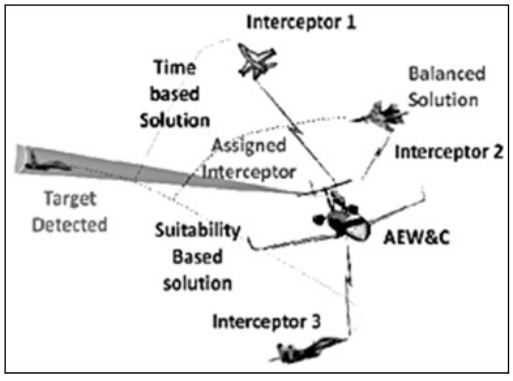

Figure 17: MSC - Interception Management

and automatic handling of threats.

Interception management, Guidance and Recovery are optimally done using tactical software resident in the MSC. Sub-systems' health is monitored and reported and also overall house keeping of the AEW&C system is done by MSC.

Data Handling and Display System

Figure 18: Data Handling and Display System

The Data Handling and Display System (DHDS) provides the interface to operators to interact with the AEW&C system. Each Operator Work Station (OWS) displays the integrated tactical air situation picture to the operator. The OWS functionality deals with the Human Machine Interface (HMI) required for exploitation of the AEW&C system. It involves displays of tactical data, tools to insert Operator's inputs to the Air Situation Picture, displays of overall system serviceability, etc.

Data Links

Figure 19: Data and Communication Links

Data from Radar, ESM and CSM can be downlinked to the ground stations and tactical control data uplinked to the AEW&C system. Communication between the AEW&C system and Ground Exploitation Stations (GES) is through a

dual redundant 'C'-Band line-of-sight Data Link and 'Ku'-Band beyond-line-of-sight SATCOM Data Link. These Data Links also operate with two voice channels each.

Mission Communication System

The Mission Communication System (MCS) provides Air-to-Air and Air-to-Ground V/UHF voice channels.

It also provides integrated control of all on-board communication sets and intercom for all mission operators and the flight crew. The communication channels have in-built ECCM features. Continuous IP recording of voice is possible for all the five (+2) radios.

Platform Aircraft

The Platform aircraft to house the AEW&C system has the matching flight performance attributes to facilitate that Mission System tasks are performed effectively during operational missions.

Figure 20: Flight Testing in 'Hot & High' Leh

Considering that the platform aircraft packs in more sub-systems to enhance mission capabilities compared to contemporary systems built on the same EMB-145 platform, additional Fuselage Fuel Tanks have been installed in AEW&C India to realise realistic time-on-station performance during normal sorties. An In-Flight Refuelling (IFR) system has also been added together with five rest crew seats in the cabin to enable extended operations. The IFR also has added operational versatility to AEW&C India while having to operate from 'hot & high' airfields. During such situations, the aircraft can get airborne at WAT (Weight-Altitude-Temperature) – limited Take-off Weight, fill up the tanks to full capacity using air-to-air refuelling and head for an extended mission, if required.

The design Max Take-Off Weight (MTOW) of the platform aircraft has been consciously retained in order to preserve the aircraft's ability to operate from any existing military airfield in the country.

Figure 21: Testing under Icing Conditions

AEW&C India has been extensively flight tested in Bangalore, Jamnagar, Agra and Leh to evaluate the mission system's functionalities and assess the platform aircraft's flight performance characteristics.

Figure 22: In-Flight Refuelling Trials

The aircraft has been put through rigorous flight trials to establish conformance to certification requirements for In-Flight Refuelling (IFR) and safety of flight while flying under severe natural icing conditions. In-Flight Refuelling is an unique feature adopted on *AEW&C India* and no other AEW&C / AWACS with AESA radar has IFR internationally.

Ground Segment Systems

The 'Air Segment Systems' of the *AEW&C India* have a complement of 'Ground Segment Systems' that are essential for effective operation of the surveillance system fleet.

The *Ground Exploitation Station* and the *Mission Planning and Analysis Station* are important links in the operation of the surveillance fleet. The *Automatic Test Systems* for the entire sub-systems and the Transmit-Receive Multi-Module provide essential maintenance support. The *Mission Software Support Facility* is meant to help maintenance and configuration management of all the system software. The *Operator Training Station* is an indispensable training facility.

Ground Exploitation Station

Ground Exploitation System (GES) acts as an interface between the AEW&C System and the Integrated Air Command and Control System (IACCS). The GES shall receive the Air Situation Picture from the AEW&C system and communicate commands of the IACCS to the AEW&C system. It also handles commands and communications to and from other elements of the Air Defence Forces. The ruggedised GES is mobile and can be deployed swiftly in tactical field areas as required.

Figure 23: GES, the mobile Station

Figure 24: GES Cabin

Mission Planning and Analysis Station

The Mission Planning and Analysis Station (MIPAS) is an essential tool for operational planning, pre- and post-operation analysis. MIPAS will facilitate carrying out the following activities:

i. Pre-flight Message Generation
ii. Tactical Mission Data Generation
iii. Data Analysis
iv. Audio Video Play-back.

Figure 25: MIPAS

The MIPAS plays an important role in exploitation of the surveillance exercises.

Automatic Test System

Numerous parameters are to be checked before clearing every sub-system in the integrated mission system after every change or upgradation. The TRMMs are to be quickly screened before installation in the AAAU everytime these are to be reinstalled. The Automatic Test System (ATS) developed for the purpose carries out the checks flawlessly in a matter of minutes saving enormous time and manual effort.

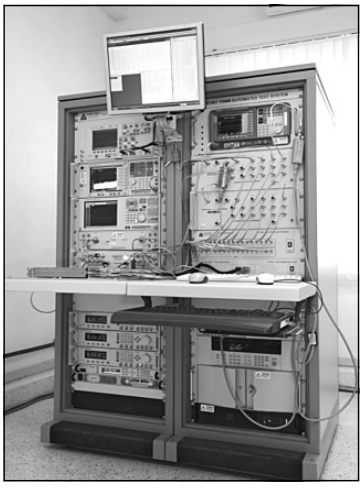

Figure 26: ATS for TRMM

Mission Software Support Facility

Mission Software Support Facility (MSSF) is a dedicated stand-alone ground facility to handle Maintenance and Configuration Management of all the software packages of the AEW&C system.

Operator Training Station

The Operator Training Station (OTS) is a ground based system used for training of operators on the following:

i. Tactical Training
ii. Command and Control
iii. Battle Management
iv. Behaviour of sensors under different scenarios

Figure 27: Operator Training Station

Infrastructural Facilities

Infrastructural facilities were created, or, augmented to cater to needs of fabrication, testing and integration to realise the AEW&C system. The facilities so created have become permanent assets to serve as a enduring development resource for future generations of AEW&C sytems.

The notable among the facilities created are the following: (i) AAAU Assembly Rig (ii) Planar Near Field Measurement Facility, (iii) System Test and Integration Rig, (iv) Lightning Test Facility, (v) EMI/EMC Test Laboratory, (vi) System Simulation Laboratory, (vii) Virtual Visualisation & Prototyping Centre, (viii) Roof Top Test Rig and (ix) Development Flight Test Facility.

AAAU Assembly Rig

The AAAU had to be fabricated with utmost precision in view of its demanding external aerodynamics and high inertial loads on the structure over the full flight envelope of the platform aircraft.

Figure 28: AAAU Assembly Rig

The AAAU Assembly Rig was therefore built around a large surface table with appropriate jigs and fixures to ensure precision fabrication. A Laser Tracker Instrument is utilised to ensure accuracy of critical dimensions of the AAAU.

Planar Near Field Measurement Facility

The Planar Near Field Measurement (PNFM) facility of 24m x 8m size is built inside an Anechoic Chamber of size: 33m x 13m x 13m. The PNFM facility is designed to meet the *Active Electronically Scanned Array* test requirements for the current AEW&C programme as well as the sytems to come in the

Figure 29: Antenna Measurements in PNFM Facility

future.

An XYZ Scanner of the PNFM that does the Transmit-Receive Pattern Measurements is fully automated and is operated from a Control Room located outside the Anechoic Chamber. The absorbers positioned on the chamber wall are meant for high power transmission measurement.

A custom-designed Antenna Positioner (weighing about eight tonnes) for Cylindrical Near Field Measurement (CNFM) is supported by four 'Air-cushion' pads that easliy slide on the floor in orthogonal directions.

System Test and Integration Rig

The most important facility created for integration and testing of the AEW&C sub-systems was the System Test and Integration Rig (STIR). Physical, Electrical and Functional Integration of the Sub-systems of the AEW&C system are carried out in the STIR Facility.

Figure 30: System Test and Integration in STIR

The functionalities and performance of each of the AEW&C sub-systems are first established in the stand-alone mode. Subsequently, the sub-systems are integrated into the AEW&C system and the total system is checked for EMI/EMC issues and its operational performance is evaluated on the rig.

Lightning Test Facility

The Lightning Test Facility (LTF) was one of the major facilities to be created in CABS in the early years. The facility has been serving the needs of major indigenous programmes like Light Combat Aircraft, Advanced Light Helicopter, etc.

The LTF is used to design

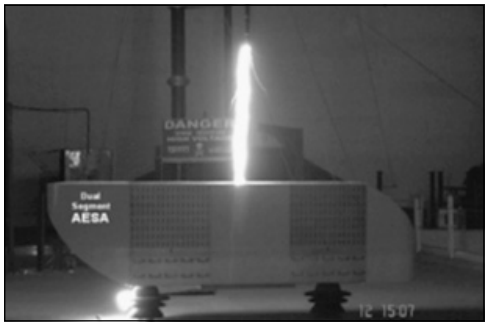

Figure 31: Lightning Strike Test on AAAU

and test Lightning Protection Schemes and ensure Lightning-Worthiness of aircraft and air-borne systems. The facility was effectively put to use to ensure protection against *direct* and *indirect* effects of lightning strike on the AEW&C mission system components.

EMI/EMC Test Laboratory

The Electo Magnetic Interference (EMC) and Electro Magnetic Compatibility (EMC) Test Facility was augmented to fully cater to the needs of the AEW&C system.

Figure 32: EMI/EMC Test Laboratory

Line Replaceable Units (LRUs) of the many sub-systems of the AEW&C system were tested at the EMI/EMC Test Facility and cleared for integration into the system. The LRUs were subjected to prescribed tests on *Conducted Radiation, Conducted Susceptibility, Radiated Emission* and *Radiated Susceptibility* aspects and necessary protective schemes incorporated.

The total AEW&C system after integration on to the aircraft was also subjected to an overall EMI/EMC test scheme to ensure that functionalities of the aircraft- and the mission- sub-systems were satisfactory.

System Simulation Facility

The AEW&C system has many sensors onboard the platform aircraft for detection, tracking, identification and classification of targets so as to provide a *Recognizable Air Situation Picture (RASP)* of the scenario of interest. The RASP is built using attributes of the scenario observed by different sensors and combining them through a suitable data fusion

Figure 33: System Simulator Laboratory

algorithm. In addition, the system also has communication links to transfer the RASP to ground stations.

The AEW&C System Simulator aims to simulate the end-to-end chain of the mission system at the data level. The System Simulation Facility provides various simulation configurations to enable (i) system performance analysis, (ii) system integration and testing, (iii) performance prediction for the real system and (iv) operational user training.

Virtual Visualisation & Prototyping Centre

A Virtual Visualisation & Prototyping Centre has been established at CABS. Virtual Reality Creator (VRC) and Virtual Reality Trainer (VRT) software have been generated and their Functional Testing has been carried out.

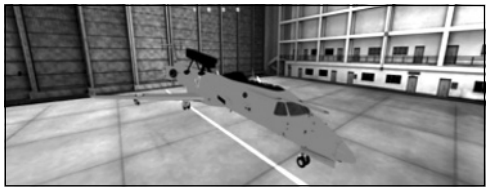

Figure 34: Virtual Visualisation & Prototyping Centre

SATCOM Antenna Radome and the Active Antenna Array Unit have been modelled and assembled as examples of Content Creation for Visualisation.

Increased exploitation of the centre as a prototyping facility in the future is envisaged.

Roof Top Test Rig

The Test Rig on roof top of the STIR building is meant for carrying out radar radiation tests in free space. The test unit is operated from the fourth floor control room that is right below the roof top.

An Air Blower mounted on rails can supply cooling air at the rate of 3.5 – 4.0 kg/s against a pressure drop of 4kPa to the AAAU during the radar performance evaluation tests.

Figure 35: Roof Top Test Rig

The Jib crane has a capacity to lift 2.5 tonnes and that makes handling of test equipment easy.

The Test Rig was extensively used during initial trials of the Radar and IFF against opportune and dedicated airborne targets.

Development Flight Test Facility

The Development Flight Test Facility caters for flight assessment of system equipment under development, leading to qualification of items under flight environment as well as evaluation of their functionality and performance as airborne equipment.

Figure 36: Development Flight Test Facility

The facility is manned by qualified IAF personnel and trained flight test engineers.

Export Potential

M/s Embraer, the Brazilian manufacturers of the platform aircraft, EMB-145, have indicated an interest in joint marketing of an export version of the *AEW&C India.*

From a comparison of notional cost of medium AEW&C Systems in the global market, the potential for an Indo-Brazilian venture to market an

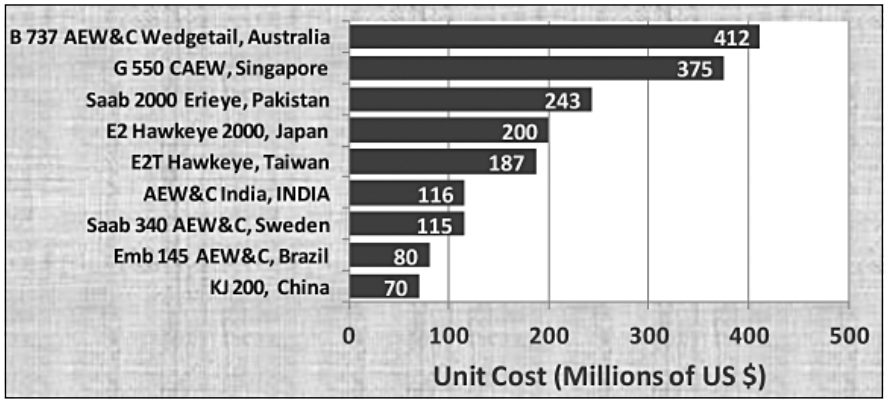

Figure 37: Unit Cost of Medium AEW&C System

Figure-38: *AEW&C India* at Bahrain International Air Show February 2014

export version of *AEW&C India* seems bright.

The comparison of indicative costs is based on information available in open literature and will be realistic when seen in relation to the features included in the Mission System and performance parameters of the Platform Aircraft of individual systems.

Conclusion

The *AEW&C India* programme is resurgence of the National effort that was launched in mid 1980s to realize *airborne early warning capability* indigenously. The early programmes that were initiated – Guardian, Airawat and ASP - had hurdles and set backs and came to a halt with the loss of the ASP flying test bed in 1999.

The *AEW&C India programme* was launched with renewed vigour in 2004 to synchronously accomplish the following three objectives:

(i) Realising an optimal and agile military surveillance system for the IAF.
(ii) Generating crucial building-block technologies for the system indigenously.
(iii) Creating essential R&D infrastructure for futuristic AEW&C systems.

These objectives have been accomplished to a realistic measure through the *AEW&C India* programme and India can now claim a place among the handful of nations that boast of AEW&C capability.

Dr S Christopher
Distinguished Scientist, Programme Director (AEW&C) & Director CABS

Dr S Christopher, after having done his BE (Hons) in *Electronics & Communication Engineering* and M Tech in *Microwaves* and *Radar Engineering,* obtained his PhD in *Antennae and Measurement Techniques.*

Dr Christopher joined the public sector company M/s BEL in 1985, where he was responsible for antenna design for Airborne Early Warning (AEW) system. This was the countries first attempt to get an indigenous early warning system but could not succeed.

Dr Christopher joined Electronics and Radar Development Establishment (LRDE). He played a key role in development of airborne antennae systems based on the *Slotted Array Technology,* that being first of its kind in the country. Antennae systems for radars in the Light Combat Aircraft, *Tejas; Airborne Surveillance Platform (ASP); Missile Seeker; Maritime Patrol Airborne Radar (MPAR); etc.,* were evolved with his active participation. Dr Christopher was Project Director for development of the *MPAR System mounted on 'Dhruv' helicopter* for Indian Navy.

Airborne Surveillance Platform (ASP) is the second attempt in the country in 1990s to acquire the indigenous Airborne Early Warning system. Dr Christopher was responsible in LRDE for development of the Antenna and Signal Processor. Unfortunately the ASP programme had to be closed with the crash of the ASP prototype system in 1999. Incidentally, Dr Christopher was onboard that aircraft during its previous sortie participating in the flight trials.

When the *Airborne Early Warning & Control (AEW&C) System* development programme was assigned to the Centre for Air-Borne Systems (CABS) in 2004, Dr S Christopher was appointed Programme Director (AEW&C) to lead the multi-faceted, time-bound task for Indian Air Force. In 2007, he took over additional charge of Directorship of CABS.

The indigenous AEW&C Surveillance System was to be realized and mounted on an optimum Platform Aircraft in order to deliver an operational military machine to Indian Air Force. A decade-long effort of Dr S Christopher has culminated in realization of the complex AEW&C Surveillance System that is to be inducted into operation by Indian Air

Force by early 2015. Dr Christopher has been thus associated with the Nation's efforts to develop AEW&C/AWACS systems right from the very beginning.

Dr S Christopher is a Fellow of INAE and member of several other societies including IEEE. He is recipient of a number of awards including DRDO's *Scientist of the Year Award* in 1998 and five NRDC *National Awards.* IETE has honoured him with *Ram Lal Wadhwa Award* for Outstanding Technological Achievements.

India – Bangladesh Relations : A Myriad of Issues- Significance of a Land Boundary Agreement

Shri Gautam Sen

Overall Scenario

India – Bangladesh relations are presently quite accommodative to each other, though not without issues still to be resolved. Tension over river water sharing, and particularly the acrimony over India`s Farakka Barrage project in Murshidabad district of West Bengal state, once viewed in Bangladesh as a manifestation of India`s intention to deny the latter its fair share of water for agricultural and related usage, may be viewed as a phenomenon of the past. India's North East (NE) insurgents like cadres of the United Liberation Front of Assam (ULFA), and Tripura's National Liberation Front of Tripura (NLFT) and All-Tripura Tiger Force (ATTF), are now denied their recuperation and organizational hideouts in and Bangladesh by the Sheikh Hasina's Awami League-lead Govt. in Dhaka, and many of their leaders have been apprehended and extradited to India by the latter. Trade and commerce at various echelons viz. at informal levels at many border haats *(markets where even barter trade is practiced by the villagers and other local residents),* particularly along many designated points along India's NE States` borders with Bangladesh, mutually agreed between the two countries, is on the upswing. The land custom stations at Akhaura *(in Tripura next to Agartala)* and Dawki - not far from Cherapunji or Mawsynrem *(in Jayantia Hills district bordering Sylet district of Bangladesh)* of Meghalaya, has come up during the past few years, in a structured way, facilitating regular commerce between the two countries. Wheeling out of

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250 MW of power *(to increase to 500 MW later)* though a 440 KV High Voltage Direct Current transmission line between Murshidabad district in West Bengal and Bheramara in Kusthia district in northern Bangladesh, has started (1). Riverine transportation of essential commodities and heavy engineering equipment is being undertaken from West Bengal to NE region of India, through rivers flowing through Bangladesh. All these developments augur well for the upgrading of India – Bangladesh relations. However, a Land Boundary Agreement (LBA) between India and Bangladesh, encompassing : (a) exchange of 198 enclaves involving approximately 24271 acres and nearly 51549 residents ***(111 Indian enclaves involving 17161 acres and 37334 residents in Bangladesh and, 51 Bangladesh enclaves in India covering 7110 acres and 14215 residents);*** (b) regularization of nearly 5045 acres of territory in adverse possession ***(India adversely holding 2777 acres of de-jure Bangladesh land and Bangladesh occupying 2268 acres of land legally part of India);*** and demarcation of only 6.1 km of un-demarcated land boundary at three places (Daikhata in West Bengal, Muhuri-River-Belonia in Tripura and Lathitila-Dumabari in Assam), is still to formally concluded (2).

Inconclusive Land Boundary Agreement

A protocol for an LBA, concluded during the state visit of India`s Prime Minister, Dr, Manmohan Singh to Bangladesh on September6, 2011 (3), to resolve two primary issues viz. the issue of enclaves ie. small pieces of land territory surrounded by the territory of the adjoining country *(virtually cut-off from the territory of the mother country)* and, adverse possessions *(portions of territory that are contiguous to India`s border and within Indian control, but which is legally part of Bangladesh. The same applies to Bangladeshi adverse possessions),* is still to be operationalised through a formal treaty and its ratification by India`s Parliament *(Bangladesh has already ratified the Protocol in September 2011).* The LBA bill had been introduced by the previous Congress Party-lead United Progressive Alliance (UPA)- II Indian Govt. in the Rajya Sabha on December18, 2013. The bill could not be passed by the Rajya Sabha because of opposition of parties like the Bharatiya Janata Party (BJP), and regional parties like Assam Gana Parishad – a party presently politically inclined to the BJP, and lack of enthusiasm of the West Bengal – based, Trinamul Congress. Pending ratification by India`s Parliament, the LBA protocol cannot be given effect to, and exchange of enclaves and regularization of territory in respective adverse possession, has been stalled. The present ruling party – the BJP, had expressed reservations on the LBA earlier

in the run-up to the last Indian General Elections, particularly on India having to give up more territory to Bangladesh (*the share of territory to be assimilated by India and Bangladesh consequent on the LBA, would have been broadly in the ratio of 1 : 2)* in the enclave exchange process though, India stands to gain more territory in the process of regularization of territory in respective adverse possession. The BJP had also expressed apprehension on impact of the LBA on immigration of Bangladeshi Muslims to India, and absorption of Muslim residents of the enclaves who may opt to get integrated into India consequent on the exchange.

Likely Change in Scenario

However, the present NDA Govt. seven-months down the line since it assumed power in India, seems now inclined to arrive at a modus vivendi with the Sheikh Hasina Govt. and work out an arrangement which will enable implementation of the LBA, perhaps with an assurance from the Bangladesh Govt. on certain border protective measures, inter-alia permitting a limited trade and intercourse across the border but with more self-imposed checks on ex-filtration from either side, and above all some compensatory trade-off for the limited extra territory which India will have to give up as compared to Bangladesh, when the enclaves are exchanged and merged with the respective surrounding territory. Statements of Bangladeshi leaders including gentle observations by Professor Tariq Karim, the former High Commissioner to India, from time to time, have indicated a degree of frustration on their side on the lack of progress on the realignment of the India-Bangladesh boundary and elimination of the enclaves which have been affecting normal life of the residents in these isolated pockets of territory rendering them virtually persons without identity for more than 50 years. Diptiman Sengupta, General Secretary, Bharat – Bangladesh Enclave Exchange Coordination Committee (BBEECC) *(India Chapter)* and Mohammad Hussain, President of the BBEECC *(Bangladesh Chapter),* have both expressed their eagerness and hope that the enclaves issue will be settled to the peoples` benefit, without further delay by the govts. of the day (4).

Situation in the Enclaves

The Radcliffe Award delineating the India-Pakistan border at the time of Independence, had left the most undesirable legacy of creating a large number of land enclaves, along India`s eastern border. The enclaves are small pieces of territory near the border, surrounded by the territory of the neighbouring country, and virtually cut off from the mother country to which the residents of

the enclaves belong to. The residents of the enclaves have been generally deprived of basic minimum services eg. basic healthcare and emergency support in times of need, primary and middle school - level education, as well as agriculture activity -related extension services, apart from suffering constraints in obtaining personal security from the local law and order machinery. They have been suffering from identity crisis, with many of them not having birth certificates, citizenship documents, etc., which prevented them from availing of the bare essential services on requirement, even through the service delivery systems of the adjoining country enclosing or encircling their enclaves, and also on many occasions from their mother country. They normally did not figure as voters in the electoral rolls of their parent country and thus were unable to vote in their parent country`s elections. In the pre-Bangladesh days, particularly during the Ayub Khan era in the mid-1960s, frequent instances of border tension would arise, whenever India and Pakistan tried to enforce control on civilian movements and impose security measures in the periphery of the rival country`s enclaves. Exchanges of fire between the border guarding armed forces occurred on many occasions at places like Gitaldaha in Cooch Behar district of West Bengal on the then India-Pakistan border, near Berubari - an Indian enclave in then-East Pakistan.

Administration of Enclaves : Gearing Up for Change

The total territory of the enclaves involved, is not substantial, and less than 25000 acres. It is less than the area of many of the standard districts. The total resident population is within one 100000. While administering these widely dispersed enclaves because of their demographic nature *(with even internally spread-out habitations)* and geographical disposition of the Radcliff delineated boundary, has always been a problem with both the countries; it is the emotive aspects of likely assimilation of a number of Muslim people who may opt to stay in India when their present Bangladeshi enclaves integrate into India, in the border districts of India, which is causing the irritation. There is also opposition from an NDA ally – the regional Asom Gana Parishad, which has been steadfastly opposed to India accepting any more Bangladeshi Muslims and even that countries` Hindus, as distinct from the present BJP leadership`s inclination to accept Hindu Bangladeshis only. Notwithstanding this backdrop, the present NDA Govt. of India, in the overall interest of the country and maintaining positive Indo-Bangladesh relations in the regional strategic scenario, may eventually take a broad long-term view on this boundary settlement issue, and facilitate removal

of this major irritant resulting from an inconclusive situation persisting because of an LBA not being formalized and ratified by the respective due processes in the two countries. It is understood from West Bengal Govt. sources that, preliminaries from the land records and revenue administration standpoint, have been worked out by its establishment in North Bengal Division, to ensure that executing an LBA becomes a feasible proposition without adverse ramifications on demography of bordering districts, both in India and Bangladesh and the welfare of the residents of the border areas and enclaves, concerned. The Joint Protocol concluded by India and Bangladesh on 6th September 2011 also states that jointly verified cadastral enclave maps had already been finalized between Director General Land Records & Survey, Bangladesh and Director Land Records and Survey, West Bengal in 1997 (3).

Political Disposition of India`s Regional Leaders

When Dr. Manmohan Singh as Prime Minister lead an Indian Govt. delegation on an state visit to Bangladesh in August 2011, his entourage included the Chief Ministers of Assam, Meghalaya, Mizoram and Tripura, but not Mamta Banerjee, the Chief Minister of the ruling Trinamul Party Govt. of West Bengal - the most significant State of India bordering Bangladesh and having the longest *(more than 2000 km)* international boundary with the latter. The West Bengal Govt. had adopted a rigid stand on sharing of Teesta River waters between India and Bangladesh, which did not leave any leeway for the then UPA-II Govt. to work out a via-media agreement with Bangladesh. Teesta, which originates in upper northern West Bengal, in the foothills of the Himalayas, flows down the plains of Siliguri sub-division of Darjeeling district and part of Jalpaiguri district, before entering Bangladesh near Tin Bigha and then, flowing through its north-western districts viz. Lalmonirhat and Rangpur and merging into the Padma – Megna rivers` discharge. West Bengal Govt. has a logic for construction of the Gazoldoba barrage on the Teesta before the river enters Bangladesh, to regulate the river`s discharge downstream, both for flood control and agricultural needs of West Bengal in its command area covering nearly 6.32 lakh hectare. There is also a raison-detre for this barrage vis-à-vis flood protection requirement of West Bengal , in the backdrop of the devastating floods which ravaged Darjeeling district in the late sixties. However, Bangladesh`s agriculture related needs, of its north-western districts encompassing nearly 13 lakh hectare, cannot be overlooked. It appeared that, sagacity of approach to balance out the West Bengal`s needs vis-à-vis those of Bangladesh, which was evident when India`s

Premier Indira Gandhi and Jyoti Basu – then West Bengal Chief Minister, tried to work out a via media and defuse tension over the Farakka Barrage project, which was finally resolved in December 1996 when India`s Prime Minister Deve Gowda and his Bangladesh counterpart, Sheikh Hasina signed the 30-year water-sharing treaty, was not evident in 2013.

Disagreement on Teesta Affects LBA

The fallout of disagreement between Govts. of West Bengal and India on Teesta River water sharing with Bangladesh, was the apparent failure of New Delhi and Kolkata to arrive at an unified approach on an LBA. It appears that, had her objections on the Teesta water-sharing been broadly accommodated, Mamta Banerjee would have been an enthusiastic supporter of the proposed LBA *(eventually however, her party member Dr. Sugato Bose has been part of the consensus recommending the LBA in the Standing Committee on External Affairs)* (2), reckoning the general favourable disposition on this issue within her party, the Congress Party and the parties of the Left combine in the State. A more sensitive handling of these issues by the UPA-II Govt. during the run-up to Prime Minister Man Mohan Singh`s visit to Bangladesh in 2011, would have yielded a positive outcome facilitating the LBA, though overcoming the NDA parties` resistance in the ratification process may have still posed a hurdle but could have been eventually overcome. Instead of involving Salman Khurshid, the then Minister of External Affairs, who had personal rapport with Mamta Banerjee, in advance before Dr. Singh`s official visit to Bangladesh, for back-channel dialogue with her, engaging Shivshankar Menon, the Govt.`s National Security Adviser to assure the West Bengal Chief Minister on her apprehensions of giving away a disproportionate share of the Teesta waters to Bangladesh was an imprudent step by the Man Mohan Singh Govt. With the West Bengal Govt. not on board, agreements on both the LBA and Teesta water- sharing, fell through.

Near-Future Political Scenario and LBA

State Assembly elections in both Assam and West Bengal, are still two years away. There is a new Central Govt. in India. In Bangladesh, after a stiff and vicious political campaign by her main opponents – Khaleda Zia`s Bangladesh Nationalist Party and the Jamaat Party, Sheikh Hasina`s Awami League has managed to retain power and a degree of political edge over its rivals. In this political backdrop, it may be advisable to push through an LBA in the mutual

long-term interest of both India and Bangladesh. Narendra Modi, India`s Prime Minister incumbent and his Bangladeshi counterpart, Sheikh Hasina, seem to have developed a degree of political rapport as evident from the continuing existing level of trade and intercourse and above all, sharing of intelligence and security related inputs to combat extremist and communal elements in both the countries. The only plausible obstacle however, may arise from the contestation in West Bengal between Mamta Banerjee`s Trinamul Congress, and the State outfit of the BJP, trying to capture the political space vacated by the erstwhile ruling outfit of the Left Front of the Communist Party of India (Marxist) Party and its allies. It remains to be seen whether, the central leadership of the BJP outweighs the short-term benefits of political gain in West Bengal or, works towards furtherance of India-Bangladesh relations in a wider South Asian context. Govt. of India`s efforts to control extremist national and international forces in South Asia, which can only be realistically feasible with an anti-communal and proactive Govt. like that presently in power in Bangladesh, willing to counter elements in Bangladesh inimical to India`s security and stability and also facilitating the growth of regional trade and infrastructural links for mutual development of both the countries.

Recent Incidents

After the recent bomb blast incident at Khgragarh – Mangalkote, and detection of Bangladeshi terrorist hideouts in Burdwan and Murshidabad districts and a few locations in northern West Bengal (4), the necessity of having a comprehensive web of cooperation between India and Bangladesh, cannot be overstated. India`s north-east region is still affected by economic and social problems apart from ethnic issues. Bangladesh is a country which is geopolitically placed as such, that India is bound to experience the maximum ramification of the former`s policies and actions. India may therefore, engage with Bangladesh In a manner that, irritants in bilateral relations are eliminated, economic development of West Bengal and India`s north-eastern States promoted, and particularly, the mutual border areas stabilized to the maximum extent and inclination of people in the vicinity of the borders to migrate across, is reduced if not eliminated altogether. Exchange of enclaves through an LBA, will undoubtedly fit into this overall macro objective.

Sensitivity of Land Transfer : Compensation for Migrants

The most difficult and sensitive issue for any country is the giving up of its

territory, whether as a consequence of conflict or part of a political accommodation. For India, obviously, it may not be different. Apart from emotive aspects, and that too, stirred up by political parties *(on both sides of the border)* trying to obtain electoral mileage, with resonance from some segments of the people affected, the implications of such territorial exchanges on settlement of contentious border issues – if existing, have to be reckoned. A territorial exchange as in the present case, between India and Bangladesh, is not expected to impinge on settlement of the mutual border, except to the extent the enclaves are concerned. The India-Bangladesh boundary is quite stable, mutually accepted both in its land and sea contents. Therefore, the proposed LBA will only add on to the stability of the border. However, the LBA on the anvil, may have some positive and token effect towards indicating the way forward towards resolving differences, in at least some segments of the Sino-Indian border. The issue on which both the Govts. of India and Bangladesh will have to show maturity, concerns the assimilation of citizens of the neighbouring country. The present residents of the enclaves who opt to become citizens of the country to which the enclave has merged, may have to be dealt with in a people-centric manner, with their welfare as the matter of prime concern, irrespective of their religious faith. The issue concerning people of Hindu faith, of enclaves integrating into Bangladesh, who may prefer to move to India, would be a little sensitive matter in view of the socio-economic conditions in adjacent border areas, poverty, etc., and some competing demands on local resources. Govt. of India may have to consider obtaining some transfer of movable assets from Govt. of Bangladesh in their favour *(which may not be substantial as limited number of people will be involved),* to compensate for the assets of these people leave behind in the erstwhile enclave, and facilitate their rehabilitation in India. Land vested in the control of State Govts. in India may have to be provided to these people on long-term lease basis, for agricultural purpose and agro-based livelihood activities.

Enclaves in Perspective

There are approximately three million people in enclaves throughout the world. A large number of the enclaves suffer from lack of governance and security of the residents. Enclaves influence bilateral relations between the mainland country to which the enclave politically belongs, and the surrounding country, to a disproportionate degree.(5) West Berlin was a classic example of this phenomenon in the Cold War era and was the source of high order tension

between USA and the Western powers and the opposing erstwhile Soviet Block, over administration of the city enclave, its security and movement in and out of it. Gibraltar as a prominent enclave, has however been less contentious between Great Britain – the owner of the enclave, and Spain – the surrounding country. The enclaves along the India and erstwhile East Pakistan border, have also been a source of tension between the mainland countries ie. India and Pakistan, as already mentioned. From the international perspective, the present set of Indian – Bangladeshi enclaves had generally been regarded as among the lot suffering from inadequate local administration, having virtually no police protection for its residents and their property, as well as absence of institutionalized welfare measures.

Implications : India`s Responsibility

India – Bangladesh relations are multi-faceted. Enclaves and settlement of the border areas related to these territorial pockets, is only one of the ingredients in their bilateral relations. Nevertheless, they have a significance of their own, impact relations among the residents of these enclaves and those of the adjacent areas, much beyond the physical confines of these pocket territories. An environment where, an ambiguous situation prevails, and governance is at a low ebb, can only facilitate the functioning of non-state actors and elements inimical to the interests of both the countries. Development of border areas is also incomplete without the enclaves attaining a proper threshold of development. An humanitarian approach, harmonised with a proper appreciation of geopolitical realities of South Asia, should induce both the ruling Govts. in India and Bangladesh, to formalise the LBA at the earliest, before any negative factor vitiates the process. The present Govt. of India in particular, may take the initiative, without looking into the past or short-term political gains.

The Report of the Standing Committee on External Affairs (2), recently submitted to Parliament, clearly recommending early formalization and ratification of the LBA by India, should help Govt. of India to wrap up the matter, in the long-term interest of both the countries. There are no operational obstacles for executing an LBA as conceived, compensation to those opting to settle in India may not be financially significant and border management is likely to be better. Govt. of India as well as the incumbent State Govts. concerned, may show the requisite political will and foresight for the purpose.

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Shri Gautam Sen

Shri Gautam Sen is a retired officer of the Indian Defence Accounts Service (1976 Batch) of Govt. of India. The officer has been a student of Economics and International Relations and had served in different appointments with Union Ministries of Defence, Information & Broadcasting, Home Affairs and External Relations. A substantial part of his service has been in an environment of Indian armed forces operations eg. under `OP Pawan` in Sri Lanka (when he was Financial Adviser to India`s High Commissioner in Sri Lanka vis-à-vis Indian Peace-Keeping Force`s operations), and in the North East and Jammu & Kashmir. The officer`s North East experience encompasses responsibilities discharged as Financial Adviser of North Eastern Council & Assam Rifles under Union Ministry of Home Affairs and his present assignment as Adviser (Finance Commission matters) of Govt. of Nagaland.

Space Security

Dr Pramod Kale

Introduction

Security of our Space Systems, Space Assets and our Access to Space is a very vital requirement. It is not just the physical security of our national facilities and assets but it is also the security of our ability to access the Space for our national requirements. Today our national economy depends on our operational Space Systems and Services for providing vital Telecommunications, Television and Radio Broadcasting, Meteorological earth observation, Remote sensing earth observation for natural resources, Regional navigation and many other aspects. We need to ensure that we should be able to launch our satellites using our launch vehicles as and when we require these operational space services. We certainly need to abide by our National laws and regulations as well as International Laws, Regulations and Treaties. We have demonstrated that we have been following them without any breach of laws, regulations or treaties. In the last twenty years we have made spectacular progress in operationalizing our space systems and services. We are providing the necessary operational space services for our national requirements and are also making significant contributions in providing these services to international community. The successful launching of the two important scientific missions namely Chandrayaan 1 and Mars Orbiter Mission has brought national and international recognition of our ability to carry out such complex missions. There is now a discussion going on for providing a satellite to be made for SAARC countries. We have launched satellites for other nations in a very reliable, timely and cost effective manner. We have provided launch opportunities for national and international experimental missions.In the light of the above, it is necessary to address the question of Security of our ability to

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have unhindered operations of Space Systems and access to Space.

ISRO Launch Vehicles And Services

After the initial experimentation with smaller Satellite Launch Vehicle- SLV 3 and Augmented Satellite Launch Vehicle- ASLV, we have now operationalized the Polar Satellite Launch Vehicle PSLV. The first developmental launch of PSLV D1 took place in 1993 and that was unsuccessful. We learnt very valuable lessons from that failure and after the necessary corrections and improvementshad successfully launched PSLV developmental flight PSLV D2 in 1994. Since then we have had twenty five successful flights of PSLV in various configurations. There has been not a single failure. The vehicle technology and configuration that was developed in the 1985 – 1991 time period has served as our 'work horse' very ably.

We had undertaken the development of Geosynchronous Launch Vehicle GSLV in 1990- 1995 time period. In the initial period we were dependent on the bought out Cryogenic Stages for the GSLV as the upper stage. Our aim was to get the technology for the Cryogenic engine and stage from Russia but that had resulted in embargo problems. Due to the embargo problems we could buy a few cryogenic engines and stages from Russia without any technology or know how transfer. We had undertaken the indigenous development of the Cryogenic engine and stage. The first flight was a failure. We have had a successful flight of the GSLV in January 2014 with indigenously developed Cryogenic engine and stage. We had a successful launch of the heavy lift GSLV Mark III this year. The vehicle carried the mock up of the Crew module for testing the atmospheric reentry characteristics. This vehicle is expected to be used for our Human Space Program.

Currently we are averaging about five to six launches per year. We need to step up this rate to meet our own launch requirements of about forty five missions over next five years as projected in 2011. We need a mix of PSLV and GSLV Mark II launches.We have now two launch pads operational at Satish Dhawan Space Center. (Ref. 1)

ISRO Satellites

A large number of satellites have been developed and launched by ISRO. These have included Scientific Satellites, Meteorological Satellites, Remote Sensing Satellites, Communication Satellites, Navigation Satellites, Lunar and Mars Orbiter Satellites. While we are using our launch vehicles to launch our satellites, we need to use other International / Commercial launch vehicles for our larger and heavier Communication Satellites. (Ref.1)

Opportunities For Smaller Satellites

In December 2011 at the STS2011 conference at Vikram Sarabhai Space Center, ISRO at Thiruvanathapuram I had presented my ideas about the opportunities available for launch of smaller satellites which could be launched using the PSLV and PSLV variants. Considering these opportunities I had suggested that we need to very seriously take the necessary actions to develop our national capabilities for providing launch services to meet the national and international requirements. A large number of questions were asked about the viability of continuation of the production and operationalization of the PSLV vehicle.

The question of obsolescence of the technology developed in 1985-1990 time period was the foremost. We know that Vostok, Delta, Proton, Atlas Centaur, Arianne 4 launch vehicles are still in use. If we are determined we can develop further, refine and improve the technologies required without allowing complacency setting in. So far our record for reliability and the safety of the vehicle systems has been excellent.

The tables giving the projections presented at STS2011 are reproduced here-

Possible Missions In The Next Twenty Five Years	
GEOSTATIONARY	
FUNCTION	**NUMBER**
Commucations C Band	5
Communications Ku Band	5
Commulcaons Ka Band	2
Communications X Band	4
Communications L Band	4
Communications VHF	3
Communications Foreign	5
Communicatlons Advanced Experiments	4
Broadcasting	3
SUBTOTAL	**35**

Possible Missions In The Next Twenty Five Years	
GEOSTATIONARY	
FUNCTION	**NUMBER**
Earth Observatlons Met	4
Earth Observations Remote Senslng	2
Early Warning Missile Detection	2
Earth Observatlons Ocean	3
Earth Observatlons Foreign	5
SUB TOTAL	**16**

Possible Missions In The Next Twenty Five Years	
POLAR SUNSYNCHRONOUS	
FUNCTION	**NUMBER**
Earth Resources	6
Environment	4
Meteorolgy	6
Reconnalsance	7
Oceanography	3
Geode Sy I Gravity	3
Geomagnetlsm	3
SUBTOTAL	**32**

Possible Missions In The Next Twenty Five Years	
SCIENCE AND TECHNOLOGY	**NUMBER**
Lunar	3
Solar	3
Deep Space	3
Human Space Program	5
Docking In Space	3
Microgravity	3
SUBTOTAL	**20**

ISRO is a Research and Development organization. If we are to target continuing availability of PSLV launch vehicle we need to make certain that

it should be produced by a separate Industry entrusted with the responsibility. While ISRO should be still responsible for quality assurance, quality control and ensuring safety, ISRO will need to concentrate on further refinements and improvements.

ISRO has been dependent on a large number of industries for the delivery of the subsystems necessary. So far no industry has come forward to take on the role of 'Systems Integrator' for Satellites and Launch Vehicles. In the 1970-1975 time period there were many problems faced by the European Countries involved in Launch Vehicle developments. ELDO was not successful. France had taken certain decisions and Arianne as a vehicle was initially developed by CNES of France. It was then given as a responsibility to Aerospatiale as 'Industrial Architect'. Today Arianne as an organization has become an undisputed launch vehicle and launch service provider.

Access To Geostationary Orbit

Access to space is not prohibited by any specific international law or regulation. The operations carried out for launching a satellite currently require launching large size multistage rockets. Once the first stage is ignited and lift off occurs, a properly guided and controlled rocket can reach the minimum velocity required for achieving a low orbit in about twenty minutes. The rocket preparation time at the launch pad can take a few weeks.

A fairly smaller size rocket can be carried below a large aircraft and after reaching proper altitude and speed can be released. That rocket can reach a low orbit and release its payload. Attempts are being made to launch satellites using high performance fighter aircraft in combination with rockets.

In both the cases above certain stages fall off on the earth and only the final stage and the satellite reaches the orbit. The flight operations require fairly extensive national and international coordination in terms of alerting the airlines, shipping lines and others.

The access to geostationary orbit requires much longer preparation. The satellite there is launched for specific purpose and for that purpose requires specific frequencies to be used. These frequencies are required to be coordinated nationally and internationally. This process could take over three to four years of bilateral and multilateral negotiations. Certain modifications to space segment and or ground segment may have to be accepted to ensure success in getting the orbital slot assigned. The orbital slots have been allotted on the basis of filing sequence.

The orbital slots are assigned by ITU very much before the actual launch and operationalization of the satellite. A country could lose its credibility if it has filed for such slot and cannot actually occupy the orbital slot. Thus it is not prudent to file for more orbital slots in order to ensure access to Geostationary Orbit.

Orbital Security

Once a satellite is successfully launched and operationalized, it can be utilized by us continuously during the planned lifetime of the satellite. The on orbit operations of a satellite can be interfered with or hampered by jamming its command and control system. It is a difficult operation but it can be done. Sending a command which could deactivate a satellite is a very difficult operation. Interfering with the command system receiver of a satellite by sending a stronger signal than the legitimate or authorized signal is possible.

In the case of communication satellites jamming a specific frequency band is a relatively simple operation. A specific transponder can be jammed. When we try to develop and deploy low cost, low power uplink transmission systems to be used with 'bent pipe' transponders in our satellites, we must remember we need to use highly sensitive high gain receiving system in our satellite. Such a system then is quite open for jamming also by low power uplink jammers. Jamming of a transponder is not just an act of 'Denial of Service', but it is a far more deliberate hostile and disruptive act.

We need to have a proper definition of jamming or intentional interfering. In many instances the interference is unintentional. At one time I had said that we should consider the proven act of jamming as an 'act of war', and I am still of the same opinion. Declaration of this principle by the Government of India at the appropriate level will be a credible deterrence.

Detection Of Threat And Act Of Jamming

Newer and newer techniques are being developed to detect the location of the jammer or the location from where interfering signal is originating. Having our own two or three satellites operating in the same frequency band but at different orbital locations can simplify the identification location of origin of jamming or interfering signal using time of arrival of signal technique.

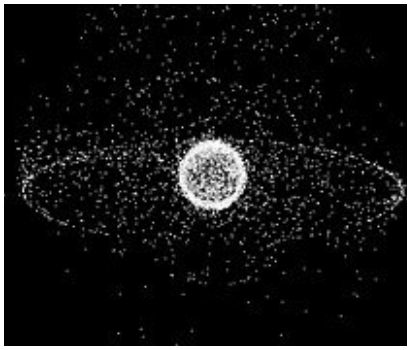
We need a dedicated monitoring system equipped with appropriate tools and equipment to continuously monitor the radio frequency spectrum being used by our communications satellites. Many a times we try delegate this

type of task to some operational agency and for them this type of task being not their main work, it gets lower priority and attention. Once interference is detected and reported to appropriate authority, further action needs to be initiated and completed.

Space Debris

Since the launch of the first artificial earth satellite 'Sputnik' in 1957, the 'space debris' is accumulating. When a satellite is injected in the orbit, the last stage of the launch vehicle also gets injected in the orbit. This stage is separated from the satellite and does not carry any additional propellant or control system. Beyond three hundred kilometers such a stage could remain in orbit for a considerable length of time. The same is the case when a satellite that has completed its useful lifetime remains in orbit.

The useful life of a satellite comes to an end when the propellants are exhausted, when a satellite cannot be controlled or when the payloads stop functioning. As per the UN / ITU recommendation the radio frequency transmitters are turned off at this stage but the dead or inert satellite remains in the orbit. In addition certain hardware also separates from the last stage or satellite. The last stages of almost all the communication satellites injected in the geostationary transfer orbits also are in this category. It is known that some hardware and tools have been lost by the Astronauts and Cosmonauts in orbit during their 'spacewalk '. This is the 'orbital debris' or 'space debris'.



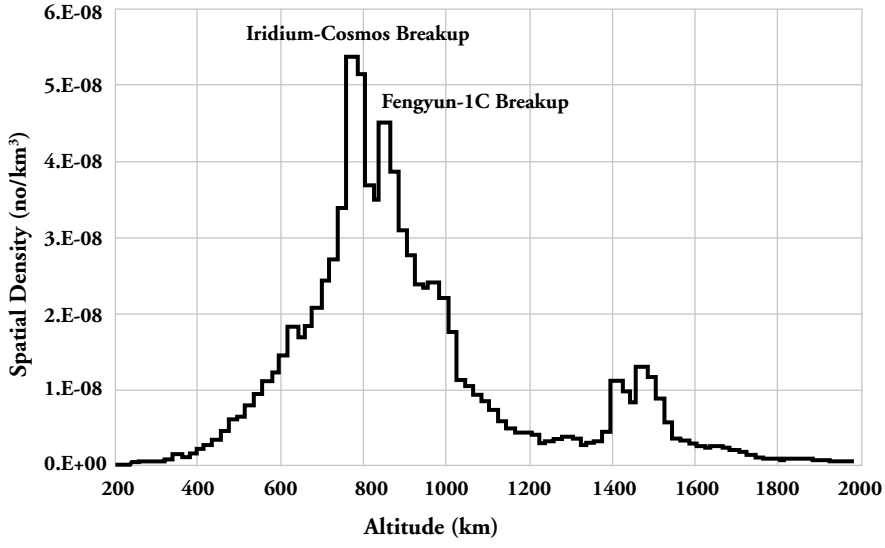
'Space debris populations' as seen from outside the Geosynchronous orbit (GEO). Note the two primary debris fields, the ring of objects in GEO, and the cloud of objects in low earth orbit (LEO). (Ref. 2)

Orbits of such dead satellites or separated spent stages will decay due to aerodynamic friction and this debris will finally enter denser atmosphere. Its temperature rises and smaller objects burn up. Some of the larger objects can survive the reentry into the atmosphere and could cause accidents on the earth. Reentry of 'Skylab', 'Mir' and 'Columbia' are very well known examples of such fiery and dangerous events.Use of optical tracking systems and radars has been made regularly to keep track of such objects.

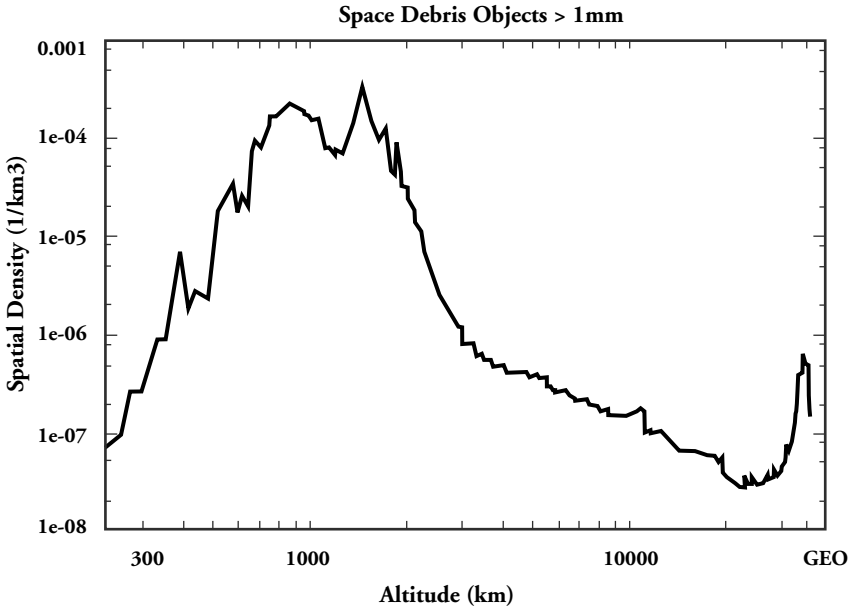
As of 2009, about 19,000 pieces

of debris larger than 5 cm (2.0 in) are tracked, with 300,000 pieces larger than 1 cm estimated to exist below 2000 km altitude. For comparison, the International Space Station orbits in the 300–400 km range and both the 2009 collision and 2007 Antisat test events occurred at between 800 and 900 km.(Ref. 2)

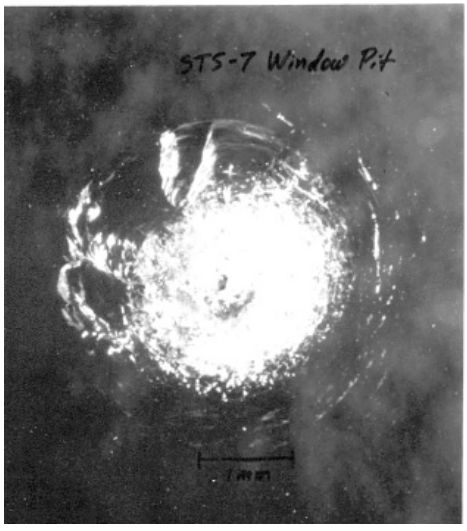
These items can pose danger to newer satellites entering in orbits. In certain orbits such debris items can collide with active satellites. The loss of a good satellite due to such a collision with debris can result in a considerable loss for a launching nation. (Ref.2)



Spatial density of LEO space debris by altitude according to NASA report to UNOOSA of 2011.



Spatial density of space debris by altitude according to ESA MASTER-2001. This graphic does not include the large amounts of debris from the Chinese ASAT and 2009 collision events.



A fleck of paint left this crater on the surface of Space Shuttle Challenger's front window on STS-7.

Meteorites And Micrometeorites

While designing a satellite we need to take care of possible impact of a space debris object or micrometeorite. The data collected by various space agencies and published is used for deriving as design guidelines. These objects approach the earth at extremely high velocities. On the ground we know the damage that can be caused by slow moving vehicles with speeds of the order of about 5 to 10 meters per second in accidents.

Meteors or Micrometeorites approach the earth with speeds in excess of 10 to 19 kilometers per second. Even very small objects colliding with operational satellites with such high speeds can cause devastating damages and destructions.

A full view of the smoke trail with the bulbous section corresponding to a mushroom cloud's cap.

The Chelyabinsk meteor was a Superbolide caused by a near-Earth asteroid that entered Earth's atmosphere over Russia on 15 February 2013 at about 09:20 YEKT (03:20 UTC), with a speed of 19.16 +/- 0.15 kilometers per second (60,000 - 69,000 km/h or 40,000 - 42,900 mph). It quickly became a brilliant Superbolide meteor over the southern Ural region. The light from the meteor was brighter than the Sun, even at 100 km distance. It was observed over a wide area of the region and in neighbouring republics. Eyewitnesses also felt intense heat from the fireball. (Ref. 3)

Probability Of On Orbit Contact Or Collision

Collisions between satellites can occur. The probabilities of such collisions can be computed. On the basis of such computed probabilities, 'First party or Third party legal liability insurance policies' can be obtained by agencies providing operational space systems. Such insurance policies are regularly being obtained for our communication satellites.

Dr. Lubos Perek had written extensively on the subject of collisions in space traffic management. Collision between a good operational satellite and a dead satellite can lead to extensive loss of business. We need to be very vigilant about this subject. Management of operational satellites sometimes may require us to take evasive measures. When we collocate our satellites in the same orbital slot, we need to take specific precautions.

In the time period 1957 to 1987, the launch and deployment activities were frenetic, partially caused by the technological war between the US and the USSR. In 1979 Dr. Luboš Perek had presented a paper "Outer Space Activities versus Outer Space" which was the first space debris mitigation measure, to re-orbit GEO satellites into a disposal orbit at the end of their lives.

Very important studies on this subject are available in literature. (Ref. 4 and5)

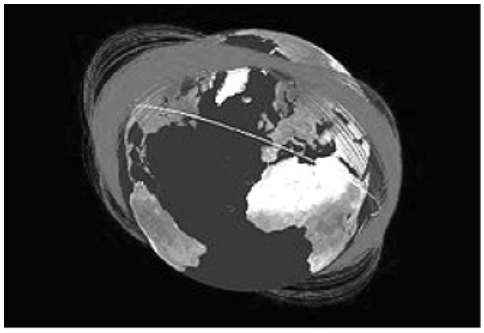
Asteroids And Comets

Impacts by asteroids and comets on earth in the past have left many craters. One well known crater is there in Maharashtra, India at Lonar. The impact of the comet 'Shumaker Levy' on Jupiter in 1994 is very well known. The hazard presented by such near earth objects was investigated by Dr. Tom Gehrelsand his efforts have resulted in establishing many optical telescope facilities for 'Space Watch'. (Ref. 6)

We have many telescopes operational in India. We need a dedicated facility that keeps a watch on such asteroids, comets and Near Earth Objects. We also need a network of Amateur astronomers interested in identifying such objects.

These asteroids also present hazards to our satellites and our ground facilities. Even though we might classify such hazards as natural hazards, we need to take actions in terms of redundancy, diversity and dispersion of facilities to prevent what can be termed as 'Single Point Failure or Single Event Impact'.

ASAT - Anti Satellite Weapons



Known orbit planes of Fengyun-1Cdebris one month after its disintegration by the Chinese ASAT (orbits exaggerated for visibility) (Ref. 2)

Highly accurate control, guidance and navigation of space vehicles had made it possible to develop and demonstrate 'Anti Satellite Weapons'. Such weapons were initially developed as Anti-Ballistic Missile Defence systems. These are not science fiction ideas. These are real. In the literature we can find many references. Deliberate destruction of a space object will create a large number of debris objects increasing the danger of hazards to operational space systems. These weapons could be classified as passive kinetic weapons or weapons which require explosives. So far such tests being carried out by USA, China and Russia are reported in the literature.Such weapons can be launched by using small rockets being carried by large aircraft or high performance fighter aircraft.

Phased Array Tracking Radars

Phased Array tracking radar in Alaska, USA

A large number of RADAR systems have been developed by many countries. These ground based radar systems can track multiple objects simultaneously without moving the antenna. Such radars use phased antenna arrays. These radars are track even small objects in space. Every satellite or any debris item has to cross the equator twice in its orbit. Thus a constant watch on the equator can provide the necessary opportunity for detection of such objects. From the tracking data the orbits of such objects can be determined in a short time.

ISRO is in process of developing such a radar in our country and the progress of the development is going on at a fast pace.

Dispersion Of The Facilities

We definitely need to have our facilities located in various parts of our country. This is required from the consideration of providing opportunities for a large number people from various states in the country. In addition this is required to be done to make certain that we need to provide security and protection of our national facilities.

We have various research centers and facilities located in places such as Ahmedabad, Bangalore, Thiruvananthapuram, Valiamala, Shriharikota, Mahendragiri, Gadanki and Hyderabad. There are about twenty five State Remote Sensing Applications Centersas well as six Regional Remote Sensing Service Centers all around the country. Satellite Tracking and Control stations are located in Bangalore, Hassan, Bhopal, Lucknow, Dehradun and other locations.

For the Mars Orbital Mission we had used ship borne tracking systems very successfully. The ships used were commercial sea vessels. In the future we will need to use dedicated ships equipped with such facilities.

Industries all over the country are contributing to the space efforts. We started our Rocket Research activities at the Thumba Equatorial Rocket Launching Station near Thiruvanathapuram. We can use that facility for smaller Sounding Rocket launching. We have established the Satish Dhawan Space Center - SDSC at Shriharikota Island.

At one time there was a thought about locating a 'Material Research Center' in the eastern part of the country. Over the years this has not materialized. We need to establish such a center as early as possible. It preferably could be located in the eastern part of the country from the Geographical dispersion and diversity point of view.

Today SDSC is the only launch site from where we can launch our satellites for accessing space. From the Security of our assured access to space we need to establish one more satellite launching facility. While we have now two operational launch pads at the SDSC, considering the launch opportunities in the future we need to take steps to ensure that we have one more satellite launching facility.

The major Rocket Propellant Plant of ISRO for the Solid Propellant required for the PSLV and GSLV stages is located right at the SDSC. A

major unfortunate accident at this facility could result in delays in almost all the activities at that center. We definitely need to establish one more Rocket Propellant Plant.

The Oxidizer required for the solid rocket propellant is also produced by ISRO at Aluva in Kerala. Again this is the only plant that is producing the required Ammonium Perchlorate Oxidizer for ISRO Launch Vehicles. We need to establish one or two more such plants. This is required from security and environmental pollution avoidance point of view.

Local Impediments

In the initial period we were able to establish our various facilities in different locations. The local people were enthusiastic about supporting the establishment of such facilities. Most of these facilities were away from the centers of population. Today the situation is different. In many locations various political groups are demanding enhanced and extra compensation for the lands acquired to establish the ISRO facilities. This is over and above the compensation that was received by people at the time of acquisition of the lands required. This is a dangerous trend and could lead to frustrating the people working there. It is not a question of the 'quantum' or 'financial burden' only but it is also a situation that is resulting in alienation.

Self Reliance

Right from the beginning of the Space Program it was very well understood by all of us that we will need to develop the required technology and initially produce the required subsystems and systems. A large number of the components, subsystems and systems were developed and wherever possible industries have contributed in the required delivery of the systems. While this has happened in the areas of Mechanical Engineering, Chemicals, Propellants and Propulsion systems it has not happened in the area of Electronics. We still need to import a large number of electronic parts, integrated circuits, RF components. Availability of the easier route of import has almost wiped out our industry engaged in Electronic Components and Semiconductors. We definitely need to consider this aspect while we try to have continued access to space. I reproduce here what I had said earlier –

"We need to capitalize on the gains of those years. We need to have a strong commitment about "Self Reliance". We need to get to the position of

not allowing the situations to develop where the recurrence of the Embargo could happen and if it happens we must have alternate strategies. We have the resilience but what we must have is the will and determination. During the time when Embargo was present we did not give in. Some of our programmes were delayed but we persisted in developing alternate sources. A large number of these sources were indigenous. As students of Dr. Vikram Sarabhai we learnt from him, "When options are closed, resources arise". Even when easy options of import were available, we knew that we had to develop the necessary technologies for the launch vehicles. There was job satisfaction for the working scientists, engineers and all the staff, there was pride in our work." (Ref 7)

Conclusion

In 1970 for the first time a document titles 'A Decade Profile for Atomic Energy and Space' was prepared and published. Dr. Vikram Sarabhai. He had indicated to us that 'It takes more than five years to establish an atomic power plant or to develop a satellite launch vehicle; hence we should prepare a Decade Profile instead of a five year plan. This should be a document in the public domain and should be widely circulated. This document will inform the Parliament, the Planning Commission, the general public and Industries about our plans for the coming decade'. The foreword for that document written by him is clearly indicative of the reason why such a 'Decade Profile' necessary. This practice has been kept up by ISRO and Department of Space. Industries thus can make their business plans and projections. So far I have not seen any such projections and plans by an industry which could indicate their initiatives in this direction.There are over seven to eight hundred industries participating in the delivery of products to ISRO. We need industries to take the lead and provide total end to end systems and services. Industrial initiatives in this area will lead to security of our space systems, services and access to space.

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Dr Pramod kale

Pramod Kale, born in 1941 at Pune, was student of M. S. University for his B. Sc. Physics degree at Vadodara in 1960. He obtained his M. Sc. Physics degree in 1962 from Gujarat University, Ahmedabad.

Pramod Kale had worked with the Indian Space Research Organization (ISRO) for over thirty two years (1962-1994) during which he held various leadership positions. He started his work on satellite tracking at the Physical Research Laboratory - PRL, Ahmedabad in 1960 and was a member of the first team sent to Goddard Space Flight Center, NASA, USA for training in launching sounding rockets in 1963 and establishing the Thumba Equatorial Rocket Launching Station – TERLS. He had worked as a Research Student with Dr. Vikram Sarabhai at PRL, Ahmedabad for three years 1962 – 1965.

Some of his notable assignments and positions in ISRO / DOS were –

- Project Manager, (Electronics and TV Hardware); Satellite Instructional

Television Experiment (SITE), SAC, Ahmedabad
- Project Director; INSAT 1 Space Segment Project, Bangalore
- Director, Space Applications Center (SAC), Ahmedabad
- Director, Vikram Sarabhai Space Center (VSSC), Thiruvananthapuram

He had been active in teaching at the Gujarat University for the Post Graduate Diploma course in Space Science and Applications. He is continuing to give lectures on Space Communications Systems for the students at CSSTEAP program at the Space Applications Center. He had delivered a large number of lectures on Space Communications, Remote Sensing and Water for the Countrywide Class Room of UGC and these were transmitted by Doordarshan.

After retirement from ISRO, he worked for a few years with Global Wireless Technology Ltd. -GWTL as Head, Microwave Antenna Division and Executive Director in Pune. GWTL was responsible for the establishment of the Satellite Communication system for Maharashtra Government.

He now devotes his time as an educationist, promoting science education for children from different strata of society and also spends time with social work and community service.

Till recently he was executive chairman, Muktangan exploratory science center of the Bharatiya Vidya Bhavan's Pune Kendra and Chairman; Board of Trustees of the Indian Institute of Education (IIE); Pune.

During his career Pramod Kale has been honored with many awards and recognition. Some of them include –
- Shri Hari Om Ashram Prerit Vikram Sarabhai award in 1975
- Padmashri in 1984
- R L Wadhwa Gold Medal of the Institution of Electronics and Telecommunications Engineers -IETE
- Aryabhatta award of the Astronautical society of India in 2006.

He has published over twenty papers in national and international journals.

He has authored a book, 'Colours in Nature' in 2011.

He is currently President, Community Aid and Sponsorship Program (CASP) a renowned NGO working in the area of support to children and community. He is also President, Vasundhara Trust.

He is Director; ICIT Pvt. Ltd. Pune since August 2002. ICIT has operationalized Post graduate level Certificate Courses developed by

Department of Electronic Science, Pune University.

He is currently Member; Rajiv Gandhi Science and Technology Commission (RGSTC) of Maharashtra Government.

INSTITUTIONAL MEMBERSHIPS AND FELLOWSHIPS:

- Fellow and Past President, Indian Society of remote Sensing
- Fellow and Past President, Indian Society of Geomatics
- Fellow, Gujarat Science Academy
- Life Member and Fellow, Maharashtra Academy of Sciences
- Life member & Fellow, Institution of Electronics and Telecommunication Engineers - IETE
- Life Member, Computer Society of India
- Founder Life Member and Director, Indian Society for Advancement of Material Processing and Engineering - ISAMPE
- Fellow and Life Member, Astronautical Society of India
- President, 1996, Marathi Vignan Parishad
- Trustee, Vikram Sarabhai Memorial Trust, Ahmedabad Management Association
- Former Member, Governing Council, Information and Library Network, UGC
- Former Member, Council for Meteorology and Atmospheric Sciences (CMAS), IMD, Govt. of India.
- Life Member, Indian Association of Physics Teachers
- Life Member, Indian Institute of Education
- Executive Chairman, Muktangan Exploratory Science Center till Dec 6, 2010

Understanding China

Maj Gen RK Malhotra (Retd)

The September cover of the Time magzine carried Xi Jinping's photograph with a caption 'Emporer Xi'. The theme of the lead article was woven around a leader who was the strongest to come around in years and he aimed to propel China to the top of the world order. Much that has been written about our own Prime Minister substantially carries the same hope. It is therfore not surprising that China and Sino- Indian relationship have been much in debate. This is especially so after the recent visit of the Chinese President. The visit generated much goodwill and promised to take the economic interaction to the next level. All this however took place in the back drop of a major face off between the two border holding forces ----the Border Defence Regiment of the PLA and our ITBP. Violence and conflict have however been avoided so far. The efficacies of the Border Peace and Tranquility Agreement and Confidence Building Measures have proven to be useful to this extent. Yet, the increase in activity and new edge of assertion if not aggression of the PLA is a recent phenomenon. This could be seen also as a reaction to Indian efforts to improve the connectivity and infrastructure of the areas that Indian troops have always occupied. Fundamentally, the friction is a result of contest between change and status quo. The compulsions of both sides are however quite different and these have to be fully understood. Without this clarty, the situation where economic growth has co-existed with confrontation cannot be understood. Strategically, there are some things that can change and there are some that cannot change. While the Strategic Power Balance can come under

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contest, Geography is a permanent factor. The compulsions of Geography can ofcourse be mitigated or highlighted through skilful diplomacy.

Unfortunately, the public debate or articles in the media have not brought about any clarity, and have infact added somewhat to the confusion. What is direction at which relations are moving and is the possibilty of conflict increasing or decreasing? The reasons for the dilemma are two fold. Firstly, the Indian view is in line with the Indian experience and Indian aspirations. It does not take into account a similar stimulii of the Chinese side. Being surprised by the Chinese action/reaction is a natural corollary. Anticipation of the outcomes of a chain of events has always been misfounded and India has been surprised nearly always. China is not India and the leadership of China has grown through a different Historical and Geographic experience. Their pre-disposition is therefore different. Secondly, our perspectives and thus our prescription may be well articulated but it lacks the comprehensiveness and depth that is required for a realistic national policy. Geography and History are specific disciplines of study in India but these have little place in policy formulation. These are vital ingredients of a country's DNA and cannot be ignored. Military campaigns take terrain as a major factor of consideration while developing plans and alternatives. Unfortunately this finds no place in our policy considerations and is considered as a realm of military professionals. Diplomacy treats this as a given backdrop that has to be somehow managed. It does not take into account mindsets and levers or vulnerabilities that accrue because of these major factors. This is not a shortcoming of a particular leadership in power but a shorcoming of our traditional approach towards learning. The traditional Indian system of learning has been based on 'Struti' and 'Smriti'. The articulative and spoken tradition of 'Guru- Shishya' is Struti and the power of recall, analyse and expand is Smriti. Geography is about maps and hues of array of colours with each tone depicting a particular characteristic of the terrain. It is these hues of colour that create the challenges and opportunities of a country and pre-dispose it towards certain choices of actions. Each aspect can set off a separate debate and analysis of these will prove too burdesome for the points that this article wishes to make. The larger point is that we need to learn and be better prepared for anticipating Chinese reactions and for engaging with her.

It is worth recalling what Chinese President Xi Jinping did in his initial visits on taking over. A year back he rounded out a 10-day tour of Central Asia that included state visits to Turkmenistan, Kazakhstan, Uzbekistan and Kyrgyzstan, as well the G-20 summit in St. Petersburg and the Shanghai Cooperation Organization summit in Bishkek. At each stop, the then new president made

hearty pledges of financial support and called for further diplomatic, security and energy cooperation. In Turkmenistan, Xi inaugurated a natural gas field. In Kazakhstan, he agreed to invest $30 billion in energy and transportation projects. In Uzbekistan and Kyrgyzstan, he made similar promises to increase investment and cooperation in the coming years.

Xi's tours should be seen as part of China's attempt to reduce its exposure to security risks and supply disruptions off its coast by developing new overland transport routes for goods, energy and other natural resources. China's eastern seaboard, and the maritime realm beyond it, has dominated Chinese political, economic and military planning in recent decades, and in many ways it will continue to do so for the foreseeable future. The coast will remain central to China's role in the global economy, facilitating the flow of Chinese goods to overseas markets, as well as the imports of seaborne energy and raw materials relied upon heavily by coastal provinces to feed their oversized manufacturing bases.

In recent years, however, this geographic anxiety over the security implications of the country's dependence on coastal trade has taken many forms. China's aggressive efforts to modernize its navy and expand energy, resource and infrastructure projects overseas are perhaps its most visible attempts to cope with the geopolitical implications of its economic and energy needs. Xi's tour, along with several other recent events, has highlighted China's enduring need to focus on westward development as well.

Geography and its Compulsions

An analytic overview of China's geography is relevant. Geographically, China consists of three shelves that radiate up and outward from east to west like the steps of an amphitheater. The first and second shelves essentially hover over the Han core, where more than 90 percent of China's roughly 1.3 billion people live. Surrounded by plateaus, mountains, deserts and steppe, the core historically has been vulnerable to attack -- whether from Mongolian horsemen riding down through the Central Eurasian plains, the Manchu descending from Eastern Siberia or the Japanese (in 1592 and again during World War II) through the Korean Peninsula and Manchuria. Contemporary China is an island. Although it is not surrounded by water (which borders only its eastern flank), China is bordered by terrain that is difficult to traverse in virtually any direction. There are some areas that can be traversed, but to understand China we must begin by visualizing the mountains, jungles and wastelands that enclose it. In China's

strategic vision, this outer shell both 'contains', as also 'protects' China.

Internal Chinese Ethos

Internally, China should be viewed as two separate entities. One part being the Chinese heartland and the other being the non-Chinese buffer regions surrounding it. There is a line in China called the *15-inch isohyet,* east of which more than 15 inches of rain fall each year and West of which the annual rainfall is less. The vast majority of Chinese live east and south of this line, in the region known as Han China — the Chinese heartland. The region is home to the ethnic Han, whom the world regards as the Chinese. It is important to understand that more than a billion people live in this area, which is about the size of India. It is important to understand these divisions of Geography, history and ethnicity to realize Chinese behavior and sensitivities.

The Chinese heartland itself can be considered as divided into two parts, northern and southern, which in turn is represented by two main dialects, Mandarin in the north and Cantonese in the south. These dialects share a writing system but are almost mutually incomprehensible when spoken. The Chinese heartland is also defined by two major rivers — the Yellow River in the north and the Yangtze in the South, along with a third lesser river in the south, the Pearl. The heartland is China's agricultural region. However — and this is the single most important fact about China — it has about one-third the arable land per person as the rest of the world. This pressure has defined modern Chinese history — both in terms of living with it and trying to move beyond it.

A ring of non-Han regions surround this heartland viz Tibet, Xinjiang province (home of the Muslim Uighurs), Inner Mongolia and Manchuria (a historical name given to the region north of North Korea that now consists of the Chinese provinces of Heilongjiang, Jilin and Liaoning). *If one considers Tibet in its historical zenith and not just TAR, Xinjiang is a part of it and all considerations equally apply.*

These are the buffer regions that historically have been under Chinese rule when China was strong and have broken away when China was weak. Today, there is a great deal of Han settlement in these regions, a cause of friction, but today Han China is strong and can take care of the dissension.

These are also the regions where the historical threat to China originated. Han China is a region full of rivers and rain. It is therefore a land of farmers and merchants. The surrounding areas are the land of nomads and horsemen. In the 13th century, the Mongols under Chenghis Khan invaded and occupied

parts of Han China until the 15th century, when the Han reasserted their authority. Following this period, Chinese strategy remained constant: the slow and systematic assertion of control over these outer regions in order to protect the Han from incursions by nomadic cavalry. This imperative drove Chinese foreign policy and continues to be a part of present thought. In spite of the imbalance of population, or perhaps because of it, China saw itself as extremely vulnerable to military forces moving from the north and west. Defending a massed population of farmers against these forces was difficult. The easiest solution, the one the Chinese chose, was to reverse the order and impose themselves on their potential conquerors.

There was another reason. Aside from providing buffers, these possessions provided defensible borders. With borderlands under their control, China was strongly anchored. Let's consider the nature of China's border sequentially, starting in the east along the southern border with Vietnam and Myanmar. The border with Vietnam is the only border readily traversable by large armies or mass commerce. In fact, as recently as 1979, China and Vietnam fought a short border war, and there have been points in history when China has dominated Vietnam. However, the rest of the southern border where Yunnan province meets Laos and Myanmar is hilly jungle, difficult to traverse, with almost no major roads. Significant movement across this border is almost impossible. The Indian Army holds many battle honours and individual decorations for personal courage in these battles as part of the British forces. China therefore considers itself secure in this region.

Kakabo Razi, almost 19,000 feet high, marks the border between China, Myanmar and India. At this point, China's southwestern frontier begins. This is anchored in the Himalayas. More precisely, it is where Tibet, controlled by China, borders India as also Nepal and Bhutan. This border runs in a long arc past Pakistan, Tajikistan and Kyrgyzstan, ending at Pik Pobedy, a 25,000-foot mountain marking the border with China, Kyrgyzstan and Kazakhstan. This is a somewhat difficult border in terms of inter se movement. Historically, parts of it have been accessible as a merchant route. On the whole, however, the Himalayas are a barrier to substantial trade and certainly to the military forces. India and China — and China and much of Central Asia — are in a way sealed off from each other. Trade and ideas are another matter. Ideology and culture have flown through the proverbial Silk route.

The one exception is the next section of the border, with Kazakhstan. This area is passable but has relatively little transport. As the transport expands, this

will be the main route between China and the rest of Eurasia. It is the one land bridge from the Chinese island that can be used. The problem is distance. The border with Kazakhstan is almost a thousand miles from the first tier of Han Chinese provinces, and the route passes through sparsely populated Muslim territory, a region that has posed significant challenges to China. Importantly, the Silk Road from China ran through Xinjiang and Kazakhstan on its way west. It was the only way to go.

Playing out of the Internal unity paradigm

China is more enclosed than any other great power. The size of its population, coupled with its secure frontiers and relative abundance of resources, allows it to develop with minimal intercourse with the rest of the world, if it chooses. During the Maoist period, for example, China became an insular nation, driven primarily by internal interests and considerations, indifferent or hostile to the rest of the world. It was secure and, except for its involvement in the Korean War and its efforts to pacify restless buffer regions, was relatively peaceful. Internally, however, China underwent periodic, self-generated chaos.

The weakness of insularity for China is poverty. Given the ratio of arable land to population, a self-enclosed China is a poor China. Its population is so poor that economic development

driven by domestic demand, no matter how limited it might be, is impossible. However, an isolated China is easier to manage by a central government. The great danger in China is a rupture within the Han Chinese nation. If that happens, if the central government weakens, the peripheral regions will spin off, and China will then be vulnerable to foreigners taking advantage of Chinese weakness.

For China to prosper, it has to engage in trade, exporting silk, silver and industrial products. Historically, land trade has not posed a problem for China. The Silk Route allowed foreign influences to come into China and the resulting wealth created a degree of instability. On the whole, however, it could be managed.

The dynamic of industrialism changed both the geography of Chinese trade and its consequences. In the mid-19th century, when Europe — led by the British —compelled the Chinese government to give trading concessions to the British, it opened a new chapter in Chinese history. For the first time, the Pacific coast was the interface with the world, not Central Asia. This in turn massively destabilized China.

As trade between China and the world intensified, the Chinese who were engaged in trading increased their wealth dramatically. Those in the coastal

provinces of China, the region most deeply involved in trading, became relatively wealthy while the Chinese in the interior (not the buffer regions, which were always poor, but the non-coastal provinces of Han China) remained poor, subsistence level farmers.

The central government was balanced between the divergent interests of coastal China and the interior. The coastal region, particularly its newly enriched leadership, had an interest in maintaining and intensifying relations with European powers, Japan and America. Trade had its own impact on the internal situation of China. The more intense the trade, the wealthier the coastal leadership and the greater the disparity between the regions. In due course, foreigners allied with Chinese coastal merchants and politicians became more powerful in the coastal regions than the central government. The worst geopolitical nightmare of China came true. China fragmented, breaking into regions, some increasingly under the control of foreigners, particularly foreign commercial interests. Beijing lost control over the country. It needs special mention that this was the context in which Japan invaded China, which made Japan's failure to defeat China all the more extraordinary. This is how important, History and Geography are.

Mao's goal was threefold, Marxism aside. First, he wanted to recentralize China — re-establishing Beijing as China's capital and political center. Second, he wanted to end the massive inequality between the coastal region and the rest of China. Third, he wanted to expel the foreigners from China. In short, he wanted to recreate a united Han China.

Mao first attempted to trigger an uprising in the cities in 1927 but failed because the coalition of Chinese interests and foreign powers was impossible to break. Instead he took the Long March to the interior of China, where he raised a massive peasant army that was both nationalist and egalitarian and, in 1948, returned to the coastal region and expelled the foreigners. Mao re-enclosed China, recentralized it, and accepted the inevitable result. China became equal but extraordinarily poor.

Dynamics of the Buffer Regions and their control

Prior to Mao's rise, with the central government weakened and Han China engaged simultaneously in war with Japan, civil war and regionalism, the center was not holding. While Manchuria was under Chinese control, Outer Mongolia was under Soviet control and extended its influence (Soviet power more than Marxist ideology) into Inner Mongolia, and Tibet and Xinjiang were drifting away.

Mao's civil war was simultaneously also laying the groundwork for taking control of the buffer regions. Interestingly, his first moves were designed to block Soviet interests in these regions. Mao moved to consolidate Chinese communist control over Manchuria and Inner Mongolia, effectively leveraging the Soviets out. Xinjiang had been under the control of a regional warlord, Yang Zengxin. Shortly after the end of the civil war, Mao moved to force him out and take over Xinjiang. Finally, in 1950 Mao moved against Tibet, which he secured in 1951.

The rapid consolidation of the buffer regions gave Mao what all Chinese emperors sought, a China secure from invasion. Controlling Tibet meant that India could not move across the Himalayas and establish a secure base of operations on the Tibetan Plateau. There could be skirmishes in the Himalayas, but no one could push a multidivisional force across those mountains and keep it supplied. So long as Tibet was in Chinese hands, the Indians could live on the other side of the moon. Xinjiang, Inner Mongolia and Manchuria buffered China from the Soviet Union. If seen in this context, it becomes evident that Mao was more of a geopolitician than an ideologue. He did not trust the Soviets. With the buffer states in hand, they would not invade China. The distances, the poor transportation and the lack of resources meant that any Soviet invasion would run into massive logistical problems well before it reached Han China's populated regions, and become bogged down — just as the Japanese had.

The Korean War gives an insight into Chinese views on Force application. China had geopolitical issues with Vietnam, India, Pakistan and Afghanistan, neighboring states with which it shared a border, but the real problem for China came from Manchuria or, more precisely, Korea. North korea invaded South korea. The Americans intervened, defeated the North Korean Army and drove it to the Yalu, the river border with China. The Chinese, seeing the American force surge to its borders, decided that it had to block its advance and attacked south. What resulted was three years of brutal warfare in which the Chinese lost about a million men. But from our point of view, what it demonstrated was the sensitivity of the Chinese to any encroachment on their borderlands, their buffers, which represent the foundation of their national security.

Current context of the Geopolitics

From a political and military standpoint, China has achieved its strategic goals. The buffer regions are intact and China faces no threat in Eurasia. It sees a very diminished, if any, a possibility of an attempt to force China out of Tibet. For China, however, Tibet is a minor irritant; China has no possible intention of

leaving Tibet, the Tibetans cannot rise up and win, and no one is about to invade the region. Similarly, the Uighur Muslims represent an irritant in Xinjiang and not a direct threat. The Russians have no interest in or capability of invading China, and the Korean Peninsula does not represent a direct threat to the Chinese, certainly not one that they cannot handle.

The greatest military threat is a naval threat to China. The Chinese have become highly dependent on seaborne trade and the United States Navy is in a position to blockade China's ports. This would cripple China. Therefore, China's primary military interest is to make such a blockade impossible.

There is one area in which China is being modestly expansionist — Central Asia and particularly Kazakhstan. Traditionally a route for trading silk, Kazakhstan is now an area that can produce energy, badly needed by China's industry. The Chinese have been active in developing commercial relations with Kazakhstan and in developing roads into Kazakhstan. These roads are opening a trading route that allows oil to flow in one direction and industrial goods in another.

In doing this, the Chinese are challenging Russia's sphere of influence in the former Soviet Union. The Russians have been prepared to tolerate increased Chinese economic activity in the region while being wary of China's turning into a political power. Kazakhstan has been European Russia's historical buffer state against Chinese expansion and it has been under Russian domination. This region needs to be monitored. If Russia begins to feel that China is becoming too assertive in this region, it could respond militarily to Chinese economic power.

Economic Dimensions of Chinese Geopolitics

The Geopolitical problem of China is economic and it presents itself in two ways. The first is simple. China has an export-oriented economy. It is in a position of dependency. No matter how large its currency reserves or how advanced its technology or how cheap its labor force, China depends on the willingness and ability of other countries to import its goods — as well as the ability to physically ship them. Any disruption of this flow has a direct effect on the Chinese economy.

The primary reason other countries buy Chinese goods is price. They are cheaper because of wage differentials. Should China lose that advantage to other nations or for other reasons, its ability to export would decline. Today, for example, as energy prices rise, the cost of production rises and the relative importance of the wage differential decreases. At a certain point, as China's trading partners see it, the value of Chinese imports relative to the political cost of closing down their factories will shift.

And all of this is outside of China's control. China cannot control the world price of oil. It can cut into its cash reserves to subsidize those prices for manufacturers but that would essentially be transferring money back to consuming nations. It can control rising wages by imposing price controls, but that would cause internal instability. The center of gravity of China is that it has become the industrial workshop of the world and, as such, it is totally dependent on the world to keep buying its goods rather than someone else's goods.

The dramatic economic development of the last generation has been ruthlessly geographic. This development has benefited the coast which is the Han core but it has unfortunately left the other large part of China which it considers the periphery, reasonably outpaced. Phenomenon of an export based economic growth has created vulnerabilities related to global forces over which it has no control. It can neither afford to accommodate them due to its own internal compulsions. This is not new in Chinese history. The result of the past cannot be accepted by China because it meant growing regionalism and the weakening of the central government.

China has been trying to bridge its geographic deficiency by seeking land routes to Eurasia and infrastructure for its oil needs. An additional avenue for its exports and energy needs. History however tells us that efforts to develop overland transport routes to and through Central Asia will be constrained by distance, terrain and political and security risks -- not only in the Eurasian states that new lines would pass through but within Xinjiang as well. Projects such as the Kashgar-Gwadar corridor will be easy targets for local separatists or jihadist elements with ties to the East Turkestan Islamic Movement in Xinjiang and Pakistan's Waziristan region. Meanwhile, the China-Europe line will be vulnerable to shifts in Russian policy or in Moscow's relations with other countries along the route, especially Kazakhstan, Belarus and Poland. Similar political, geographic and security challenges will complicate another long-discussed project, the Trans-Asia Railway (known colloquially as the Iron Silk Road) linking China to Europe via the Middle East. Similar to planned oil and natural gas pipelines that will run from the coast of Myanmar to Yunnan and like the prospective Gwadar-Kashgar transport corridor, overland railways could serve as possible lifelines for arms, munitions and energy in the event of a security crisis on the coast. However remote this possibility, China's leaders are not insensitive to it, especially given the modern legacy of war and invasion from the east.

Conclusion

- Chinese security behavior since the emergence and maturation of the unified Chinese state has contained five core features, each significant to both current and future security policy:
- Firstly it has rested on efforts to protect the Chinese heartland through border defense and control over a large and long-standing strategic periphery whose outer geographic limits remained relatively constant over time.
- Secondly, periodic expansion and contraction of periphery control and regime boundaries, primarily as a result of fluctuations in state capacity; the eventual reemergence of a unified state, often despite long periods of fragmentation and civil war.
- Thirdly, the frequent yet limited use of force against external entities, primarily for heartland defense and periphery control, and often on the basis of pragmatic calculations of relative power and effect.
- Fourthly, a heavy reliance on noncoercive security strategies to control or pacify the periphery when the state is relatively weak, unable to dominate the periphery through military means, or regards the use of force as unnecessary or excessively costly.
- Finally, a strong, albeit sporadic, susceptibility to the influence of domestic leadership politics, through both the largely idiosyncratic effect of charismatic leaders and elite strife and the more regular influence of recurring leadership debates over autonomy and the use of force.

History and Geography have defined Chinese strategy. Geopolitics incorporates the ambition of the country itself and those around it .China's primary geopolitical issue is this: For it to develop it must engage in international trade. If it does that, it must use its coastal cities as an interface with the world. When that happens, the coastal cities and the surrounding region become increasingly wealthy. The influence of foreigners over this region increases and the interests of foreigners and the coastal Chinese converge and begin competing with the interests of the central government. China is constantly challenged by the problem of how to avoid this outcome while engaging in international trade. In its present situation the oceans and its navy gain importance.

As far as India is concerned, Tibet is not a territory that we seek and yet it remains an area of threat because of Chineese persistant claims on Indian territory. The albatross of Pakistan that China encourages around our neck comes in the way of any reapproachment. The flux in the global strategic balance causes

further friction. We need to consider the geographic vulnerabilities of China and use these as a leverage to find solutions to the territorial issues that come in the way of permanent peace between our countries. Maritime capabilities and asymmetric tools are an obvious primacy. Unfortunately our policy refuses to take these aspects into account and policy remains to be hinged on 'More of the same Kind' as it proceeds with 'Business as usual', despite the change in leadership. Our relationship with countries that occupy the South China Sea or the Pacific may receive attention but this will be of little use till we have capabilities of our own.

Maj Gen RK Malhotra (Retd)

Having joined Infantry, Maj Gen Malhotra had commanded a Jat battalion and went on to command an Infantry Division. He has had vast experience in the field both on the Western and in the Eastern sectors. During his staff appointments, the officer was posted to Integrated Defence Staff and had the distinction of manning the Interim National Command Post (INCP). As a member of DPP, he also coordinated the National Response after Tsunami. He has also participated in the Joint Working Group with USA and Japan and has served with distinction for seven long years at the National Security Council Secretariat (NSCS).

An Overview of the Functioning of Armed Forces Tribunal (AFT)

Air Marshal SC Mukul (Retd)

Impact

On 8 Aug, 2009, Her Excellency Smt. Pratibha Devi Singh Patil inaugurated in the hallowed precincts of Vigyan Bhavan, New Delhi, the Principal Bench of the AFT in accordance with the provisions of the AFT Act enacted by the Parliament in 2007. It was a truly historic occasion wherein the desire for an independent adjudicatory forum for the defence personnel of the three wings of the Armed Forces was met, when the founder Chairperson Hon'ble Justice A.K. Mathur along with eight Judicial Members (retired High Court Judges) and fifteen Administrative Members (14 retired Lt Gens and a retired Naval Commodore who was JAG, Navy) formally took up assignments in the duly constituted 15 Benches of the AFT, regionally distributed, three benches each at New Delhi, Chandigarh and Lucknow, a Bench each at Jaipur, Kolkata, Mumbai, Chennai, Guwahati and Kochi. The opening of the Principal Bench at New Delhi in Aug 2009 was followed up within months by the opening of other seven Regional Benches and the one at Mumbai opened on 09 Jun 2011.

In one go, by the decree of the Act, all pending cases of the Armed Forces personnel at the High Courts and lower courts coming under the ambit of the Act were transferred to the respective Tribunal Benches. As a result there was a flood of pending transfer cases, some of them dating back to 1990's. Today, five years plus down the road, it can be stated with a great deal of assurance and pride that there is practically no pendency of cases

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inherited from Lower courts & High Courts. Now the benches are mostly dealing with current cases and disposing them in a matter of eight to ten months from filing of the petition/appeal to delivery of judgment.

This by itself is an unparalleled achievement with more than 30,000 plus cases having been cleared during last five years, that too in the background when some of the earlier sanctioned Tribunals have not even established a place to commence work. The contours of this success story, more importantly its long-term implications for the three Services, both for serving and the larger beneficiaries i.e., the retirees/veterans, need to be understood by servicemen at large and in particular by the higher leadership at the Service HQ and MoD. For the readers it will be interesting to also read the

Having had the privilege of being a part of this stupendous venture for the past three years, in my view, two key issues which need to be highlighted and understood by each and every servicemen are, Firstly, that the AFT Act and the Tribunals thereof are "of the defence forces, by the defence forces and for the defence forces". Today we have a win-win situation wherein with conclusion of majority of litigation cases within 10 months at an average, and transfer and resolution of pending cases in High Court and lower courts the "redressal system is working well" and is "dealing with the entire service spectrum from the cradle – once enrolled/commissioned – till the grave and even then continuing for the family thereafter." More pain we take to "refine the process" and make the dispensation of military justice transparent higher will be satisfaction level. Secondly, this "refining process of military justice", which is being accomplished by handling of critical law issues by former members of judiciary, is resulting in well-reasoned judicial pronouncements. This is good omen, as refinement of rules and regulations will help the service person, either in service in his capacity as subordinate or a superior up and down the chain of command to know what is expected of him at all times or after retirement. It is sincerely hoped that in the long run this consolidation will result in "mature, streamlined and transparent" in-house dispensation of military justice by the services themselves, which is capable of standing the scrutiny of an independent judicial review.

Just past 5th birthday, the AFTs today are trying to surmount the teething problems, prominent being prompt implementation of Tribunal Orders. Detailed analysis on this aspect put down before summing up. Meanwhile let us start by SWOT analysis of the Armed Forces Act itself,

firstly tracing the genesis and secondly highlighting the urgency of its enactment.

Necessity

While tracing the origin of our military Acts we find that they are derivatives of similar Acts of the British which were evolved to maintain a grip on discipline over the native Army. The existing Army Act of 1950, for example, traces its origin to East India Company's Mutiny Act of 1754, the "Articles of War of the late 1800" vintage and the Indian Army Act of 1911, basically aimed at controlling the native Army.

A review of the report card of their implementation since Independence indicates that more than the Acts themselves, the problem perhaps is with the executors. Portions of Acts, though oppressive in parts, were never meant to be draconian and have a number of inbuilt checks and balances to avoid miscarriage of justice. The provisions of pre and post confirmation petitions which had been incorporated have become more of a formality today and are rarely used in a fashion they were intended, prompting Supreme Court to remark that "today these are akin to an appeal from Ceaser to Ceaser's wife". In the Acts, "absence of an effective appeal is the most glaring omission" as there is not a single provision that can be deemed akin to a judicial appeal, highlighting the need for a Tribunal. No judicial authority had the jurisdiction to look into or examine the evidence on the basis of which court martial sentences were rendered or the merits of the issues involved. The High Courts and the Apex Court under the writ jurisdiction could of course intervene but only in cases where there was a flouting of statutory provisions or when the sentences rendered were particularly harsh and not commensurate with the offence. The Supreme Court further observed in Ranjit Thakur Vs Union of India (1987) that conscience shaking sentences which are irrationally disproportionate would not be immune from judicial review.

In fact, in this regard, we need to salute foresightness of our founding fathers who while framing the Indian Constitution had identified this glaring need and had defined the scope of AFT at Article 136 Clause 2 which reads-

"There shall be a Tribunal relating to the Armed Forces and its judgment, determination, sentence shall be final."

Similarly, the Article 227 Clause – 4 of the Constitution reads –

"Armed Forces Tribunal constituted shall not be subject to superintendence of the High Court."

While the Indian Constitution has framed special provisions for the armed personnel, the Parliament has the right to curtail those rights under Article 33. As a consequence the armed personnel are entitled to rights which are available to them as laid down by the Constitution & Parliament. In the present context, the pious hope of the constitutional framers was lost sight o till 1982 when the Supreme Court in case of Lt.Col. Prithi Pal singh Bedi V. Union of India [1982 (3) SCC 140], drew the attention of the Government towards the need for an Armed Forces Tribunal as mandated by the Constitution for fulfilling independent appellate function.

Despite this nudge, the process of formulation and processing took more than 25 years and it was passed by the parliament in 2007.The Preamble defines the scope-

"An Act to provide for the adjudication or trial by Armed Forces Tribunal of disputes and complaints with respect to commission, appointments, enrolment and conditions of service in respect of persons subject to the Army Act, 1950, the Navy Act, 1957 and the Air Force Act, 1950 and also to provide for appeals arising out of orders, findings or sentences of courts-martial held under the said Acts and for matters connected therewith or incidental thereto."

Salient Aspects of the Act

The original jurisdiction as defined as 'service matter' at Section 3(o) deals with:-

"remuneration including allowances, pension retrial benefits, tenure including commission, appointments, enrolment, probation, confirmation, seniority, training, promotion, reversion, premature treatment, superannuation, remission of service, summary disposal and trials where the punishment of dismissal is awarded or any other matter whatsoever connection to this." Except transfer matters & summary court-martial where punishment is less than three month

Under *"Appellate Jurisdiction",* by the virtue of Section 15, the Tribunal has *"Full appellate power against the order of the court-martial or any matter connected therewith or incidental thereto, like a court of appeal. It can grant bail, with or without conditions. Further it can set aside that finding which is not sustainable for reasons recorded, the finding involves a wrong decision on a question of law or there is material irregularity in the course of the trial*

resulting in miscarriage of justice. It has power to substitute findings of the court-martial, finding of guilty for any other offence for which the offender could have been lawfully found guilty by the court-martial and pass a sentence afresh for the offence specified or involved in such findings under the provisions of the Army Act, 1950 or the Navy Act, 1957 or the Air Force Act, 1950. It can, if required reduce the sentence if it is found to be excessive, illegal or unjust. The Tribunal shall have the power to remit the whole or any part of sentence, with or without condition. Mitigate the punishment awarded, commutes such sentence to lesser punishment. It has also power to enhance the sentence awarded by court-martial, but shall be done only with an opportunity of being heard to the petitioner. It can suspend a sentence of imprisonment or pass any order as it may think appropriate. In short the Tribunal shall be deemed to be a criminal court for the purposes of Sections 175, 178, 179, 180, 193, 195, 196 or 228 of the Indian Penal Code and Chapter XXVI of the Code of Criminal Procedure, 1973."

Unlike many other similar acts in advanced countries, our Act of 2007 is unique in many respect that it has under one umbrella all service matters of defence personnel and has been conferred powers to decide both questions of law and facts that may be raised before it.

The decision of the tribunal disposing of the application shall be final. As stipulated at Sec 30 of the AFT Act, appeal provision against any order of the AFT lies only at the doorstep of the Hon'ble Apex Court thus speeding up the litigation time by placing its superintendence only at one level above. Currently the question of Superintendence and Writ Jurisdiction is already lying at the doorstep of the Hon'ble Apex court and in due course it will hopefully be settled once for all. Of course the litigant, in exercise of his fundamental rights, can always take up a case under Article 226 /227 of the Indian Constitution at the High / Apex Court for further adjudication.

However, there is one shortcoming under the Armed Forces Tribunal Act that is power of Civil Contempt. If any order has not been complied with then there is no power of civil contempt within the Act for which a proper recommendation is pending with the Government.

'The Armed Forces Tribunal (Amendment) Bill, 2012 is currently with the Rajya Sabha and has been referred to the Standing Committee on Defence. It basically has two proposed amendments, dealing with tenure of members and grant of powers of Civil Contempt.

The act affords a forum to servicemen, after exhausting administrative remedies available under the Act, to ventilate their grievances before an independent body which can adjudicate their rights and can undertake a judicial review of the decision of the Armed Forces establishment or Government.

The starting point for any litigation action is the grievance needing redressal either not provided for or unfairly rejected by the authorities. This dissatisfaction provides the necessary cause of action expressed as relief(s) being sought. Any service person, serving, retired or his legal heirs, having any cause of action arising in service or after retirement has a right to approach the Tribunal based on his current place of service, place of cause of action, or place of residence after retirement. In order to ease the litigant's burden, the territorial jurisdiction of the respective Tribunal benches is as under

- Principal Bench .....Delhi
- Jaipur Bench .....Rajasthan,
- Mumbai Bench .....Maharashtra, Goa & Gujarat,
- Kochi Bench .....Kerala & Karnataka
- Chennai Bench .....Andhra Pradesh & Tamil Nadu
- Kolkata Bench .....WB, Bihar, Orissa & Jharkhand,
- Lucknow Bench .....UP, Madhya Pradesh & Chattisgarh
- Guwahati Bench .....Assam & 7 North-Eastern States
- Chandigarh Bench ...Punjab, Haryana, HP and Jammu & Kashmir.

In case any litigant finds it difficult to approach the tribunal bench of respective territorial jurisdiction, he can make an application to the Chairperson to transfer the case from one bench to another The Benches of Tribunal also has power to hold circuit benches with prior approval of the Chairperson.

At the Tribunal on receipt of the original application it is checked out for jurisdiction, content matter itself, availment of alt remedies and limitation criteria before processing it further. Next the case is taken up for hearing. Covered cases, with the consent of both the parties are decided during the first hearing itself. The judgments are pronounced in the open court and promulgated. Either party has the option for review or apply for permission to approach the Apex Court within the stipulated time.

Performance

Performance statistics / Report card for the past five years is as under:-

Institution / Disposal / Pendency (Nov 2009 - 30 Jun 2014)

S. No.	Bench	Institution	Disposal	Pendency
1	Delhi PB	4276	3620	656
2	Lucknow	3990	2763	1227
3	Chandigarh	14,807	12,565	2,242
4	Kochi	1205	1145	60
5	Chennai	861	720	141
6	Kolkotta	896	685	211
7	Jaipur	2568	1726	842
8	Mumbai	368	333	35
9	Gauhati	229	201	28
Total		**29,180**	**23,758**	**5,442**

One finds the schedule is busy at AFT Chandigarh as it looks after states of Punjab, Haryana, HP and J&K. Details are as under:-

Chandigarh Bench (NOV 2009- AUG 2014)

S. No.	Type of Application	Received	Disposal
1	Transfer Applications + Original Applications	15,182	12,700
2	MA - Execution	18,130	11,675
3	Review Applications	1070	897
4	Contempt Applications	296	247
Total		**34,678**	**25,789**

Analysis Of Cause Of Action / Litigations

Pension related cases amount to about 85%. Details are;

(a) **Pensions** - Retiring, special, reservist, invalid, disability, liberalised, war-injury, 2nd pension, dismissal cases

(b) **Service Pension** calculation of max Pension for 33 yrs; Pension for Honorary Ranks; Grant of SE for pre 1973 cases; Pension for MNS; Suspension / withdrawal of Pension; Pension for TA Question of continuing wrong

(c) **Disability Pension;** Appeal Med Board; Diff in Opinion of Med Boards; Disability on Leave; Disability due Diseases; Disability due injuries; Disability Pension on Dismissal; Interference by PCDA; Primacy of Medical Boards; Rounding Off; Disability Pension on Voluntary Discharge
(d) **Family Pension -** Ordinary, Special, Liberalised, Dependent
(e) **Division of** OFP / SFP / LFP ; Remarriage of Childless widow / widow; 2nd FP, FP to Handicapped Child; FP to Parents, Plural marriage issues; Missing Personnel

Discipline related issues consist of about 5% cases, the details are Court Martial- (SGCM, GCM, DCM, SCM); Biased Decision; Injustice; Quantum of Punishment, Fast Track Court Martial, Procedural Lapses. Summary awards / Summary Trial; Adm Action including termination of service /Red Ink Entry Discharge; Award of censure incl Severe Reprimand; Bails; Disciplinary and Vigilance Ban.; Court of Inquiry; Plural Marriage.

Selection & Promotion related issues amount to about 5%. The Details are Promotion date, Denial of Promotion; Extension of Service; Screening Boards and related issues; LMC grant of extension; MACP issues; Promotion after reinstatement

ACRs related issues consist of about 3% cases. The Details are

Expungment of adverse remarks; 90 days physical service; Adequately exercised period; Bias alleged; Non communication of adverse; Promotional issues after expungment of the ACR entries

Introspection

The work at AF Tribunals is akin to diagnostic and pathology lab combined – providing pointers for curative action, either through policy or implementation procedure. The issues needing attention are:-

(a) Clearance of backlog of appeal against CMs have put forward various issues both concerning law and procedure that need attention and non repetition through fresh policy guidelines etc.
(b) Concept of a Standing committee – continuous research and amplification, revision and promulgation of changes in Acts, Rules and Regulations
(c) Requirement to distinguish between what is correct as command function in the interest of service, military discipline, military ethos, military culture etc on one side and the legality of particular action and its sustenance in the eyes of law. Are old ways right? Can they be justified in the present scenario?
(d) Culture of CO / Cdr is always right – arbitrary actions – being questioned

today and need to be justified in current environment

(e) The role played by the extent of reach of current communication revolution – RTI, media, cell phones etc

(f) Officers and PBORs differences narrowing – earlier case and present situation - background is becoming common – Officers have to earn their place and rank – prove it – not get it as gratis due wearing the rank

(g) Cdr – resort to military law should be the last resort and not vice versa – not a crutch to lean upon – dangerous trend – lesser is better as far as use of mil law is concerned.

(h) CMs have a traumatic effect on the unit and morale – use of social media – wild fire – rumours – detrimental to discipline

(j) Scrutiny of performance by own jurisdiction – lenient and lax – not meeting the ends of justice – reluctance to prescribe correct judgment as per law to own people – rape –etc – compromises discipline in the long run.

(k) Feedback on performance of AFT – delay in implementation – but does get done

(l) Online check-list on service in house network for various procedures – do's & don'ts, e-library at Record Offices of its past cases for reference – AWOL, desertion Court Marital cases

(m) Increase in workload at various offices dealing with correspondence of the litigation replies and subsequent follow up – Record offices, Command HQs, Unit HQs, Service HQs, MoD, PCDA – need for additional manpower – could be from the veterans

(n) Use of RTI – great boon in opening closed doors and spreading transparency.

(o) Awareness of the benefits of pension, FP thereafter- discussions – measures for safeguarding future prospects – video clip – professionally made and seen – better discipline

(p) Family pension with respect to the missing Armed Forces personnel.

Urgent requirement of in-house tri-service level introspection to eliminate the subjectivity at all levels, starting from initial stages of Inquiry ending in to the Trial cannot be over-emphasised. The letter of law at all stages needs to be followed in spirit and not as a sheer formality, along with an effective system of defence for the accused. The senior officers in the chain of command need to be sensitised so as not to interfere in the deliverance of justice.

Implementation Of Aft Order

The misconception about implementation of Tribunal Orders needs to be dispelled. Once an order is passed it shall be implemented or taken up in a higher court. One must realise that in the process of implementation *"it is not we and they"* but all of us together as the entire environment being treated at AFTs is in house under the MoD - the Dept of Ex Servicemen, CGDA / PCDA, DPDO, Service HQs and Record Offices / AFRO / NRO. While the Home Ministry which deals with similar cases pertaining to CAPFs has not been active in pursing cases at the Apex Court, the Dept of Ex Servicemen has been vigorously taking up a variety of issues regularly. The view point of the Dept of Ex Servicemen at MoD given to the Parliamentary Committee is as under:-

"By and large, the decisions of the Hon'ble AFTs are honoured by the Department of Ex-servicemen Welfare and implemented promptly unless they are against the settled policy of the Government. AFTs are working as Courts and delivering judgments on the issues. Either party to the case is free to implement, if possible or to go in for Appeal.

……"The policy decision must be left to the Government as it alone can decide which policy should be adopted after considering all relevant aspects from different angles. In the matter of policy decision or exercise of discretion by the Government, so long as the infringement of fundamental right is not shown, courts will have no occasion to interfere and the Court will not and should not substitute its own Judgment for the Executive in such matters.'

This results in delay in implementation of an AFT Order. However to compensate this delay a built-in provision of (xx%) interest per annum on the outstanding amount is included in the judgment itself to safe guard the interest of the litigant. This is further illustrated by the Apex Court while hearing / clubbing the appeals by passing orders such as

..... the learned counsel for the petitioners submits that the Govt shall pay the difference amount of pension with interest at the rate of 10% p a from the date of the order passed by the Tribunal till actual payment to the respondents and all those similarly situated with them in case the order passed by the Tribunal is eventually upheld. This statement is recorded. The implementation of the impugned order shall be, in light of above statement, remain stayed pending further orders from the court. Tag the matter with CA No.....

Conclusion

In conclusion one can surmise that there is no doubt that we are on right path. Since inception of the AFTs varieties of policy decisions of the Government have been relooked and by and large majority of outstanding issues have either been solved or are in process of resolution at the Apex Court. The Indian military justice is entering a new phase and is in the process of consolidation and in due course will become more stable and transparent, leading to greater trust, boost in morale and a much happier, cohesive and prosperous fighting force ready to deliver the goods when called upon.

Appendix

History Of Pensioners' Benefits In The Armed Forces

1. Most orders concerning pensionary benefits to defence personnel issued by the MoD are based on instructions issued by Dept of pensions functioning under Min of Personnel, Public Grievances & pensions.

- Contours of military pensions, in vogue since pre 1940's, have been retained even today – requirement of minimum 15 yrs service for grant of pension is one of the examples.
- During and after WW II, 'Mustering Out Pension' was introduced to cater to large influx out of service – min service was 10 yrs for grant of service pension for above category.
- Reservist pension was also introduced.
- The pension was varying from arm to arm and service to service.
- New scheme came into being in 1953 wherein the entire manpower was divided into 8 groups and the pension was granted based on one's group and rank with minimum qualifying service of 15 years to earn pension.
- The pension regulations for the Army were codified in 1961, currently in use today, with many changes having been incorporated. The Pension Regulations for the Army have not been statutory cleared.
- An attempt was made to promulgate revised version of Pension Regulations for the Army in 2008, however, the attempt has not been progressed further so far.
- 4th & 5th CPCs – linked full pension with 33 yrs of qualifying service and introduced weightage system for determining the pension. Average 10 months of pay to be taken for determination of pension. During the 5th CPC the OROP dream was inched closer by grant of enhanced weightage to existing

pensioners, irrespective of date of retirement / discharge, e.g. 1953 retiree would get enhanced weightage of 10 yrs, at 1996 rates, i.e. will get pension equivalent to 25 years service at 1996 rates.

- 6th CPC – Changed the entire calculation method wherein full pension is eligible on completion of minimum service, and stands at 50% of the emoluments last drawn (PBORs effective -1.1.2006) for PC Officers w.e.f 2008. Average emoluments last 10 months dispensed with – Pay drawn in the pay band; Grade pay as admissible; Mil service pay; Classification allowance; X group pay where applicable; NPA **Family Pension -** Far reaching changes in 5th CPC - Slab system under 4th CPC was changed to uniform 30% of last reckonable emoluments drawn. 5 categories for determining the family pension payable after death of defence personnel Cat A to E.

2. Liberalised definition of Family i.r.o. Ordinary Family Pension, Special Family Pension and Liberalised Family Pension introduced.

3. Disability Pension and Attributability / Aggravation, related benefits

- Disability Pension is granted – discharged on medical grounds (Invalided) with a disability which is assessed at 20% or more and declared as attributable or aggravated by military service.
- Personnel with a disability who are released, retired, or discharged on completion of terms of their service or on attaining the age of superannuation are also deemed to be invalided out from the service for the purpose of grant of disability pension - as decreed by Hon'ble DHC in 2004 in the case of Mahavir Singh Narwal, upheld by the Hon'ble SC in 2008.
- The Disability Pension consists of two parts, namely – service element and disability element.
- SE is granted in accordance with the length of service
- Disability Element is given in accordance with the % of disability suffered. Rates are different for different ranks.

  5th CPC – Radical Changes in meeting out relief to the disabled pensioners - Medical Boards – cumbersome & repetitive procedure- simplified & DE rounded off (1/1/1996).- finally notified on 7.02.2001. Further clarifications given out in Seep 05, May 06 and consolidated letter issued by AHQ on 20.7.2006, along with a detailed SOP.

  Post of MA (P) abolished at PCDA.

- Injury Cases – decision regarding Attributability to be taken by an authority next to CO and % of disability assessment by Medical Board would be final unless a review was requested by the Petitioner himself.
- Disease Cases – Attributability & Aggravation aspects, % of disability as indicated in the MB would be final – no periodic RsMBs.
- The Disability Pension is exempt from Income Tax.
- Invalid Pension – granted when personnel with 10 years or more service are discharged on medical grounds and disability is held to be neither attributable nor aggravated by the military service. (Regs 198 & 199).
- 5 categories for determining the compensation payable for disability of defence personnel. Cat A to E.

4. Fresh inputs are awaited with new definition emerging out of One Rank One Pension issue resolution in near future.

Air Marshal Suresh Chandra Mukul (Retd)

Commissioned into the IAF in 1972 into the fighter stream and retired on 31 Dec 2010 in the rank of Air Marshal. During a career spanning four decades officer flew 4200 hours of accident free flying on various fighter and trainer aircraft of the IAF, mainly consisting of MIG 21 & MIG 29. He is a Qualified Flying Instructor and also a Qualified Weapons Instructor. Currently he is appointed to the Armed Forces Tribunal, Regional Bench Chandigarh, as Administrative Member w.e.f. December 2011.

The Air Marshal has made significant contribution professionally and has held wide variety of important operational and staff appointments. Some of these include:-

- Chief of Integrated Defence Staff to Chairman Chiefs of Staff Committee, HQ IDS (MoD), New Delhi (Oct 08 – Dec 10)
- Air Officer Commanding-in-Chief of Southern Air Command, Trivandrum (2007-8)
- Senior Air Staff Officer, South Western Air Command, Gandhinagar (2005-2007)
- Assistant Chief of the Air Staff (Operations) at Air Headquarters, New Delhi (2004-6)
- Air Assistant to the Chief of the Air Staff (2002-2004)
- Commanded Air Force Station Adampur during "Operation Parakram" (2000-2002).
- Air war college, USA 1995
- Commanded MIG-29 Fighter Squadron (1989-1991)
- Defence Services Staff College 1988
- Deputation to Iraq as A2 Flying Instructor (1982-84)

For his distinguished service, Air Marshal Mukul has been honoured by the President of India and has been awarded Param Vishisht Seva Medal in Jan 2009, Ati Vishisht Seva Medal in Jan 2007, Vishisht Seva Medal in Jan 1996 and Vayu Sena Medal in Jan 1992

Indian Shipbuilding Industry and the Indian Maritime Strategy - A Review

Cdr (Dr) Arnab Das, Vice Adm DSP Varma (Retd)

Abstract

A maritime nation like India can ill afford the absence of a cogent and visible maritime strategy. The over six decades of sea blindness, post independence has anyway been a missed opportunity, however, the heightened maritime activities in the 21st century may not substantially contribute to national growth and prosperity if not backed by a strategic vision. The ship building industry has the potential to engage a plethora of manufacturing industries, financial services and energy sectors, all fundamental for inclusive growth of the national economy, significantly impacting GDP growth. Developed countries such as Korea and China, have their shipbuilding industry contributing around 4% of their national GDP, compared to 0.02% in India. The military and merchant fleets need to be indigenous and state of art, to play a strategic role in the geo-political dynamics of the Indian Ocean Region (IOR). The economic and political potential of the maritime sector can be leveraged only with a vibrant shipbuilding industry and enhanced maritime capacity and capability.

Today, several industrial sectors within India are at the cutting edge of technology and world class in their specific sector capabilities. The shipbuilding industry however, is uncompetitive, both in cost and delivery time. The infrastructure in majority of the shipyards is dated and unsustainable for modern shipbuilding. Indian shipbuilding industry today is not prepared to harness the

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economic and strategic potentials in the emerging economic and geopolitical environment. This is mainly attributable to economic inequality in the shipbuilding sector on multiple fronts, such as taxation policies on procurement of raw material, sale of ships, etc. While shipbuilding giants like the Republic of Korea (ROK) and China have a special status for shipbuilding in addition to an extremely supportive taxation policy, India has an indifferent and archaic policy towards shipbuilding. The sector needs concerted focus on infrastructure up-gradation of the shipyards, modern shipbuilding methodologies and adoption of contemporary technologies. The priority of the nation should also be to fill up the leadership void in the sector with innovative, visionary and vibrant leadership to bring about the revolutionary transformations that the sector direly needs.

Considering the undeniable intrinsic link between economic power and maritime strategy, the shipbuilding industry is a significant component of the maritime strategy of the nation. At present there are as many as sixteen ministries, agencies and departments of the Government of India, looking after the policies related to the maritime domain. Consequently, we as a nation have failed to coherently exploit the potential wealth of our Exclusive Economic Zone (EEZ) of 2.02 million square kilometres.

The paper attempts to analyze the strengths and weaknesses of the Indian shipbuilding industry in the light of maritime strategy for nation building and economic prosperity. A comprehensive maritime strategy approach is recommended rather than an isolated discussion on improving the shipbuilding industry in India.

Introduction

Amongst the key enablers of the national maritime domain, the Indian Navy is the sole maritime force to have published a Maritime Doctrine in 2004 and a Maritime Military Strategy named, "Freedom to Use the Seas: India's Maritime Military Strategy", which was published in 2007 [1]. It is important for us to appreciate that maritime power is not synonymous to naval might, nor can it be strictly coupled to the military aspects. A larger understanding of maritime power translates to our capability to accelerate technical and industrial progress backed by research and development in the field of undersea resources, fishing and merchant seafaring with a maritime force to safeguard these interests.

Shri K.M. Panikkar had famously said: "The importance of the sea came to be recognised by the Indian rulers only when it was too late" [2]. Not much has

changed even post independence and our continental approach has continued. The absence of a strategic maritime vision has resulted in 'sea blindness' that has ensured lack of appreciation of ocean related problems, compensating instead with "continental solutions" by our policy makers. The lack of maritime vision is attributable to the successive invasions from the north. The continental mindset did not change even after the end of two centuries of colonial rule, post significant invasions from the sea by the Western powers.

India's economic development since 1991 has resulted in a more vigorous and liberalised economy which is today better integrated with the rest of the world. The country's Gross Domestic Product (GDP) has touched US $ 2.0 trillion and with the present trends, India is projected to be the fourth largest economy by 2020 (in terms of Purchase Power Parity). Consistent with that growth, there must be enormous increases in capacity for India's transportation network, especially in the maritime sector. The fact that 95% of the nation's international trade volume is carried by sea, reiterates the importance of the shipbuilding sector [3].

The maritime wealth across the Indian coastline will require formulation of a cohesive and coordinated maritime vision to be able to integrate shipping, shipbuilding and repair, fishing, exploration and exploitation of marine resources, and allied services as an industry. The "Maritime Agenda 2010-2020" is an effort in that direction. This is the third such document released by the Government of India within a span of seven years after the "Sagarmala" in 2003, followed by the "National Maritime Development Plan" in 2005 [4]. The Maritime Agenda further saw significant resource allocation by the Planning Commission for the first time to the maritime sector [5]. Critics claim that the Maritime Agenda being driven by the Ministry of Shipping only focuses on a few segments like ports and harbours, leaving out a whole array of infrastructure in the maritime domain [6].

There are presently sixteen ministries, agencies and departments within the Govt of India that oversee the maritime aspects. While fisheries is under the care of the Ministry of Agriculture, offshore hydrocarbons is under the purview of the Ministry of Petroleum and interestingly the Indian Navy and the Indian Coast Guard responsible for providing security to the maritime assets, report directly to the Ministry of Defence that is not included among these sixteen organizations [6].

The new government has taken multiple initiatives to improve governance and provide policy support for inclusive growth. The initiatives are in the right

direction, however in the absence of a comprehensive maritime vision, the multiple stakeholders will continue to excel in isolation without being able to coherently exploit the maritime potential and provide a geo-strategic position for India in the IOR and the world at large [7].

The paper attempts to highlight the multiple dynamics of the shipbuilding industry and its dependence on the varied aspects of the maritime domain. The inability of the nation to leverage the huge potential of the shipbuilding industry and integrate it to the GDP growth in the absence of a comprehensive maritime vision has been discussed. A way forward has been presented to develop a vibrant shipbuilding industry as part of a strategic maritime role for India in the Indian Ocean Region (IOR).

Maritime Perspective

That India is a maritime nation is hardly debatable any more. In modern times, a country with over 7500 km of coastline, over 2.01 mn sq. km of EEZ, geo-strategically located atop the fulcrum of the world's third largest water body called the Indian Ocean and a marine force level which is the seventh largest in the world, intrinsically becomes a maritime nation. Add to this, the fact that India is world's tenth largest economy in terms of nominal GDP and third largest in terms of purchasing power parity (PPP) [3]. Fig. 1, presents a pictorial view of India's strategic location in the IOR.

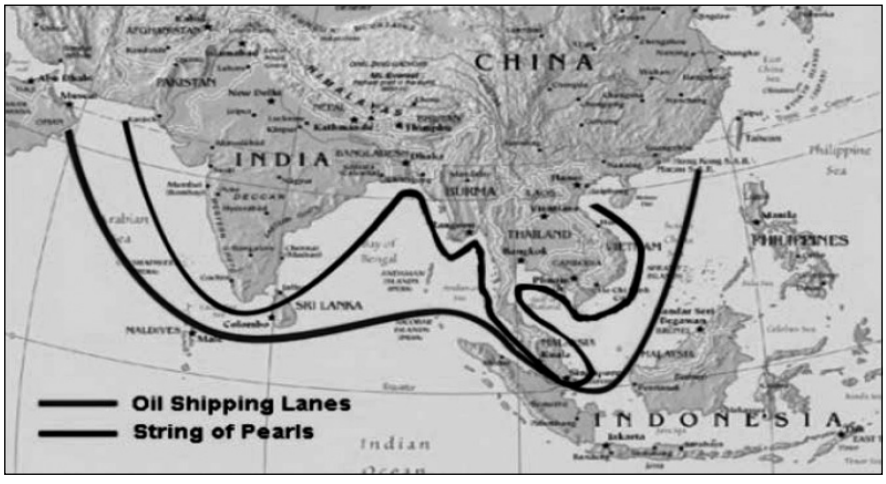

Figure 1: Geo-strategic Location of India in IOR

The changing face of economic geography historically, could provide us with indicators that may be helpful as we consider the future and the role of a maritime nation. Which areas of the world are now most important for global trade? Maritime strategies always reflect the dominant economic geography of the period. In the sixteenth-eighteenth centuries, the major arenas of maritime competition were the Mediterranean, Atlantic and Caribbean. The Caribbean's importance in the global economy waned in the nineteenth century, and in the twentieth century the Pacific Ocean became increasingly important. The Indian Ocean and Pacific Rim have become the focus of maritime geography in the twenty-first century, reflecting the rise of Asian economies and the importance of energy flows from the Persian Gulf [8]. Geographically speaking, India holds centre stage in the only ocean in the world which is named after a country. Her peninsular configuration juts out 1,500 miles into the sea and places her at the focal point of shipping lanes which are the arteries of travel from the Persian Gulf and Middle East to feed the energy requirements of the industries and economic engines of China, Japan and many south east Asian countries [9].

Globalization can be viewed as the flow of goods, services, funds, people, technology and information across borders. In the twenty-first century it is characterized by increasing volume and speed. Economic productivity and prosperity have been enhanced by the free flow of goods, services, monies, ideas and talents with world trade expanding and the world GDP growing over the last several decades. A major portion of these flows occur on the global maritime commons [8].

The comforting optimism about the future of globalization depends on the assumption of sufficient resources. This could be an illusion and most obviously in the availability of oil. A steep rise in the oil demand, especially from China, Japan and the rest of the Asia-Pacific, is coinciding with a terminal fall in the discovery of new reserves. Anticipating that they shall soon have to start scraping the bottom of the barrel, states are already maneuvering so they can cope with less secure energy future, and even now that is exacerbating relations with neighbours. China and Japan are in dispute over islands which straddle potentially important marine oil fields. The Chinese are moving into the Indian Ocean, watched warily by India. Energy concerns are driving numerous alliances that may subsequently transform into other power hungry manifestations, thereby threatening

others outside the alliance [8].

The vulnerability of the Indian coastline has been amply displayed by the recent subversive attempts through the sea in the event of 26/11. The strategic offshore assets need to be safeguarded and also the large undersea resources available in the Exclusive Economic Zone (EEZ) need to be commercially exploited without any intervention by the subversive elements. Fishermen being attacked in the international waters along the Pakistan border and the Sri Lankan border are a cause of concern. Naval deployments have to be backed by state-of-the-art indigenous ship-building capabilities.

India in the Indian Ocean Region (IOR) remains a recognizable economic power and can leverage this economic prosperity to ensure security concerns if handled wisely. The issue of graduating to a responsible maritime nation or so called "big brother" status comes with significant responsibility. The globalized world today requires major nations to be perceived as liberal internationalists rather than national liberals. The liberal internationalists and the national liberals are two contra forms of maritime strategies. The liberal internationalist represents the philosophy of economic prosperity driving the agenda and security being ensured as a spin-off rather than the philosophy of national liberals where security concerns drive the national policy initiatives and economic prosperity being ensured with aggressive naval strategy [8].

Irrespective of the philosophy India chooses to follow as a maritime strategy, the requirement of a vibrant ship-building industry is inescapable. The shipbuilding industry is a technology, skill and material intensive assembly operation, drawing large number of services and utilities. Ship-building/ship-repair being a labour intensive industry, the cost of labour plays an important determinant in the competitiveness of any nation. Thus over the years, the production base has shifted from Europe, to Asia (Japan and Korea) and more recently taken firm roots in People's Republic of China due to low wage. India with its low wage and highly skilled labour force can potentially offset this trend and emerge as a major shipbuilding destination globally.

Shipbuilding Globally and in India

The shipbuilding industry has been a global manufacturing industry for a long time since product needs are nearly standardized for most of

the commercial vessels. At the same time, the industry is geographically concentrated; firstly as it is dependent both on large single manufacturing sites and on coastal locations, secondly the shipbuilding industry has always been dominated by one or a few countries world-wide. Paradoxically, although highly globalized when it comes to sales, until recently, the industry has at the same time been highly nationalized when it comes to the organisation of production with relatively high levels of state intervention [10].

All along the history of shipbuilding industry, there have been dramatic changes in global leadership. At the beginning of the 19th century, the USA was the world's leading shipbuilding nation. From 1850, when the first steel ships were built until 1945, Great Britain was the world leader in shipbuilding contributing to 80 % of the world market, whereas shortly after the Second World War, Germany and some other European countries took over the leadership from Great Britain. In 1960s, Japan became the world's leading shipbuilding nation. Since 1973, South Korea has been building up and expanding its shipbuilding industry. Among the emerging shipbuilding countries, China is the most prominent. While new countries successfully entered the world shipbuilding market, others such as Sweden, had to withdraw from the market [11].

Analysis of the multiple aspects for the global and migratory nature of shipbuilding industry reveals that, those nations with surging overseas trade have an excellent opportunity to build up their shipbuilding capacity, provided they possess a minimum threshold of shipbuilding competitiveness in terms of cost of labour and technological know-how. Once the national shipbuilding industry has reached a level to match the global competiveness in terms of cost, delivery time and quality, tapping the export market for its ships will only be a natural step forward. India today is at this critical juncture, where it needs to gear up to reach the next level [11].

Theoretically, a new ship order is placed either when there is a requirement to move more cargo or to replace an old vessel, which is to be scrapped. The demand trend for shipbuilding follows the demand pattern in the shipping fleet, with a time lag. The global commercial shipbuilding delivery is presented in Fig. 2. The analysis of the shipbuilding cycle reflects that the 'shipyard delivery' peaks after the 'market demand' peaks and vice versa. The trend of 'shipyard delivery' follows 'market demand' with a time gap attributable to the time to build and delivery time of the ship. This

time gap can be observed to be generally around 2 years in the previous ups and downs of the shipbuilding history [11]. Current boom if not harnessed by India will be grabbed by other countries such as Korea, Japan or China. In fig. 2, it can be noted that the next cycle is round the corner and we now need to be prepared to be able to catch the ground running.

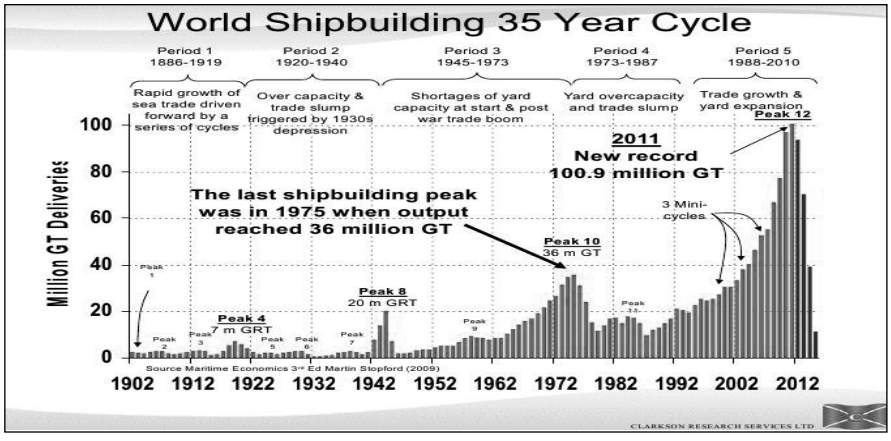

Figure 2: Global Shipbuilding Cycle [12]

The Republic of Korea (ROK) is an Asian country having an approximate area of 100,000 sq km, with 2,400 km of coastline located in the Korean peninsula, with North Korea, China and Japan as its neighbours. ROK has gone through more than 900 invasions in the last 2000 years. In 1901, Korea was captured by Japan and remained under Japanese rule till the end of the Second World War. Again in 1950, it was involved in the Korean War. ROK is one example where the shipbuilding industry has contributed immensely to the nation's economic growth in a short period of time with an integrated strategic approach with visionary leadership [11].

Peninsular India with 7,500 km of coastline provides the most vital infrastructure requirement for the growth of shipbuilding industry in India. The Indian shipbuilding industry has multiple strengths to potentially boost the sector as enumerated below:

(a) **Growing Indian trade.** Indian sea trade is growing at a continuous pace, warranting a large Indian fleet of commercial ships. Currently

only 8% to 10% of Indian trade is carried by Indian flagships.

(b) **Demographic Advantage.** India has favourable demographic profile with over 60% of the population in the potential working age group of 15-59 years.

(c) **Diverse Mix of Administrative Control.** The Indian shipyards are managed or controlled by diverse owners, including private and public sector providing mitigation of financial and business risks. Joint Ventures (JVs) are being seen between public and private sector shipyards of strategic projects for infrastructure sharing and other aspects.

(d) **Defence Orders.** The Defence PSUs have the experience of building a plethora of warships by integrating systems/weapons sourced from diverse countries. This is an experience that only a few countries have.

(e) **Shipbuilding in the Genes.** India is one of the oldest shipbuilding nations in the world and was globally renowned in the late 1700s.

(f) **Available Skill sets.** India as a nation has proved its skills globally in the automobile and the Information Technology Enabled Services (ITES) sectors. These are skills that will have complementary applications in the Shipbuilding sector as well.

(g) **Leadership Skills.** India as a country has had innovative leaders who have brought about revolutionary transformations in their respective fields.

Mentioning the weaknesses of the present shipbuilding sector in India here, will be in order:

(a) Lack of focus on reviving the industry by most of the stakeholders.

(b) Inadequate support by the ancillary industry due to unfavourable environment.

(c) Lack of trained/skilled manpower specific to shipbuilding.

(d) Shipbuilding in India, currently is not a remunerative industry, which can attract the best talent.

(e) Establishing a shipyard has high entry and exit barrier.

(f) Lack of clarity in the government policies, regulations and priorities.

The analysis of the above factors indicate a lack of comprehensive approach towards resolving the irritants and poor government involvement in the sector though it has significant potential to contribute to GDP growth and national prosperity.

Maritime Capacity Building in India

The vibrant shipbuilding industry is deeply connected to the maritime capacity of the nation. Multiple players come in as we discuss maritime capacity in terms of military and commercial aspects. Multiple players further complicate the scenario with the dynamics of interplay between them. India's capabilities and shortfalls in terms of shipbuilding capacity, ports and harbour infrastructure, shipping, human resource and ancillary fields in this sector need a comprehensive assessment. The enlarged understanding of sea power is the capability of a state to accelerate its technical and industrial progress backed by research and development in the field of seabed resources, fishing and merchant seafaring with a navy to safeguard these interests. Thus, the military and the commercial interests are strongly interlinked and mandate a collective maritime vision [6].

Significant amount of regulatory issues require attention. Ports and harbours in India are currently regulated by a number of laws resulting in a lack of standardization and management. The definition of ports itself has no clarity. The minor and major port nomenclature is based on its inception at the outset as an entry under the law, instead of the cargo handling capacity or its financial capacity/turnover. Major ports are classified under the Major Ports Act of 1963 however the Ennore Port in Tamil Nadu comes under the Companies Act. The Indian Ports Act of 1908 allows coastal states to set up their own port systems leading to an inconsistent administrative structure of port infrastructure in India. The inefficiency of the Indian ports is attributable to flawed management, both in terms of human resource and administration much less due to lack of capability. Ports are being managed by officers of the Indian Administrative Service, without specialist knowledge of the sector rather than experienced professionals [6].

The advanced ports globally have turnaround time of less than a day, like in Colombo and Hong Kong the turnaround time is 16 and 13 hours respectively. In India the average time in a port is 3.79 days on account of outdated and obsolete equipment and rigid management, customs and labour practices. Cargo handling capacity in India requires an overhaul even to redefine 'major' and 'minor' ports. The target set by the government in Maritime Agenda-20 is handling of 3.2 billion tonnes of cargo by 2020 [6]. Fig. 3, presents the present status of ports globally [13].

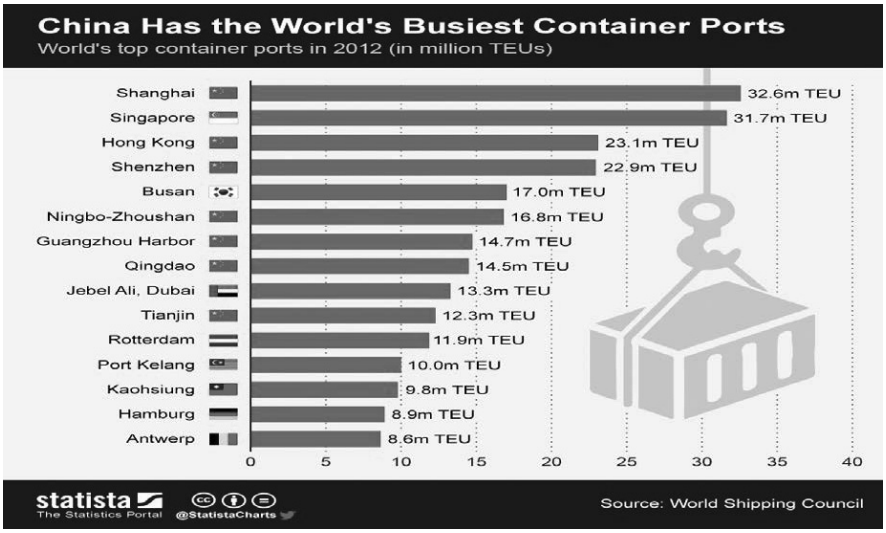

Figure 3: World Top Container Ports in 2012 [13]

The mismatch between the onshore infrastructure and the generation of merchant vessels needs to be synchronized. Effective application of Information Technology Enabled Services (ITES) in the Indian ports sector will improve efficiency and realize the dream of creating a transhipment hub in India. The transhipment hubs require large tracts of coastal land for operations unlike ports. The escalating price of land acquisition and even lack of availability of large tracts make it a challenging task to set up transhipment hubs. The cost and competiveness of other global hubs like the one in Colombo is another aspect that requires consideration [6].

The security concerns in the IOR with multiple fringe groups raising their head and striking nations through the maritime route and also creating sense of insecurity for maritime operators mandates impetus for coastal defence. Coastal security translates to preventing ships from running aground and a host of other challenges like maritime terrorism, piracy, smuggling, etc. The environmental impact of offshore economic activities like fishing, oil exploration, dredging, coastal infrastructure projects, etc. needs to be assessed. The coastal security apparatus across the coastal states and the maritime agencies of the Union of India in the absence of a centralized agency with comprehensive authority has been counterproductive due to multiple reasons. One of the main reasons is the

varied level of infrastructure and administrative priority accorded by various states. Some states with better resources and higher priority towards coastal security are taking on far more responsibility and exercising authority, even in defiance of the central agencies in some cases, whereas others are leaving it to the central agencies to take over. Such non-uniform structure leads to confusion and lack of coordination across the entire coast [6].

In the early twentieth century, Germany was an advanced industrial nation but not a great power as its maritime footprint was small due to low infrastructure. Similarly the Asian nations today are progressing, however in the absence of significant maritime infrastructure they fall short of being considered as developed nations like the Europeans in the twentieth century. Thus infrastructure becomes a key factor for nations looking at leveraging economic prosperity from the maritime sector.

The term 'maritime infrastructure' not only covers coastal infrastructure like ports and yards but also includes roads and railheads, warehouses, financial institutions, legal assistance and allied services that facilitate maritime activity. An enhancement of these support facilities is equally important for the main infrastructure to function optimally.

India in the 21st Century

The India of the 21st Century is all about optimism and growth. Multiple sectors have shown significant growth and global leadership, however the overall picture is still not a very encouraging one. Umpteen examples of growth and prosperity can be buried under counter examples of bureaucratic delays, apathetic government regulations, lack of vision, etc.

The government formed in May 2014 has generated substantial optimism among investors, industrialists, service providers, common man on the streets and more importantly the global political as well as the economic fraternity. The government has firstly worked very carefully to enhance public perception within and abroad. The multiple public addresses by the Prime Minister at varied locations including 'The Madison Square Garden', 'Allphones Arena Olympic Park', etc is sending very positive signals. To add to that the policy and administrative initiatives back home has further bolstered Indian image globally. Resources seem to be available now and if not channelized with proper vision could be counterproductive.

Some of the initiatives taken by the Government that could have

relevance to the maritime domain include:

(a) Make in India campaign to showcase India as an investment destination.
(b) Boost to manufacturing sector with policy level support.
(c) Environmental clearance made online for more transparency and accessibility.
(d) Restructuring of the ministries at the Union government level.
(e) Labour law reforms and unified portal for labour law compliance.
(f) Significant stress on skill development.
(g) Doing away with the Group of Ministers (GOMs) and Empowered GOMs

Statistics can throw up very distressing facts and policy initiatives must address these facts. Some facts that could have significant impact on the shipbuilding industry are :

(a) **15% :** That is the current share of manufacturing sector in Indian's GDP. This compares poorly with other Asian countries. The sector is 34% of China's GDP and 31% of South Korea's.
(b) **100 million jobs:** The number of manufacturing jobs the Indian government aims to create by 2022. According to Justin Lin, a former chief economist at the World Bank, China will shed 85 million manufacturing jobs in the next few years because of fast rising wages. India can attract some of these jobs—and it desperately needs to—if it can cut bureaucratic hurdles that scare away new businesses.
(c) **65%** of India's 1.2 billion population is under the age of 35. The average age of an Indian in 2020 will be 29, compared with 37 in China and the United States. In the next decade, India is expected to have the largest available workforce in the world. But if the country cannot create jobs for its youth, the demographic advantage would be wasted.
(d) "In the last five to six years we have had jobless growth and consumption. That is unsustainable. We have only created 2 million jobs every year. But 12 million youth are coming to the job market every year.
(e) **134th:** That is where India stands, out of 189 countries, in World Bank's "Ease of doing Business" Index. In South Asia, only Bhutan (141) and Afghanistan (164) rank lower than India. The World Bank report notes that it takes 27 days to start a business in India. In Singapore it takes two

and a half days. Registering a business takes less than a day in Singapore.

Since the new government took over in May, the process of applying for industrial license has been made online on the e-Biz website. Multiple initiative are being seen, and these generic efforts will certainly lift the overall growth, however in the absence of a specific maritime vision the overall momentum may not be able to boost these sectors that require strategic efforts, massive infrastructure investment, specialized human resources and technology. "Sea blind" national strategy is no more sustainable and the multiple stakeholders have to come together under a cogent and visible national maritime strategy.

Conclusion

A cogent maritime strategy integrated with the national grand strategy will require a comprehensive assessment and in-depth understanding of multiple aspects. The aspects that would be relevant to the shipbuilding industry could be enumerated as:

(a) Maritime capacity and infrastructure.
(b) Globalization and its impact.
(c) Maritime terrorism and security issues.
(d) Maritime forces.
(e) Regulations and policy issues.
(f) Energy security issues.
(g) Technology and Research aspects.
(h) Role of Industry and Academia.

In India we need to involve think tanks to generate this grand maritime strategic vision. We need to formulate policies and allocate resources based on the strategic vision.

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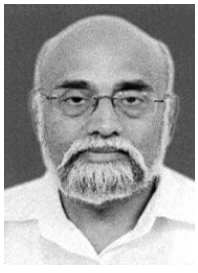
Vice Admiral DSP Varma (Retd)



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Nuclear Diplomacy of the Present Central Government

Rajiv Nayan

Introduction

Contrary to expectations Prime Minister Narendra Modi has laid great emphasis on foreign policy and diplomacy. It was generally felt that the new government would look inward and concentrate on economic stability and growth in addition to restructuring of internal security preparedness. The government surprised many by inviting the South Asian Association for Regional Cooperation (SAARC) plus Mauritius for the new Prime Minister's swearing in ceremony. Even if one may disagree with a somewhat hasty decision and the timing of inviting Pakistan and Sri Lanka, it was a great indicator that the Modi government would not prefer slow motion on diplomacy and foreign policy.

In fact, after the initial *faux pas* the government did a wonderful course correction. India terminated the dialogue process with Pakistan; so, diplomacy with Pakistan is now normal and to an extent sanitised. The government is pursuing a highly innovative diplomacy. The Prime Minister, Narendra Modi, has visited small states such as Bhutan and Nepal, and built unique confidence in the neighbourhood. The government's engagement with several Asia-Pacific countries and great powers such as the United States (US) and Russia has revealed a multifaceted character of pro-active diplomacy. Old areas are being consolidated and new areas are being explored. Nuclear Diplomacy has emerged as an important component of

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the Modi government's active diplomacy.

Narendra Modi is leader of the Bhartiya Janata Party (BJP). The earlier BJP-led government under Atal Bihari Vajpayee had a different approach towards nuclear issues. It had conducted nuclear tests in 1998 and got support from other political parties for nuclear weapons programme and nuclear deterrence. At the same time, the then BJP-led governmentalso continued global nuclear disarmament of the old regimes. However, since 2004, the BJP as an opposition party had some strong reservations on a few nuclear policies like the Indo-US nuclear deal. The principal question thatpuzzles the policy community is: how is the Modi government going to address the nuclear question? Though the government is merely a few months old, yet it has manifested a certain character about its nuclear diplomacy that it is following the policy or principle of continuity in the government.

Global Nuclear Disarmament

Nuclear India has not abandoned its long cherished dream of a nuclear weapons free world. It never abandoned the project even when it turned a nuclear weapons country in 1998 or subsequently, when somewhat the world recognised its nuclear weaponstatus by giving exemptions in the guidelines of the Nuclear Suppliers Group (NSG) in 2008. The current government is continuing the India's commitment to nuclear disarmament. Both the Prime Minister and the External Affairs Minister have reiterated it at the political level and other officials are echoing it in different international meetings.

In the UN General Assembly address, the Prime Minister, Narendra Modi, asserted, "Let us continue redouble our efforts to pursue universal global disarmament and non-proliferation." During his September 2014 US trip, the two countries issued a "Vision Statement for the U.S.-India Strategic Partnership 'ChaleinSaathSaath: Forward Together We Go'in which once again the Indian Prime Minister along with the US President made it clear that they "remain committed to reducing the salience of nuclear weapons, while promoting universal, verifiable, and non-discriminatory nuclear disarmament." The phrase—universal, verifiable and non-discriminatory disarmament –has been the hallmark of the Indian government nuclear policy for years.With Australia the Modi government decided to have an annual bilateral dialogue on nuclear disarmament.[2]

In Japan, Prime Minister Modi clarified that "There is no contradiction in our mind between being a nuclear weapon state and contributing actively to global nuclear disarmament and non-proliferation. India remains strongly committed to universal, non-discriminatory, global nuclear disarmament".[3] In fact,. India and Japan both are the strong supporters of nuclear disarmament, yet in the international organisations, both the countries work differently to pursue nuclear disarmament. In the UN General Assembly, both vote against each other. The Modi government has also associated itself with G-21 position in the Conference on Disarmament. G-21 is a grouping of developing countries. India and China also decided to consult each other on nuclear disarmament[4] when the Chinese President Xi Jinpingvisited India in September 2014.

As the Modi government continues to support for a world without nuclear weapons, officials on different global and international platforms have articulated the nuclear policy or nuclear disarmament policy of the Modi government. For example, on October 7, 2014, the Indian Permanent Representative to Conference on Disarmament at the General Debate of the First Committee of the 69th UNGA reiterated: "India's support for the complete elimination of nuclear weapons is consistent with the highest priority to the goal of nuclear disarmament agreed by consensus in the Final Document of the First Special Session of the General Assembly. As a nuclear weapon state, our commitment to universal, non-discriminatory and verifiable nuclear disarmament remains undiminished."[5]

India has maintained its old disarmament policy in different international bodies. Even in the current government,Indian diplomacy supports reducing salience of nuclear weapons for a step by step move towards the process of nuclear disarmament. It reiterates de-legitimisation of nuclear weapons. Other steps such as reducing nuclear dangers reflected in accidental or unauthorized use of nuclear weaponsthem through risk management efforts and Convention on the complete prohibition of the use or threat of use of nuclear weapons are also repeated in the Conference on Disarmament and other bodies.

The Modi government has also supported negotiations for a Nuclear Weapons Convention that bans development, production, stockpiling and use of nuclear weapons as well as facilitates time-bound destruction of these weapons. The Modi government participated in the third conference dealing with the humanitarian impact of nuclear weapons. The first two

conferences, in which the erstwhile Prime MinisterManmohan Singh had allowed the Indian government to send its representatives, were organised without the nuclear countries such as the US and Russia. In the third conference held in Vienna that the US sent its official-level delegation.

Non-proliferation

When in 2006 India presented its working paper on nuclear disarmament, it listed step by step process towards nuclear disarmament. Nuclear non-proliferation did not figure as one of the steps, yet it did mention: "Nuclear disarmament and nuclear non-proliferation are mutually reinforcing processes."[6] India does not support the non-proliferation initiatives without the disarmament roadmap. The absence of time-bound nuclear disarmament led to the Indian rejection of Comprehensive Test Ban Treaty (CTBT). However, in recent years, it is not as strict as it was before. Even the Vajpayee government had started taking a pragmatic approach. The earlier United Progressive Alliance (UPA)government further continued the practical approach.

The Modi government also seems to have a practical approach to non-proliferationeven if it supports nuclear disarmament. The government also seems to continue the non-proliferation policies adopted by the Vajpayee and Manmohan Singh governments. This practical approach is reflected in bilateral and multilateral diplomacy conducted at the summit and other ministerial and official levels. The joint statements issued during many of the prime ministerial visits reiterated India's commitment to non-proliferation. In these statements, the support for non-proliferation came under different frameworks varying from India's national security to international security.

When Putin visited in 2014, India and Russia expressed their support to not just nuclear proliferation but also the entire category of Weapons of Mass Destruction (WMD)[7]. And very interestingly, both the countries expressed their support as possessors of advanced technologies to non-proliferation. There is a growing global concern that non-state actors may lay their hands on WMD technologies and as a result, the international community has intensified its efforts through measures such as Nuclear Security Summit process and United Nations Security Council Resolution (UNSC R) 1540. India and Russia are active with both the initiatives.

India and Russia are also signatories of the Chemical Weapons Convention (CWC) and Biological and Toxin Weapons Convention

(BTWC). India has already destroyed its declared chemical arsenals but Russia and some other countries like the US are yet to destroy their declared chemical arsenals. These existing chemical weapons stockpiles are also considered vulnerable for WMD terrorism. India has been raising the issue of destruction of the remaining chemical weapons stockpiles in the Organisation for Prohibition of Chemical Weapons meetings. Even in the December 2014 Conference of States Parties of the CWC, India raised the destruction of the chemical weapons stockpile of the remaining chemical weapons possessor countries.[8]

The same concern about WMD security was expressed in the September 2014 India-US joint statement. With the US, India also reiterated the old policy of working together through summit process to secure nuclear materials to deny terrorists access to these materials. To fight nuclear terrorism, the US also restated its old policy of working with the Global Center of Nuclear Energy Partnership.

China and India have agreed to hold 'consultations' on non-proliferation and arms control as well.[9] Although the statement has not provided the scope of consultations, yet the Indian strategic community expects India and China to discuss the proliferation network in which China and Pakistan and other countries are involved, and affects Indian security. But the Modi government, it does not appear, may have raised China-Pakistan nuclear collaborations. It may have raised non-proliferation and arms control issues where both countries may work together. In fact, the framework of the dialogue of the Modi government and the Chinese government is 'building closer developmental partnership'.

The Modi government had a different non-proliferation emphasis when the Prime Ministervisited Japan.The Japanese government appreciated the Indian credentials on non-proliferation and the Modi government in turn appreciated the Japanese government for removing some of India's space and defence organisations from the Japanese end user list.[10] The removal of these organisations will enable them to procure high technology items from Japanese companies. The two governments also decided to work together on high-technology items,[11] overwhelmingly controlled worldwide.

Both the Prime Ministers also discussed North Korean nuclear weapons and ballistic missile developments. Both wanted North Korea to denuclearise the Korean peninsula. Besides, India and Japan expected North Korea to abide by "international obligations, including under all

relevant United Nations Security Council Resolutions and its commitments under the 2005 Six-Party Talks Joint Statement."[12] The Modi government and the US government also had the same kind of understanding on North Korea when the Prime Minister Narendra Modi visited the US in September 2014. India and the US expressed concern on the North Korean ballistic missiles and nuclear weapons development programmes, especially its uranium enrichment activities.[13]

India and the US also issued a joint statement in which they underlined "the need for diplomacy to resolve the serious concerns of the international community regarding Iran's nuclear program, and called on Iran to comply with its UN Security Council-imposed obligations and to cooperate fully with the International Atomic Energy Agency."[14] Quite interestingly, in December 2014, India and the US voted together on a UN resolution as well.[15] The paragraph 9 of the resolution mentioned 'the crucial importance'[16] of the Nuclear Non-Proliferation Treaty (NPT) for nuclear disarmament and non-proliferation. Besides, the resolution also urged all the non-members of the treaty to join the NPT as non-nuclear weapons countries. The Modi government not just voted against these objectionable paras of the resolution but one of the very important and senior officials earlier had clearly stated that India would not sign the NPT as a non-nuclear weapon state.[17]

Integration with Institutions

TheModi government is continuingthe policy of engagement with the international organisations dealing with nuclear matters. The International Atomic Energy Agency (IAEA) remained the principal organisation for managing nuclear energy and other peaceful applications as well as non-proliferation issues such as safeguards. India ratified an Additional Protocol which it had signed in 2009. This Additional Protocol entered into force on July 25, 2014.[18] So, the Modi government took the task initiated by the earlier government to a logical conclusion. India also participated in many of the IAEA technical and other policy meetings. India offered to organise a technical meetingon the Construction and Commissioning of Fast Reactors. The Modi government continued the Indian nuclear establishment's close interactions, including organising workshops with the IAEA's Integrated Regulatory Review Service.

India and IAEA are continuing to work in many other areas of nuclear

science and its applications. The new Indian government is working on the Programme on Action for Cancer Therapy and has extended support to the IAEA planned modernisation of nuclear application libraries. The head of the Indian Department of Atomic Energy informed thatIndia had offered the services of an Indian 'expert in information security'.[19] The Indian government is continuing to contribute to the IAEA nuclear security fund, and the Indian Global Center for Nuclear Energy Partnership is working in close collaboration with the IAEA. Moreover, as discussed, India has been asking the countries, including Iran which have signed agreements with the IAEA to abide by the agreements the countries had signed.

Though the IAEA's centrality continues in the Indian nuclear engagement with international organisations, yet the UN and its different organs are the bodies where peace and disarmament relating statements and policies are articulated. Prime Minister Modi himself went to the UN headquarters ignoring his political problems with the US earlier. He made the policy statement on the global issues, including nuclear related. The Indian diplomacy continues to play a highly constructive role in Conference on Disarmament, the First Committee of the General Assembly, even the General Assembly and the UN Security Council. India has been recognising the role of UNSCR 1540 and its committee in fighting the challenges of WMD. The engagement of the UN is part of India's policy for an open and inclusive rules-based global order in which India is ready for taking up responsibility in the multilateral bodies.

Significantly, India's multilateral nuclear diplomacy is pitching for the membership of multilateral export controls regimes. In 2010, the Indian commerce minister had asked for the membership of the multilateral export controls regimes during his visit to the US. Later, during the American President Barack Obama's visit in November 2010, India and the US issued a press statement which uttered that India needs to be given the membership of all the four multilateral export controls regimes, namely, the NSG, the Missile Technology Control Regime (MTCR), the Wassenaar Arrangement, and the Australia Group. Subsequently, many other countries also endorsed the idea that India should be given the membership. India has already harmonised its export control system with the technology annexes and the guidelines of the NSG and the MTCR. India has to incorporate technology lists and guidelines of the Wassenaar Arrangement and the Australia Group for getting the membership of these

regimes. Besides, the member countries of these regimes have to exempt the NPT criteria for at least NSG and the Wassenaar Arrangement.

India wants to start with the membership of the Nuclear Suppliers Group (NSG), but the Western countries want India to start with the Australia Group.The joint statement issued at the time of Modi's visit to the US seems to have reconciled to the Indian approach to the road map of the membership of multilateral export controls regimes. The statement noted: "As a critical step in strengthening global non-proliferation and export control regimes, the President and Prime Minister committed to continue work towards India's phased entry into the Nuclear Suppliers Group (NSG), the Missile Technology Control Regime (MTCR), the Wassenaar Arrangement and the Australia Group. The President affirmed that India meets MTCR requirements and is ready for membership in the NSG. He supported India's early application and eventual membership in all four regimes." The Modi government also received the support from Japan and Russia for its membership of all the regimes.[20] These countries had supported the Indian case for the membership in the earlier when Manmohan Singh was the Prime Minister. Hopefully, the issue is resolved in 2015.

Of late, Indian nuclear diplomacy has also been supportive of the initiatives involving a small group of countries. It is already participating in the NSS process for nuclear security. It has been a supporter of Six-Party Talks for resolving the North Korean conundrum. It has supported E 3+3 initiative among others for addressing the Iranian nuclear issue so that dialogue and diplomacy remain the key tools for resolving the contentious global issues. The Modi government is also continuing the old policy of resolving hostile nuclear issues through negotiations agreed by all the parties to the dispute.

Civil Nuclear Energy/Science and Technology

What will be the fate of the nuclear deal negotiated and concluded by the previous governments led by Manmohan Singh? This is a question that many policy analysts ponder. The Modi governmenthas given a clear-cut answer to the question by engaging all the governments which signed civil nuclear energy relating agreements. Here too, the new government has adopted the principle of continuity. The Modi government further expanded the scope of cooperation in some of the agreements. It has

discussed for nuclear energy cooperation with Bangladesh, China and Japan, though there are several issues which are to be resolved before nuclear energy cooperation with these countries. With a country like Australia negotiations finally resulted in the signature of a Memorandum of Understanding. Admittedly, the two countries are still working out the administrative arrangements to make the understanding operational.

The Modi government also continued the famous India-US civil nuclear energy initiative. During his US visit, the two leaders decided to set up the India-US Contact Group on civil nuclear cooperation.[21] The first meeting of this group took place on December 16-17, 2014.[22] It discussed 'administrative issues, liability, technical issues and licensing to facilitate the establishment of U.S.-designed nuclear power plants in India.'[23] The American companies such as Westinghouse and GE-Hitachi technologyand the Indian public sector undertaking like Nuclear Power Corporation India Limited along with other stakeholders participated in the meeting.

When Russian president Putin visited India in 2014, a released document explicitly mentions that both countries "intend to actively develop mutually beneficial cooperation in the peaceful uses of atomic energy. Towards this, the two sides especially recognize the importance of the following documents signedbetween their governments:

- Agreement between the Government of the Russian Federation and the Government of the Republic of India on cooperation in the construction of additional nuclear power plant units at Kudankulam site as well as in the construction of Russian designed nuclear power plants at new sites in the Republic of India, signed on December 5, 2008 (hereinafter referred to as the Agreement of 2008); and Agreement between the Government of the Russian Federation and the Government of the Republic of India on cooperation in the uses of atomic energy for peaceful purposes signed on March 12, 2010 (hereinafter referred to as the "Agreement of 2010")."[24]

Russia and India agreed to construct and commission at least 12 more reactors by 2034 under the 2008 agreement. Quite importantly, the two governments decided to take forward the April 20 2014 General Framework Agreement for construction of Koddankulam 3 and 4 reactors. This also signifies that the two countries have also developed some kind of understanding on the Nuclear Liability Act. With the road map of the

serial construction of reactors, the two countries agreed to use the 'Make in India' framework of the Modi government for nuclear industry. The Indian nuclear industry will not only supplyequipment and services for construction of rectors but also work in joint ventures. The idea seems is to minimise the cost of nuclear power production in India.

The India-Russia nuclear partnershipmayalsostrive for capturing the foreign market for nuclear reactor and other peaceful applications of nuclear science.[25] In the strategic vision document, the two sides also decided to work on several nuclear power and non-power relating science, technology and engineering development works. The two may have 'joint research in fast reactors, thorium fuel cycle, accelerator-blanket systems, high current protons and ion accelerator, and controlled thermo-nuclear fusion...'The two countries will also jointly endeavour uranium mining and radioactive waste management.

Although nuclear safety and security and other regulatory issues are considered indispensable for the operation of not just nuclear fuel cycle but also other aspects of nuclear science and technology, yet in recent years the role of regulatory board and different regulatory mechanisms has become more central in nuclear governance. India is also in the process of developing an independent nuclear regulatory board through a Parliamentary act, though it has an autonomous and well functioning regulatory board—the Atomic Energy Regulatory Board. India interacts with different countries and international organisations to share experience and appropriate practices. The Modi government also underscores the significance of sharing regulatory practices. Among other diplomatic activitiesthe Atomic Energy Regulatory Board of India and the Radiation and Nuclear Safety Authority of Finland had an arrangement for nuclear and radiation safety regulation related cooperation. The current government also signedsafety related agreements with countries such as Australia, Russia and the US.

Diversified Nuclear Diplomacy

As discussed, the Modi government, which was generally believed to de-prioritise foreign policy in general and nuclear diplomacy in particular,has surprised the worldby assigning a high priority to diplomacy, including nuclear diplomacy. The current Indian nuclear diplomacy is quite diversified. As discussed above, thematically, India has covered all the issues of nuclear spectrum. The government has not confined itself to one

country, one region or one group. It has engaged all the leading nuclear technology countries as well as some new nuclear aspirant countries.

The Modi government has discussed the possibility of nuclear energy cooperation in theneighbourhood. China and Bangladesh were two countries in India's neighbourhood with which the Modi government expressed its desire to work for nuclear energy cooperation. The Modi government has not used the SAARC framework for nuclear energy cooperation. Like previous governments, the Modi government, too, does not appear very serious about the nuclear energy business with China, though the Modi government may have to raise China's role in nuclear proliferation in its interactions. In the future, the Modi government may have to raise China-Pakistan nuclear collaborations.

However, the India-Bangladesh nuclear energy cooperation may develop into a regional nuclear energy involving SAARC minus Pakistan and a few other countries like Myanmar. Of course, for nuclear weapons, the current government must strongly discourage any regional framework, which is being revived by a strong section of the Western non-proliferation community backed by some Western governments. The only real solution to nuclear weapons is the global solution.

The Modi government continues to engage with India's time tested and new friends alike. Russia and to an extent France have been time tested nuclear energy friends of India. Although the Modi government may not have organised any summit kind of meeting with France in the early months, the nuclear energy partnership is continuing strongly with it. However, the Modi government has a high-level engagement with some European countries such as the UK, and Finland.Russia and India have also emphasised their nuclear relationship with a summit-level meeting. India has reached out to the US. Japan and Australia are other important countries from the Western group which are expected to have more serious relationship with India in the much talked about Asian century. Other than the UN and the IAEA, the Modi government has also used the platform likethe BRICS Summit in 2014.

Challenges

The Modi government has done exceptionally well in the beginning of its first year of governance. Nuclear diplomacy as part of governance has tried to consolidate previous gains and explore new areas. It has to manage

Indian nuclear interests in both the peaceful and security realms. There are challenges in many of these areas. Some of these challenges are old but the Modi government may face some new challenges as well. So, the initial months of activism has to confront the ground reality in the future.

As discussed, a section of the non-proliferation lobby backed bya few Western governments are pushing some old, outdated and discredited approaches, ideas, initiatives, frameworks and treaties. One of such ideas has been the revival of the South Asia nuclear framework to engage India and reduce all the global nuclear dangers to this framework. This artificial and unrealistic construct is basically to insulate China and find a misplaced solution to the problem emanating from Pakistan. A section of the Indian strategic community has become a beneficiary of this revival and may try to provide an intellectual space.

Yet, the overwhelming section of the Indian strategic community and the Modi government may have to strongly reject this new push. Of course, the government will have to neutralise Pakistan/China lobbyists in the non-proliferation community differently. Here the rational section of the strategic community may play an important role in exposing these non-proliferation elements. The Modi government needs to talk tough to the Western governments, especially the US and the UK and ask them not to support these elements financially or otherwise.The message should be clear and, if required, loud.

After the exposure of the Pakistan-led A Q Khan proliferation network some western analysts and their governments started downplaying the involvement of the Pakistani and Chinese governments, and started shifting blame on non-state actors and independent companies. However, time to time, different Western governments and their agencies have been highlighting the role of these governments in the proliferation network. The Western governments know quite well that the network still exists. Now their strategy seems to co-opt China and Pakistan and persuade them not to contribute to the WMD making of the countries like Iran.

No doubt, the existence of the proliferation network is detrimental to security of India and the Western countries. The Western governments need to become aware that for commercial interests any sacrifice of security interests may be extremely damaging in the long-run. The Modi government may have to highlight the perils of the proliferation network and work with the elements in the Western governments which understand

the dangers of the proliferation network.

Another non-proliferation measure, the CTBT, poses a unique challenge. A few nuclear weapons countries may have ratified the treaty. But it has not been ratified by the US because its security establishment maintains that its aging arsenals need refurbishing. Possible, it wants to test. Moreover, all the nuclear weapons countries, which ratified the CTBT, had already conducted a number of tests before the CTBT was concluded.

In recent years, some governments and non-governmental organisations ask India to sign and ratify the CTBT. India, which conducted only five tests, should resist the temptation to get closer to the letter or spirit of the CTBT. The Modi government needs to be careful in unnecessarily pronouncing India's unilateral moratorium on nuclear test. Like other countries India will also have to review the test option for maintaining reliability of its nuclear deterrence.

Similarly, very soon, further nuclear weapons developments in the Indian neighbourhood may instigate a debate around the Indian nuclear doctrine. The BJP manifesto indicated that it would revise the nuclear doctrine. This led to the speculation that the No-First Use element in the nuclear doctrine may be revised, though the Modi government and the BJP both denied that the No-First Use would be changed. However, the Indian strategic community and the Indian security establishment want that for the Indian deterrence to become effective it needs to undergo some changes. The Pakistani blackmail and terrorism can only be checked with a proper nuclear signalling. The Modi government may have to use its nuclear diplomacy to explain to the world what forced it to change its nuclear doctrine.

The membershipof the four multilateral export control regimes has been a top priority of Indian diplomacy. After Modi's US visit, it has once again generated a momentum. Indian diplomacy needs to target the membership of the NSG in 2015. However, the Modi government should not allow any other linkage to its membership. India should not allow Pakistan to piggyback. India is being considered for the membership of the regimes for its incredible non-proliferation record. A section of the anti-India non-proliferation community has been trying to take additional unrealistic concessions from India. India should not agree more than what other members had agreed for the membership. India is not a member of the NPT and it may join the NPT only as a nuclear weapon country,

nothing less than that.

Conclusion

The Modi government has preferred continuity in the nuclear policy in general, and nuclear diplomacy has truly reflected the government's policy of continuity.The basic objective of the entire exercise seems geared to generating confidence of the international community in the Indian policy making process. For the purpose, the government has engaged diversified international actors.

The significance of multilateral bodies and international organizations continues in Indian nuclear diplomacy. The customary UN address and other engagements are used to connectIndia to the world on conventional peace and security issues. The Modi government has sent a strong message that itcontinues nuclear disarmament as the main plank of the Indian nuclear policy. Other international organizations like the IAEA remain the forum for nuclear energy and other nuclear science and technology related activities.

However, the Indian policy for seeking the membership of all the four multilateral export controls regimes has become one of the high profile agenda of Indian nuclear diplomacy. The Modi government too has understood the relevance of joining the regimes and pushed it in different international interactions. Although G-20 is not discussing nuclear issues, other forums such as the Non-Aligned Movement and BRICS have been used by the Modi government for its nuclear diplomacy.

Bilateral nuclear diplomacy is another feature of the Modi government's international nuclear engagement. At the summit-level meetings, nuclear engagement has constituted part of general diplomacy. It has been an issue with all the relevant countries. The government seems to have convinced these countries about the merit of doing nuclear business with India. As it is the beginning of the new government, all the countries have reciprocated the Indian gesture and the assurance of developing the bilateral and multilateral nuclear partnerships.

However, the Modi government may have to overcome challenges in nuclear diplomacy in the future. Some of these challenges may be new and some old. The principle of continuity will certainly help in facing the old challenge. The government has done well in the external engagement; it should reach out to the Indian political class, and build a consensus on crucial nuclear issues. Needless to say, a non-partisan approach will be a

force multiplier, and for sure, will increase the effectiveness of Indian nuclear diplomacy.

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International Treaties on Outer Space and Indian Policy

Dr Rajeswari Pillai Rajagopalan

Rule-making in the realm of outer space has been gaining some traction in the recent years with current debates focusing a great deal of attention on the EU-initiated International Code of Conduct for Outer Space Activities (ICoC). The need for a new mechanism has been driven by an increasing number of threats and challenges – rising population in outer space including growing levels of space debris, increasingly military-oriented space programmes, increasing concerns around space weaponisation, spectrum allocation and radio frequency interference, and cyber-enabled space threats, among others.

Unlike other traditional security domains such as nuclear weapons, there is no effective outer space regime. There are no effective guidelines and norms that would regulate activities in outer space. Therefore, there is a clear need for defining and outlining boundaries of responsible behavior while framing rules of the road. The broad objectives of any regime should be ensuring security of space, ensuring order and stability in space activities and guaranteeing sustainability of outer space. While most states acknowledge these, there are gaping holes between rhetoric and reality in formulating an outer space regime.

Current Instruments: Strengths and Weaknesses

Outer space is not bereft of legal instruments but many of these instruments have been formulated when the concerns were of a different nature. There are five key treaties that deal with outer space affairs: Outer Space Treaty (OST) (1967), Rescue Agreement (1968), Liability Convention (1972), Registration

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Convention (1976), and The Moon Agreement (1984). These need to be reviewed in the wake of new challenges and threats. Other important legal instruments include the Treaty Banning Nuclear Weapon Tests in the Outer Space and Under Water (1963), Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (1978), and the International Telecommunication Constitution and Convention (ITU) (1994). However, all of these instruments have proved to be inadequate in the current context.

It must also be mentioned that, as in other areas, the UN Charter prevails over all other treaty obligations. Two of the key provisions under the UN Charter that are often cited in outer space debates are Article 2.4 that prohibits threat or use of force including in outer space, and Article 51 on the right to self-defense.

Outer Space Treaty (OST)

One of the fundamental legal instruments relating to outer space domain is the Outer Space Treaty, which came out of the Legal Sub-committee of the UN Committee on the Peaceful Uses of Outer Space (COPUOS). Given that there were few space powers in the 1960s, the treaty was negotiated and concluded by the US, UK and the USSR. The OST is a comprehensive instrument that enshrines the principle that the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries and shall be the province of all mankind. It states that irrespective of their degree of economic and scientific development (Art I) outer space shall be free for exploration and use by all states; that outer space is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means (Art II); that the Moon and other celestial bodies shall be used exclusively for peaceful purposes (Art IV); that States shall not place nuclear weapons or other weapons of mass destruction in orbit or on celestial bodies or station them in outer space in any other manner (Art IV); that astronauts shall be regarded as the envoys of mankind; that States shall be responsible for national space activities whether carried out by government or non-governmental entities; that States shall be liable for damage caused by their space objects; and that States shall avoid harmful contamination of space and celestial bodies. The other four key agreements in the outer space domain – Rescue Agreement, Liability Convention, Registration Convention, and The Moon Agreement – deal with more specific areas and builds on particular aspects of the OST.

While the OST addresses many important issues, there are also gaps that

need to be fixed. One of the major lacunae in the OST is that it talks about non-placement of weapons of mass destruction but conventional weapons are not covered. Also OST has become far too expansive in scope and interpretation. Lack of definitional clarity is another major issue. For instance, what constitutes a space weapon, or what constitutes defensive or peaceful use of outer space is not clearly defined. Also the definition of "astronaut" has become unclear. Traditionally, astronaut referred to the "personnel of a spacecraft" but in today's situation, whether this should apply to a space tourist on a Virgin Galatic is an important question.

PPWT

Also being debated currently is the Russia-China sponsored draft Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects (PPWT) (2008), of which a revised text was submitted to the Conference on Disarmament (CD) in Geneva in June 2014. PPWT is based on elements proposed in a working paper to the CD in June 2002 by Russia, China, Vietnam, Indonesia, Belarus, Zimbabwe, and Syria. So far, PPWT has managed limited support owing to a number of issues.[1] These include, first, an over-emphasis on arms race in outer space. While arms race is likely to become a major issue in the coming years, it is not so yet. On the other hand, there is a more pressing issue regarding space debris but the PPWT makes no mention of it in the entire treaty. There is also a big focus on placement of weapons in outer space whereas the bigger concern is that of ground-based weapons that can target assets in outer space. PPWT again makes no mention of ground-based weapons or the anti-satellite (ASAT) weapons, which is a major drawback, a view shared by India and several other spacefaring powers.

PAROS

Prevention of Arms Race in Outer Space (PAROS) is yet another measure that is debated year after year at the UN General Assembly with no real progress. PAROS remains an important issue under the UN arms control agenda and a resolution on PAROS was passed first in the UN General Assembly in 1981 but the CD is yet to have a productive session on it. PAROS, in line with the

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[1] For a critique on the PPWT, see Michael Listner and Rajeswari Pillai Rajagopalan, "The 2014 PPWT: A New Draft But With the Same and Different Problems," *The Space Review,* August 11, 2014, http://www.thespacereview.com/article/2575/1.

principles enshrined in the OST, calls for ban on the placement of any weapons including conventional weapons, in outer space. There is near consensual support for the measure but the absence of few critical players such as the US has hampered any forward movement. The US argues that there are no weapons in outer space and so such a treaty is not needed. However, there is concern that the US global strike capabilities with space components could truly weaponise outer space. Such a development will provoke reactions from China and Russia, thus leading to a broader arms race in space.

While the above-mentioned are some of the major legal instruments under debate, there is an increasing interest in moving towards developing Transparency and Confidence Building Measures (TCBMs), which are political initiatives rather than legally binding instruments. TCBMs have a fairly large support base although countries including India have stated that TCBMs remain good complementary measures and not something that can replace legal ones[2].

ICoC

One of the important political initiatives under much debate is the EU-initiated ICoC. Even though a comprehensive document in its coverage of issues and measures, the ICoC has come under sharp criticism on process issues. The manner in which the EU developed the Code has been seen as an exclusive exercise, with the EU deciding what is good for the world.[3] The fact that other established space powers were not involved in the creation of the Code has left them having no sense of ownership to the Code. Even as it may sound trivial, the political benefits of being an active party in shaping the debate and the Code ultimately is huge.[4] The EU in that sense missed an opportunity to

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[2] This position was most recently reinforced by India's Permanent Representative at the Conference on Disarmament, "Statement by Mr. DB Venkatesh Varma, Ambassador and Permanent Representative of India to the Conference on Disarmament," at the CD's Informal Plenary on Agenda Item 3 on Prevention of an Arms Race in Outer Space," June 11, 2014, http://www.mea.gov.in/Portal/CountryNews/2691_PR_Statement_on_PAROS_june_2014.docx.

[3] Rajeswari Pillai Rajagopalan, "Debate on Space Code of Conduct: An Indian Perspective," *Occasional Paper* No. 26, Observer Research Foundation, October 2011, also available online at http://www.orfonline.org/cms/sites/orfonline/modules/occasionalpaper/attachments/ocp26_1319777951241.pdf.

[4] For arguments along these lines, see "Writing the Rules on Space: Why Inclusion Matters," Space News, January 23, 2012, http://www.spacenews.com/commentaries/writing-the-rules-space-why-inclusion-matters.html.

engage other space powers and today they are faced with a situation of half-hearted support from a significant number of countries. Having said that, the EU has put in major efforts in the last two years to deal with some of the process issues and make the process more inclusive. Accordingly, the EU contracted the UN Institute for Disarmament Research (UNIDIR) to conduct regional seminars in Asia, Africa, Americas and Europe as a means to understand the regional/ country perspectives. Thereafter the EU also organized three Open Ended Consultations (OECs), open to all the countries, yet again providing an opportunity for countries to voice their stand, concerns, and criticisms in the hope that more countries will extend their support for the ICoC. While the OECs have improved the understanding around the Code, these have also widened the differences on the ICoC. For instance, the debates around the right to self/collective defence have become acrimonious with a big divide between the established and developing space powers.

Even as there is a lot of debate on the process-related aspects of the ICoC, there are also serious concerns particularly from the developing world that need to be tackled. There is a sense among these countries that space having been already crowded with satellites of existing space powers, the opportunities for these new entrants would be limited. Thus, they perceive the ICoC as restricting them although there is nothing in the Code that says so. On the other hand, there is a big emphasis on international cooperation in the ICoC and so while one can say that this concern is misplaced, the history of the West in developing such restrictive measures has made it difficult to sell the idea. Also countries worry that any kind of taxation that might be brought about for spectrum allocation could make it more expensive, thus harming the interests of the new entrants.

If the ICoC is to become an effective instrument, it ought to have a large support base and also it is important to have not just the critical numbers but also critical players. It will be imprudent if the EU were to make a case saying that there is sufficient number of countries that are backing the Code and they can put it now for global endorsement. The reality is that significant number of countries in Asia, Africa and Latin America has serious objections to the Code in its current form.[5] Unless the EU can invest more time and effort to strengthen the support base, the ICoC will see the same fate as that of the Hague Code of Conduct against Ballistic Missile Proliferation (HCoC), which has failed.

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[5] Rajeswari Pillai Rajagopalan and Daniel A Porras, "EU Musters Support for Space Code of Conduct," *Space News,* July 14, 2014.

GGE

UN Group of Governmental Experts (GGE) on outer space is another initiative that has been part of the global debate on space security. The GGEs are established by the UN General Assembly as a means to study current debates including concerns and challenges and possible solutions. Given that political differences among major powers have become the foremost stumbling block in establishing an effective space regime, GGE is seen as a good political initiative under the UN to promote mutual trust, encourage cooperation and openness, reduce tensions and misperceptions as a means to prevent intended or unintended conflicts. The GGEs took its origin in the UN General Assembly's First Committee that debates security and disarmament issues.

There have been three GGEs so far, the last one from 2012 to 2013. The third GGE's work is considered a relative success given that the group managed to produce a consensual report. While the GGEs have a role in developing an atmosphere of cooperation and trust between participants, their reports are recommendatory in nature and therefore effecting policy changes in the immediate future is slim. The last GGE consisted of 15 members – Brazil, Chile, Italy, Kazakhstan, Nigeria, Romania, South Africa, South Korea, Sri Lanka, and Ukraine and the P-5 countries. Given that there were two GGEs (on outer space and cyber space) constituted around the same time, India had to choose between the two and India joined the GGE on cyber space. It was understandable that there are few international fora that debates cyber space as against outer space that are debated within the many UN institutions. Most governments have come to accept the utility of the GGEs, as a way to break the political deadlock that has characterized the CD, the body tasked with debating outer space as it relates to security.

UN COPUOS

UN Committee on the Peaceful Uses of Outer Space (COPUOS) remains an important multilateral platform to discuss outer space issues. The committee, established in 1959, oversees the implementation of the five key legal agreements on outer space. With 79 member states and around 30 international organizations, this is one of the most widely representative multilateral bodies. The COPUOS comes under the Fourth Committee of the UN General Assembly. There is also the Long-term Sustainability of Outer Space Activities (LTSSA) Working Group established under the UN COPUOS Scientific and Technical Subcommittee, with an aim of exploring and identifying methods for maintaining a safe and

secure outer space. The group is further responsible for producing a consensual report bringing out the voluntary best practice guidelines.

Some of the major activities and achievements in the recent years include development of the Space Debris Mitigation Guidelines (2007), and the General Assembly Resolution on Enhancing the Practice of States and International Intergovernmental Organizations in Registering Space Objects (2007). Space Debris Mitigation Guidelines is seen as particularly important because it brings all the important spacefaring powers to acknowledge the importance of space debris and thereafter agree to a set of guidelines to minimize debris creation. However, the disadvantages is that these guidelines are merely recommendatory in nature and do not bind states to adhere to them. Similarly, even as the COPUOS deals with one of the biggest agenda in space – the long-term sustainability of outer space activities – one of the biggest lacunae it has is that the COPUOS deals only with peaceful activities and military activities and security-related aspects of outer space are not part of the COPUOS mandate.

IADC

The Inter-Agency Space Debris Coordination Committee (IADC) is another important inter-governmental platform for co-ordination and exchange of information on space debris, both natural and man-made ones, in space. One of the primary activities is to co-ordinate information and research among the member space agencies. Current members include: China National Space Administration (CNSA), Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), the European Space Agency (ESA), the Indian Space Research Organisation (ISRO), Japan Aerospace Exploration Agency (JAXA), the National Aeronautics and Space Administration (NASA), the Russian Federal Space Agency (ROSCOSMOS), and the UK Space Agency (UKSA).

India and the International Space Regime

As mentioned before, international space regime is far from what is required given the challenges that one faces in the outer space domain. However, even as there is broad agreement on the threats and concerns challenging the long-term sustainable use of outer space, the stark differences of opinion among the major spacefaring powers in determining the best course of action in addressing those threats are significant. On most important global issues, there are two broad camps – the one of the West, led by the United States and its allies, and two, the group led by Russia and China.

India's own position on outer space issues have been evolving. While it traditionally maintained a principled stand of no weaponisation of outer space and that outer space should be used for only peaceful uses, there are signs of fluctuation in India's policy in recent years. India as part of the G-21 countries actively supported the legislation of a treaty banning the placement of weapons in outer space. And on TCBMs, India has taken a position that they are important complimentary measures. However, this is beginning to change, if one were to chronicle the statements and actions on the ground. Even as India is insistent on legal measures, it has become pragmatic enough to recognise that it has to possibly start from a normative exercise and gradually move towards legal mechanisms.

Even as India understood the importance of space technology in the national security context, its utilization of outer space was predominantly in the developmental sectors. However, driven by changes in its neighbourhood, India is now beginning to approach space increasingly from a national security perspective. The Chinese anti-satellite (ASAT) test of January 2007 was a wake-up call to the new threats and realities in its own backyard. The repeated ASAT tests and increasingly militaristic space programmes being pursued by major space powers are becoming important reasons for India to change its tack. Also the thinking in New Delhi is that if India does not respond appropriately to the changing technological challenges, India will be left out and its interests not protected. However, the policy changes are neither clear nor decisive. Even as there have been policy articulations emphasizing the need to wake up to the challenges, there has also been caution, with India not wanting to rock the boat in a dramatic style. Moreover, the military profile of India's space programme is also becoming more evident. The launch of the GSAT-7, the first dedicated military satellite for the Indian Navy, is a reflection of the changes. The debate around an Indian aerospace command is another indicator of the new thinking. It has been almost a decade since the armed forces have been contemplating the establishment of a specialized command though the final decision on the command is still pending.[6] Institutionalization of functions and coordination among the different agencies and departments – Indian Space Research Organisation (ISRO), Department of Space, Indian Air Force (IAF), the military

[6] For background and details, see Rajeswari Pillai Rajagopalan, "Synergies in Space: The Case for An Indian Aerospace Command," *Issue Brief* No. 59, Observer Research Foundation, New Delhi, October 2013.

in general, and Ministry of External Affairs – are imperatives for an aerospace command. As space becomes a critical component in today's military operations, the need for a single agency to take the lead in coordinating functions and a single window approach is real.

A second related aspect is the need for an open space policy. The debate on Indian space policy has been a narrow one and it is time that this is debated within the larger security context. It may have served a limited utility when India was not as integrated into the world community as is today. The benefits of having an open, declared space policy far outweigh the drawbacks. For one, it is one of the most effective means of messaging, both to friends and foes, about India's long-term plans in the domain. Such articulations can open up opportunities among states that are already entrenched in space as well as with new entrants. For an internal audience, this could mean greater clarity especially as multiple agencies are involved. India can also use such opportunities to build up confidence and trust among the neighbouring countries, and this may be particularly relevant in the Asian context, where trust deficit is something that characterizes each of the major bilateral relations. Such policy articulations in addition to being the best confidence building measure (CBM), will also serve to set the limits and red lines regarding permissible activities in outer space that must be maintained. This is important in the face of increasing trend towards space militarization that borders around weaponisation. Lastly, open policies could go a long way in strengthening India's credentials as an established spacefaring nation.

It is also important to examine how India has approached the development of a space regime, particularly the ICoC that has been dominating the debate in the recent years. India being one of the established space powers has an interest in the normative process and institutionalizing a space code. Equally worth noting are its interests in sitting at the high table with other spacefaring powers as an active party shaping the debate in developing new instruments for securing outer space. This is important since India has invested enormous wealth toward its space program, thus, there is a material stake in the kinds of rules now being written. India's interests are primarily driven by the fact it is one of the earliest spacefaring powers that is interested in writing rules that would affect and curtail certain activities, particularly in its neighbourhood. India is also interested in writing the rules of the game in order to ensure that the rules are holistic in approach and content. In that sense, the EU lost an opportunity to engage India to be active partner in framing global rules of the road. While many may dismiss this as trivial, the political value of being a norm-shaper is important for India. It

will send out clear signals to both friends and foes alike about the potential role of India in any normative exercise. Thus, the geopolitical value of India's efforts in this normative exercise is significant.

Even as the need for a new global mechanism guiding outer space activities in real, the importance of an inclusive mechanism is even more pertinent. In the absence of an inclusive one, like mentioned before, the critical countries that matter in this in the future will remain outside. If it were to happen, this whole exercise will be a pointless effort, resulting in another HCoC. Many countries have distanced themselves from the ICoC because they were not part of the creation process and there is an issue of lack of ownership. Ideally, responsible powers such as India should have been part of the debate in shaping the debate rather than being shaped by it.

While India traditionally argued for a legally binding and verifiable mechanism, the question is whether it is feasible anymore. India is a party to all the major legal regimes (detailed below in the table). These instruments are today considered weak owing to some of the issues mentioned above. But the difficulties associated with developing new legal regimes are huge. The lack of consensus among major powers is hampering any progress in this regard. Treaty making was a relatively easier process in the 1950s and 1960s, mostly negotiated between 2 or 3 major powers. Also technology was only available among a few of the major powers, which had an interest in stemming the flow of technology. Today the situation is drastically different with technology spread across a large number of countries, thus making the control of technology and capabilities difficult. Thus, while legal mechanisms restricting further proliferation of technology or verifiable mechanisms ensuring peaceful uses of these technologies are ideal and desirable, political difficulties make it particularly challenging.

India's and International Legal Agreements on Outer Space

SI. No.	Treaty / Convention / Agreement	India's Position
United Nations Treaties on International Space Law		
1.	Treaty on Principles Goverming the Activities Ratified of States in the Exploration and Use of Outher Space, including the moon and Other Celestial Bodoes.	Ratified
2.	Agreement on the Rescue of Astronauts, the Ratified Return of Astronauts and the Return of Objects Launched into Outer Space.	Ratified

3.	Convention on International Liability for Damage Caused by Speace Objects.	Ratified
4.	Convention on Registration of Objects Launched into Outer Speace.	Ratified
5.	Agreement Governing the Activites of States on the moon and other Celestial Bodies.	Signed
Realated International Treaties		
6.	Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer space and under water.	Ratified
7.	Convention on the prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques.	Ratified

Conclusion

Time has come for concerted action because space is a true global common. One state's action can affect a large number of states. Also space debris is not going to make a differentiation between different state's space objects. It is going to affect us all in the same manner. Space is also a limited commodity and if we have to be able to ensure sustainable use of outer space, it is time to act, rather than just talk. This means that the current momentum towards framing rules of the road could gain further traction and is likely to lead to some sort of a framework, be it a legal or a political one. India should use every opportunity to maximize its gains in this effort and be an active party in shaping the new rules that are being written. India being a major user of space cannot afford to sit on the sidelines and let the rules be written by the more powerful. As an established space power, India should also aim to push itself to be the bridge between the western camp and the emerging space powers, who are yet to ascertain a clear position based on the merits of writing a code or any other framework. While legal frameworks are the ideal instruments, India should recognise the political barriers that have hampered the rule-making exercise.

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Pakistan's Military Modernisation Post 2001

Dr Shalini Chawla

Pakistan's nuclear and conventional defence build up in the last two decades has been remarkable owing to consistent Chinese support and heavy flow of military aid from the United States. Despite its fragile economy,Pakistan has been maintaining a high defence expenditure of around 5.5 per cent of the GDP till recently, when it started to fall closer to 3.2 percent (on an average). The perceived threat perception from India and dominant role of military in the country's power politics has led Pakistan to focus on arms acquisitions and building up it's military capability. The United States, China, France and some other European countries have been the main suppliers of military equipment. These suppliers have varied from time to time due to political and financial reasons.

This paper aims to analyse Pakistan's conventional military build-up post 2001, which has been primarily been assisted by the US military aid and equipment, and easy inflow from China.

Basic Objectives shaping Pakistan's Military Capability

Pakistan has looked at arms procurement to satisfy its security concerns. The perceived threat perception from India, strategic developments on the border with Afghanistan and the emerging technologies, have been the dominant factors contributing to the sources and kind of arms procurement by the military. The basic objectives shaping arms acquisitions of Pakistan are:

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Firstly, Pakistan's adversarial relationship with India has played a major role in formation of its threat perception. The dominant military lobby in Pakistan has aggressively propagated the Indian threat within Pakistan to legitimise Pakistan's high defense spending, and on the international front to support the acquisition of high technology weaponry. This also interacts with and promotes the military's special and dominant role in the country's power structure.

Secondly, Pakistan's urge to match Indian's conventional military superiority. This has perpetually driven Pakistan into ways and means to acquire superior technology.

Thirdly, Pakistan's reliance on high technology weapons to seek competitive military advantage. The desire to acquire high technology weapons has been very strong in the Pakistan military and its alliance with the US has assisted Pakistan to procure high technology equipment.

Fourthly, Pakistan's belief in offensive aggressive strategies and its deep rooted belief that by going on the offensive, smaller size forces in history have won wars against bigger enemies. All the four wars which Pakistan has fought with India (in 1947-48, 1965, 1971 and 1999), have been initiated by Pakistan. The war in 1971 was caused by Pakistan's internal instability. But the actual war was initiated by Pakistan with a pre-emptive air strike against Indian Air Force bases on 3rd December. In addition it adopted an offensive route for its covert war through terrorism in J&K since 1988 (besides that in Punjab in 1983-93). Pakistan has relied heavily on the strategy of offensive action and thus the acquisitions of high technology weapons are sought to support this strategy.

The defense build up in Pakistan has been facilitated by mainly three factors:

1. Pakistan's alliance with the United States.
2. Pakistan's consistently growing relationship with China.
3. Financial autonomy of the military within Pakistan.

Pakistan's alliance with the US during the 1950s, 1960s, 1980s and later, post 9/11 has definitely led to the acquisitions of the high technology weapons. In the 1960s inflow from Washington included sophisticated Patton tanks (MBTs), modern artillery, howitzers, F-86 jet fighter squadrons, F-104 Startfighter supersonic interceptors, air-to-air missiles, submarine and state-of-the-art-radar, communication and transportation system. In the 1980s, Pakistan did receive the much desired F-16s from

the US.

China has been a constant partner in Islamabad's military modernization. Chinese weapons continued to have a significant share in the Pakistani inventory. Although Chinese arms though technologically inferior to those from the West were capable systems, were affordable and provided a quantitative boost to Pakistan's military powers. In fact, by the early 1980s, China had provided Pakistan with roughly about 65 per cent of its aircraft.[1]

Modernisation Post 9/11

By the late 1990s Pakistan's economy was in shambles and its viability as a state was being questioned. Fears were raised about its prospects as a "failing state". But the September 11, 2001, terrorist attacks in the US led to a major strategic shift for Pakistan and once again it became a front line state for Washington and an ally in the global war on terror. The new US-Pakistan relationship helped Pakistan to move out of economic and military decline and it received substantive military assistance from the US and its Western allies. The immediate step from the Bush administration was the waiving of the US sanctions on Pakistan resulting from its 1998 nuclear tests and the "Democracy Sanctions".

Pakistan in return offered its complete military support to the US including use of its air space and agreed to the use of Pakistani air bases at Jacobabad, Pasni and Dalbandin by American forces for "search and rescue" missions. The US presence on the Pakistani bases led to substantial US investments for renovating the bases and in addition, Pakistanwas paid for providing security for the bases. The Shahbaz air base Jacobabad, for example, went through extensive construction work to renovate the base, including, the installation of the radar equipment. Pakistan was able to obtain the US equipment and other support systems, including intelligence, which has been actively operating in the war against terrorism. In September 2003 alone, in order to enhance surveillance capability, the supply of the US air traffic control radars as well as associated equipment and services worth $110 million was authorized to Pakistan.[2]

In February 2002, Pakistan and the US signed a defense cooperation agreement, and, Pakistan agreed for American forces to use its military equipment for training and other military exercises. Pakistan also agreed to provide other facilities like food, water, medical services and transportation against payment to the US forces operating in Afghanistan. Taking a step

towards institutionalizing the military relationship with Pakistan, the US, in an important strategic move, designated Pakistan as a "major non-NATO ally" (MNNA) in March 2004. Previously, only three Muslim countries had been accorded this status- Bahrain, Egypt and Jordan. Australia. Japan, Israel, Philippines and South Korea are the non-Muslim countries that fall in this category. The status of MNNA not only enhanced Pakistan's staturebut also enabled it to obtain state of the art military equipment and spares at rock bottom prices and on a priority basis. The modern US inventories and also the spare parts of the US equipment which were being used in Pakistan,were made available to Pakistan. One of the most important advantages of this designation, is, that Islamabad would be able to obtain what is called the "Excess Defence Equipment (EDAs)". These are the weapons and equipment which the US may not need anymore, and which may be transferred at nominal rates to the allies. Pakistan did receive the weaponry which the US forces used during their operations at the Pakistani bases and facilities.

The last twelve years have witnessed exponential growth in Pakistan's defence modernization. Therehas been rather limited acquisition of land equipment as compared to that of the Air Force and the Navy(Table 1). Army acquisitions include – Large Cailibre artillery systems, Fire Control Radars. Bell-205/UH-1H, Bell-209/AH, BGM-71 TOW anti-tank missiles, ground based radars and the UAVs.

In 2006 Pakistan announced the development of Al Khalid II Main Battle Tank the original agreement for which was signed in 1990 with China North Industries Corporation (NORINCO). The first 15 pre-production Al Khalid MBTs were handed over to the Pakistan Army in July 2001. Subsequently, the MBTs have been handed over to the Army, and, currently the Pakistan Army possesses 355 MBT 2000 Al Khalid out of the total 2,501 MBTs in its inventory.[3] The Al Khalid II is reportedly a further improved variant of MBT 2000. Although, not much has been revealed about this new variant but according to the Pakistani and Chinese sources it's a major technological breakthrough for the Pakistan Army.

Post 2001, the Pakistan Air Force (PAF) has been on an acquisition spree and thenmajority of the defence acquisitions have been on the Air Force front (Table 1). The US sanctions of the 1990s gave an impetus to Sino-Pakistan defence and, in the process, the two nations entered into deal for the co-development of a fourth generation fighter aircraft, the JF-

17 (earlier called the FC-1), following the jointly produced K-8 jet trainer. The JF-17 is designated to be a low cost, multirole combat aircraft to meet the tactical and strategic requirements of the Pakistan Air force.The JF-17 is co-developed by Pakistan and China and is being built by China's Chengdu Aircraft Industry Corporation (CAC) and Pakistan Aeronautical Complex (PAC) Kamra. According to the Pakistani official sources, currently, Pakistan Aeronautical Complex (PAC) possesses the exclusive rights of 58% of JF-17 airframe co-production work.[4] There have been reports that the design was developed by the MiG complex in Russia and transferred to China after the Russian Air Force cancelled procurements. JF-17 is fitted with RD-93 engine and has the combat radius of 378 n miles in the ground attack role (in the fighter role – 648 n miles). The initial batch of JF-17 delivered to Pakistan were fitted with the Chinese radar - KLJ-7 multirole pulse Droppler. There have been reports (in the past) suggesting that the forthcoming JF-17s might be equipped with the Italian Grifo-7.Pakistan has increased its initial target of buying 150 JF-17s to acquiring up to 250 aircraft.[5] This represents a quantum jump in Pakistan aircraft industry. With the production of JF-17 Pakistan has joined the exclusive club of the few nations manufacturing fighter aircraft.

Interestingly, beginning of May 2011, immediately after Osama bin Laden's killing in Pakistan's high security military compound of Abbottabad, China announced the decision to deliver 50 JF -17s free of cost to Pakistan. JF-17 is indeed a remarkable achievement for Pakistan as it has now entered into the manufacturing of the fourth generation aircraft. Pakistan has been marketing the JF-17 quite aggressively and several countries including Algeria, Sri Lanka, Egypt, and Malaysia have shown keen interest in the acquisition of the aircraft.

In April, 2006 the PAF got the approval of the Pakistani leadership to go ahead with the negotiations for the acquisitions of J-10s from China, as part of its fighter force expansion plans. TheJ-10 has the combat radius of 250-300 n miles and the aircraft is configured with 1553B-standard databus and a helmet-mounted weapon sight. The agreement for the acquisitions of 36 J-10s (also called the FC-20s) was finalised in November 2009. But given the IMF restrictions and also financial limits there has been no progress on the acquisitions on this front.

Pakistan acquired the F-16A&B and also F-16C&D from the US, which has added enormous strength to the PAF capability (Table 1).

Pakistan has been extremely keen to acquire the F-16s, partly because of political/psychological reasons, and partly, because it has been familiar with multi-role combat aircraft since the early 1980s. The delivery of 18 new F-16D Block 525 was completed in 2012 and is assisting Islamabad in upgradation in Turkey through Foreign Military Assistance Program.[6]

Pakistan signed in 2008 a deal for the purchase of Chinese AWACS (ZDK-03) for $278 million in 2008. Pakistan is the first country to buy the Chinese AWACS system which China only started to produce in 2004. Pakistan has been focused on the acquisitions of force multipliers and this deal with China is in addition to the Saab Turboprop 2000(platform) equipped with Erieye, from Sweden. Pakistan has also acquired the IL-78 Midasrefuellers from Ukraine (Table 1).

On the naval front, the focus has been on enhancing the maritime strike capabilities of the Navy. China has been the prime supplier for the Pakistan Navy. In 1984, four Huangfen Class missile attack crafts were transferred from Beijing for about $20 million per piece. It is interesting to note that the Chinese naval equipment being inferior in quality was less desired but Pakistan obtained the missile crafts mainly, with a longer term objective of striking a deal of technology transfer in the future, for indigenous production of the missile crafts.[7]

Pakistan's naval acquisitions from China in the decade of 2000, include 24 C-802/CSS-N-8 anti-ship missiles and 4 Jiangwei II class frigates. In 2006 Pakistan Navy ordered four F-22P type frigates from China with the value of the deal at $600 million.[8] The first destroyer, PNS Zulfiqar, was delivered in 2009 and the second one in 2010. The F-22P which is a modification of a Chinese frigate that uses a Russian-designed main gun rather than a Chinese model is armed with eight C-802 anti-ship warfare missiles, eight FM-90 surface-to-air missiles (SAM), one AK-176M main gun and two Chinese 30 mm close in weapon systems (CIWS). The frigates can be loaded with one Z-9EC helicopter.[9] Fourth F-22P PNS ASLAT was inducted in the PN in September 2013. PNS ASLAT is the first Frigate of the Navy which has been indigenously built at the Karachi Shipyard and Engineering Works (KS&EW). The production was done in collaboration with the China Shipbuilding and Trading Company.[10] This was to fulfil a pledge to transfer Chinese shipbuilding technology that was part of the April 2005 agreement to build the frigates.

Other defence production plans on the naval front include 4 modern

corvettes which are planned to be built alongside with F-22P in Karachi Shipyard & Engineering Works. The Navy also plans to manufacture and procure additional mine hunters, tankers, missile and patrol boats.[11] China has also confirmed the sale of six ship-based medium sized Z 9C helicopters to the Pakistan Navy.[12] Main naval acquisitions from the US include P-3C Orion Maritime Patrol Aircraft, USS Mc Inenary –frigate and Harpoon Anti-ship missiles.

Development of the Gwadar port

Gwadar has been developed with the Chinese assistance and the primary project has been the construction of deep sea port expanding its maritime role and to allow the trade to and from the land locked Central Asia. More importantly, the port would have the conversion facilities to allow the movement of the natural gas for the Turkmenistan-Afghanistan-Pakistan natural gas pipe-line when constructed. Gwadar offers the geo-economic and geo-strategic pivot to China and Pakistan. It is strategically located on the south-western coast of Pakistan, between three increasingly important regions of the world; South Asia, Central Asia and oil-rich Middle East. Gwadar, which is overlooking the Gulf of Oman and the entrance to the Persian Gulf region is just 180 nautical miles from the Straits of Hormuz. Thus, Gwadar would eventually emerge as the key shipping hub providing mass trade to Central Asian Republics through Pakistan and China, and important naval base. China's involvement in Gwadar is undoubtedly a response to China's emerging energy requirements, China being world's second largest oil importer. Approximately, 70% of Chinese oil supply comes from the Middle East and Africa through sea. China is expanding its energy procurement efforts and the strategy of series of ports along the oil shipment routes which would allow China to safeguard and monitor energy flows. Gwadar being built in Baluchistan coast, would enable Pakistan take control over the world energy jugular and interdiction of Indian tankers.

From the military point of view Gwadar is a decongestion point to the Pakistan Navy and it will provide it a berthing point for its submarines and surface warships. Gwadar port area has been designated as the "sensitive defense zone" by the Government of Pakistan.[13] Although, there has been no official Chinese announcement on the subject but various reports are indicative of Gwadar being a future berthing point for the PLA-Navy fleet of the Indian ocean, facilitating China's military presence in the region.

This would add to the deterrent against the Indian Navy.

Development of deep sea port has strategic implications for India which were pointed out by the former Indian Naval Chief, Admiral Suresh Mehta in a lecture in Chennai:

"1. Being only 180 nautical miles from the exit of Straits of Hormuz, Gwadar being built in Baluchistan coast, would enable Pakistan take control over the world energy jugular and interdiction of Indian tankers.
2. The pressure for countries to cooperate in the maritime military domain to ensure smooth flow of energy and commerce on the high sea ill grow even further.
3. A highway is under construction joining Gwadar with Karachi and there are plans to connect the port with the Karakoram Highway, thus providing China a gateway to Arabian Sea."[14]

Table 1: Pakistan's major arms acquisitions during 1990-2013

Supplier/ Licenser	No. ordered / delivered	Weapon designation	Weapon description	Year(s) of delivery
Australia	50	Mirage 3	Fighter	1990-92
Britain	3	3 Lynx HAS- 3	ASW Helicopters	1994-96
China	40	F-7P	Combat Aircraft	1993
	6	K-8	Trainer Aircraft	1994
	20	Armoured combat vehicles		1995
	75-100	K-8	Fighter/trainer Aircraft	2000-08
	40	F-7 MG	Fighter Aircraft	2001
	44	F-7 PG Aircraft	Combat Aircraft	2001-02
	3	Type-347G	Fire control Radar	1997-2001
	250 (33 delivered)	FC-1/JF-17	Multirole Combat Aircraft	China-Pakistan joint venture, delivery possibly starting 2006

	6	A-5	Combat Aircraft	2003
	2	Type-347G	Fire Control Radar	2004
		PL-12/SD-10	BVR AAM	Year of order-2004
	64	FM-80/HQ-7	SAM	Year of order-2005
		PL-12/SD-10	BVR AAM	Year of order-2004
	4	F-22P type	Frigates	Year of order -2006
	4-6	Z 9EC	Helicopter	Year of order- 2006
	4 (2 delivered)	ZDK-03	AEW	Year of order-2008
	40	J-10	Multirole Combat Aircraft	Year of order-2009
France	4	SA316 Alouette III	Helicopters	1994
	3	Breguet Atlantique-1	MPA and strike aircraft	1996
	8	Upgraded Mirage-IIID/V	Combat Aircraft	1999
	48	Mirage IIID/5	Combat Aircraft	1998-2000
	11	Mirage V	Combat Aircraft	2000-02
	96	F-17P	AS torpedo	1999-2004
Italy	192	Grifo radar	Combat ac fire control radar (for Mirage and F-17/7 Combat Aircraft)	2000-2004
	4	Galileo Falco	UAV	2006
Netherlands	5	Fokker F27-200	Aircraft	1994-96
Sweden	7 (3 delivered)	Saab-2000 AEW	AEW&C ac	Year of order-2006

USA	3	P-3C (update 2.75)	Orion maritime reconnaissance and strike Aircraft	1996-97
	28	Harpoon	Anti-ship missiles for the P-3C Orions	1996-97
	10	Bell-209/AH-IS	Helicopters	1997
	6	S-70/UH-60 Blackhawk	Helicopter	2003-04
	26	Bell-412EP	Helicopters	2004
	6	C-130E Hercules*	Transport Aircraft	2004
	40	Bell-205/UH-1 H	Helicopter	2004
	40	Bell-209/AH-1F*	Combat Helicopter	2004
	19	T-37 B*	Aircraft	2003
	8 (7 delivered)	P-3C	MP and Strike Aircraft	Year of order-2005
	2	F-16 A*	Multirole Combat Aircraft	2005
	7	C-130E Hercules	Transport ac Ex-RAAF	2005
	100 (all delivered)	Harpoon	Anti-ship missiles	2006 (order)
	54 (18 F-16 C/D Block 50/52 delivered)	F-16 (36 F-16 A&B+18 F-16 C&D)	Multirole Combat Aircraft	2007
	6	AN/TPS-77	Air surveillance radar	Year of order-2005
	6	L-88 LASS	Air surveillance radar	Year of order-2003
	121	Refurbished Missile Launchers		

	115	M-109	Self Propelled Howitzers	
	500	Sidewinder	Air to Air Missile	
	20	AH-IF Cobra	Attack Helicopters	
Ukarine	4	IL-78	Aerial Refueller	Year of order-2008

*US Excess Defence Equipment which is normally transferred at price of less than 10% of the original. For example, the cost of each F-16 is a little over $6 million.

Source: Based on, *Stockholm International Peace Research Institute, Yearbook* (issues of various years) (New York, Oxford University Press) and Pakistan's major arms imports, as cited in Jasjit Singh, "Trends in Defence Expenditure," *Asian Strategic Review,* 1998-99, (New Delhi, Institute for Defence Studies and Analyses, 1999), *SIPRI 2002, 2004, 2005, United Nations Register of Conventional Arms* for various years and Defence Security Cooperation Agency at, http://www.dsca.mil; "Update on Pakistan C-130E Acquisitions," *Air Forces,* January 2006, p.22, *The Military Balance 2007, IISS* (London, Routledge, 2007), The Military Balance 2014, IISS

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Financing the Defence Budget

Pakistan has consistently spent a high portion of its national income on defence.

Pakistan's defence spending has always been a matter of concern for the economists and academicians within Pakistan and the financial institutions abroad. Pakistan has maintained defence spending at the rate of 6 per cent of the GDP till the late 1990's. In the last 6 years, the *official* defence spending figures have been kept low owing to the massive international pressures in the past and the strong debate in Pakistan blaming the defence spending for the country's economic woes in the 1990's.In the previous decade the official defence spending has been maintained on an average of

about 3.2 per cent of the GDP.

Every successive regime, civil or military, has been spending a significant portion of its national resources on defence and military requirements. Thus, in the last two decades, the defence budget of Pakistan has been constantly under pressure by the international monetary organizations and strategic thinkers. Pakistan, in the 1990's, experienced deplorable state of social sector which stood in a complete contrast to the grandeur of the military elites in Pakistan.

Pakistan's defence budget unlike, India or even China is not transparent and no details about the breakdown of defence expenditure are available. Only an overall defence budget figure is provided by the government. Estimated military spending is significantly higher as external military assistance in various forms is not included in the official figures of the defence expenditure. Also, several military related expenditures are covered under the civil and public administration.

Estimated Defence Expenditure

The defence budget provided by the government of Pakistan is just the total figure without indicating any details regarding the distribution of funds under various heads. It is a normal practice to get the defence budget passed by parliament as a one line item on the agenda. According to reliable Pakistani sources, the defence expenditure figures do not include the costs of acquisitions of major weapon systems.[15] The major weapon acquisition in Pakistan takes place from the military and economic assistance provided by the United States, the Arab world and other nations. For example, the initial payment of the $1.4 billion of the first 40 F-16 aircrafts in 1980-81 was reportedly funded by the Saudi money.[16] Pakistan is believed to partly finance its defence expenditure out of the budget sources obtained through secret allocations by the Gulf countries or Army controlled private organizations such as the Fauji Foundation or ISI procured drug money. These are reported facts which would be difficult to prove or disprove but revenues from these clandestine sources can assumed to be a regular source of funding Pakistan defence budget.

Pakistan did separate the military pensions which amount to approximately 11 per cent of the budget in the year 2000 from the defence budget and placed them under the civil administration expenditure, to project decline in the defence budget. The money spent on providing

various perks and facilities to serving, as well as retired defence personnel is also absorbed under various other heads. The estimated military spending including the entire military power is much higher than projected in the official defence budget of Pakistan.[17]

The actual defense spending is higher due to multiple factors. The foreign aid which Pakistan has been received, specifically, the US aid in the last 12 years has been for the military purposes but is not a part of the defense budget. The Foreign Military Financing (FMF) component of the aid which stood at $2751 million for the years 2002-2013. Also, Pakistan being a Non-NATO ally has been receiving the Excess Defense Articles from the US, at very low cost or even free of cost. The Coalition Support Funds have also been an added investment in the Pakistan's military infrastructure.

The Chinese equipment on the other hand, is received at a very low cost with easy installment payments. Pakistan does enjoy exceptional leverages with respect to its weapons dealing with China.

Conclusions

The Pakistani elites, over the decades have convinced themselves and recycled this belief that India is Pakistan's prime enemy, which in turn facilitated the military's assumption of the preeminent and pervasive position in the national power structure for most of Pakistan's existence. In turn, this also made arms acquisitions unanawerable to public or political influences. In specific, they have sought to build military power on the basis of this fundamental strategy, and, hence, pursued:

1. Acquisition of high-end military technology to neutralize what it perceived as India's conventional superiority.
2. External political support for its policies and supply of sophisticated arms (essentially from the US and China)
3. Building indigenous arms production capabilities to reduce dependence on outside sources. China has provided substantive support in this process.

The current trends in the defence build up are as follows:

1. Pakistan has accorded high priority to the acquisitions of the Air Force and Maritime strike capabilities of the Navy. The impact of the modernization can be seen in Table 2 :

Table 2 : Modernisation Effect

	1990	2018
Combat*	**380**	**420**
AEW&C	**Nil**	**8**
Air to Air Refuelling	**Nil**	**4**
Maritime Ptl & Air Strike Ac	**3**	**18**
Attack helicopters	**10**	**60+**

*It is interesting to note that the combat number in the table does not give the true picture. Out of the total combat aircraft in 1990 just around 10% were fourth generation. But *by 2020 more than 90% would be fourth generation aircraft in the PAF inventory.*

Source: Dr Shalini Chawla, *Nuclear Pakistan* (New Delhi, KW Publishers, 2012), p.74.

2. Pakistan Air Force is engaged in a massive modernisation since 1990 (boosted after 9/11) both qualitatively and quantitatively. The thinking, writing and arms procurement in Pakistan indicates the historical consistency of approach to military capability - the desire and efforts to acquire high technology arms to take the initiative to compensate for asymmetry in numbers and increase options for offensive strategy.
3. Pakistan is making significant efforts to add force multipliers in the PAF inventory.
4. Consistent demands for high technology weapons clearly indicate the modernistaion of the Pakistan Air Force and Naval air, even more than the Army and Navy which implies that they expect the Air Force to play a major role in any future conflict.
5. Nuclear arsenal has been expanded enormously to continue the doctrine of "offensive defence". Pakistan's grand strategy has been to use the nuclear card for aggressive militancy in Kashmir in the 1990s and eventually terrorism in other parts of the Indian territory. In 1989, the then Army Chief, General Aslam asserted that Pakistan lost the previous wars with India due to "lack of clear strategic vision" He announced that Pakistan had a coherent strategy now. "One aspect of the strategy was launching of the militant proxy war in J&K from July 31, 1988; and the other was the achievement of nuclear deterrence{to provide "defence" in the offensive-defence strategic doctrine, while irregular war was used for the "offensive" component} by 1987".[18]

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She has authored two books titled - ***Pakistan's Military and Its Strategy* (2009) *and Nuclear Pakistan* (2012)**

Her forthcoming book is titled - ***Pakistan Military and the Counterinsurgency Strategy (2015).***

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BOOK REVIEW OF 'BEYOND NJ 9842, THE SIACHEN SAGA'
Book authored By Nitin A Gokhale

Geo-Strategic Importance of Siachen

Lt Gen KT Parnaik (Retd)

India has had troubled relations with both China and Pakistan; as a result we have inherited a large disputed and un-demarcated boundary with both the countries. We face a complex dilemma of managing a dynamic boundary with varying interpretation of International Boundary, Line of Control, Line of Actual Control and Actual Ground Position Line. Pakistan attempted to claim Siachen Glacier Region through a cartographic aggression after it had illegally ceded Aksai Chin and Sakshgam Valley to China in 1963, which came to our notice only in 1975. The delineation of the Line of Control during the Karachi Agreement in 1949, as well as reiterating it during the Shimla Agreement in 1972, clearly indicated the LC to be marked up to "NJ 9842 and thence Northwards towards the Glaciers".

Geo–Strategic relevance of the Siachen Glacier makes it an important pivot in the North, which if conceded opens avenues for ingress to Ladakh via the Shyok and Nubra valleys. It also enables Pakistan to access Tibet through the Karakoram Pass, raising apparitions of a collusive threat from the strategic partners in the long run. Given that Pakistan illegally ceded Aksai Chin and Sakshgam Valley to China in 1963 and China claiming large tracts of land in DBO, Depsang and Demchock in East Ladakh; Siachen region remains as the missing link

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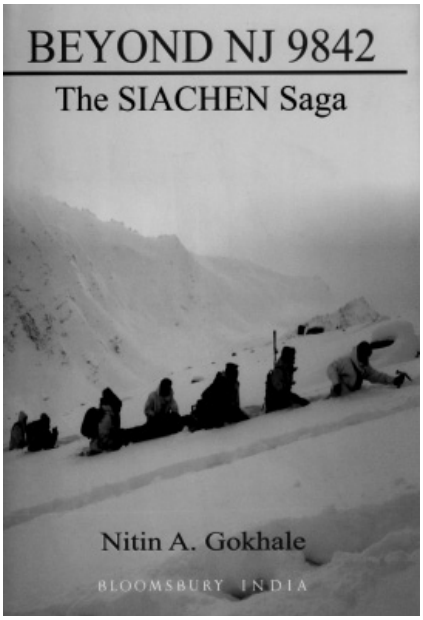

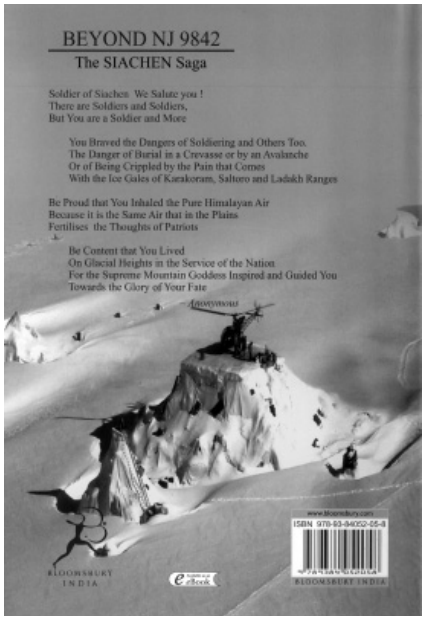

of the Jigsaw Puzzle to encircle India from North. It was therefore incumbent on the strategic military planners in India duly supported by the political leadership to pre-empt Pakistan by occupying the Soltoro Ridge dominating the Siachen Glacier and Areas to the west as well as preventing Pakistan from linking up with the vital Karakoram Pass.

There have been very few books written on Siachen Glacier, primarily due to the remoteness of the area and confidentiality attached to the matters related to the boundaries of the country. Nitin Gokhale's "Beyond NJ 9842, The Siachen Saga", comes across as a breath of fresh air, with his lucid narration in an anecdotal form. With his journalistic fervor and experience of having traversed through the region, he brings to life a saga of sound military planning, courage in adversity and the indomitable will of the Indian Armed Forces who have stood fast to defend the most treacherous and challenging terrain any where in the world, against all odds.

The final trigger for the author's desire to unravel the mystic relevance of the Siachen Glacier came during his yearly visit to Dras/Batalik

Memorial in July 2012, to commemorate the Kargil victory, a battle he had covered as a senior journalist in 1999 and now understood its umbilical connect with the Siachen glaciers. It took him on an exciting trip to Ladakh to see for himself the forbidden expanse of the Siachen Glacier, meet officers, men and civilians who served in those dizzy heights and stitch together a comprehensive story of human endeavor, unparalleled in the history of warfare.

The cartographic aggression in the Siachen Glacier was revealed in 1975 to Col N Kumar, one of our distinguished mountaineers who, while on an expedition to the Glacier region, chanced to see the maps being carried by the Germans, which depicted the LC running north of NJ 9842 to the Karakoram Pass, thus ceding all areas north of this line to Pakistan in violation of the spirit of Karachi and Shimla Agreements. The US maps printed in 1974 also showed an Air Defense Information Zone separating India and Pakistan in the Karakoram region by a line joining NJ 9842 to the Karakoram Pass, instead of following the international convention of marking it along prominent geographical features. Having learnt of numerous Japanese and US expeditions to Sia Kangri and Sherpi Kangri being launched from POK, it was decided to send a military expedition under Col N Kumar to the passes on the Soltoro Ridge in 1978. It helped the troops to familiarize with the terrain and assisted in planning at the 15 Corps/ Northern Command. It was also an opportunity for the first ever helicopter landing on the Soltoro Ridge on 06 Oct 1978, by Flt Lt Bahadur and Sqn Ldr Mongia of the IAF.

Chapter II talks of expeditions Polar Bear I&II, launched by India in 1983, which drew an official protest by Pakistan who claimed all the area north of line NJ 9842- KK Pass. A counter Protest by India of Air Space violations and intrusions in its areas precipitated the matter, leading to preparations by both sides to occupy the Passes. Pakistan started amassing troops in Khapalu and went shopping for Special clothing in Europe which was picked up by our Intelligence agencies and foreign office. Mean while HQ Northern Command started finalizing the plans once the go was given by Mrs. Indira Gandhi our PM, with a word of caution, to 'prevent wider ramifications'.

Operation Meghdoot was finally launched after detailed deliberations and planning at the Army HQ and Northern Command HQ in April

1984. The operation was premised on pre-emptive occupation of the passes on the Soltoro Ridge because whoever occupied the passes first, would be difficult to be dislodged. More ever the distance to the passes was much shorter and easier from the Pakistan side. The fact that India was preoccupied with Punjab, Assam and whole of North East lulled Pakistan into delaying the launch of Operation Ababeel, as they waited for snow conditions to abate.

A special task Force was constituted under Lt Col Pushkar Chand, CO 1 VIKAS Battalion comprising a Company of 4 Kumaon under Captain Sanjay Kulkarni and a Company of 1 Ladakh Scouts under Major Bahuguna. The whole operation was launched under the aegis of Brigadier Channa the Commander 26 Sector. The task given to the Special force was to occupy Bila Fond La and Sia La Passes on the Soltoro Ridge, dominate areas to the West, Siachen Glacier to the East and patrol up to the Indira Col to dominate the Sakshgam valley to the North. The troops for initial phase were to be heli- lifted to save time, while the remainder columns were to move on foot and the logistic elements were to be established en-route simultaneously. The author describes efforts made by the command to air deliver clothing, equipment, ammunition and shelters to sustain the troops. It was an impossible task made possible due to indomitable courage, high level of motivation and sound junior leadership. These events are intimately described through excerpts of personal interviews with Northern Army Commander, Brigadier Channa and Captain Sanjay Kulkarni, by the Author. Nitin also gives useful information of the gallant Ladakh Scouts Regiment and contributions of Colonel Shewang Rinchin and Col Sonam Wangchuck, who stoutly defended Ladakh during 1947 and 1971 wars, denying the Nubra and Shyok Valleys, capturing Chumik La Pass and recapturing the Chalunka complex. Their familiarity with the terrain was a great asset.

Operation Meghdoot got underway on 13 April, an auspicious Baisakhi Day, chosen as part of deception. Captain Sanjay Kulkarni and a platoon were airlifted to Bila Fond La Pass in 17 sorties despite intermittent bad weather. Advance elements of 1 Ladakh Scouts were similarly dropped at Sia La on 17 April while the remainder Task Force moved on foot along with logistic columns of porters carrying rations, clothing heavy weapons and tentage. The logistic camps and Advance

Logistic Base were established by 26 April and link up with Sia La accomplished by 29 April. Pakistani helicopters and aircrafts carrying out reconnaissance had discovered to their horror, the presence of Indian troops on the Soltoro Ridge. We had pre-empted Pakistan and laid claim to 3300 sq km of territory illegally claimed by them. This followed reinforcing the position with Air Defense Guns, Artillery guns and stocking of ammunitions.

Pakistan had meanwhile gathered Five Task Forces comprising the SSG and NLI troops to infiltrate and dislodge Indians holding the Soltoro Ridge. Their attacks commenced with firing on 25 April and early skirmishes from 23 June 84, which were beaten back with heavy casualties. Continued failures of Pakistani troops to dislodge our positions snowballed into a political debate in Pakistan with their Prime Minister Ms Benazir Bhutto castigating Gen Zia ul Haq and the Army for failing to defend their territory. Pakistan continued to engage in continuous battle finally succeeding to gain a foothold on Saddle opposite Bila Pass in early 85. It took all the resources of 3 Infantry Division to be mustered and brought to bear in the Glacier to hold off the Pakistani attacks.

The Glacier conflict is incomplete without mention of the daring operation by Pakistani troops in April 87 which led to occupation of the southern shoulder of Bila Pass at 21000 feet, named Quaid post by the Pakistanis. It rendered entire Bila complex untenable because of its domination by observation and fire. This operation was launched during the turn over between 5 Bihar and 8 JAK LI Battalions. It was decided to evict the Pakistani troops in May 87. A daring operation led by young Second Lieutenant Rajeev Pande was launched, to fix ropes on the 1500 meters vertical ice wall. The movement was observed by the enemy and the young officer martyred, not before accomplishing his task. 8 JAK LI launched Operation Rajeev, named in honor of the Young Officer, on 23 Jun87. On two attempts they failed to scale the ice wall due to bad weather and accurate fire from the enemy. A third attempt was made by fixing ropes all over again under Naib Subedar Bana Singh on 27 June. Despite extreme bad weather the team managed to scale the wall and what followed was a hand to hand combat killing six Pakistani soldiers while the rest jumped down from the Piquet in desperation. Only one survived to tell the tale to his

commanders. The post has since been named as BANA PICQUET, in honor of Nb Sub Bana Singh who was awarded the Param Veer Chakra for his superlative achievement. There is no parallel in the history of warfare for an attack of this kind conducted over 21000 feet.

Pakistan was not to be deterred and launched a massive Brigade size operation under the aegis of Brigadier Parvez Musharraf, later Chief of Pakistan Army and President of Pakistan. Their aim was to pulverize Bila defences and overwhelm them with large forces. Zia-ul-Haq was under pressure to deliver and his plan was hinged on India being overly preoccupied with Operation Pawan in Sri Lanka and trouble in Tibet, J&K and North East region. Interestingly Pakistan chose to attack our positions during the turn over of troops of 8 JAK LI and 3/4 GR a habit which has become predictable along the Line of Control as well. This attack too was beaten back with very heavy casualties on Pakistani troops. It was around this time (Dec 1987) that Pakistan ventured to move its troops to the border in J&K and triggered a stand off between the two armies commonly referred to as Operation TRIDENT. Nitin has described in great detail the three battles fought in the Glacier in Chapter X, with personal narrations of officers of 8JAK LI which is an amazing story of camaraderie, guts and glory.

Survival in the Glacier would not have been possible but for the stellar role played by the Indian Air force. The Air warriors delivered with dated helicopters, make shift Helipads, unpredictable weather and extreme climatic conditions. They not only ferried personnel, clothing, supplies, stores and ammunition but also evacuated casualties, saving precious lives and boosting the morale of men fighting against all odds. Undeterred by accidents and mishaps, they continued flying, setting unprecedented records of highest mountain rescue at 22000 feet and sustaining a large force at super high altitudes, neither attempted nor accomplished anywhere in the world. The author narrates personal experiences of pilots who flew early sorties, with no maps, scarce met data and under hostile enemy fire at confounding heights. An anecdote of an engine change of a stranded Cheetah Helicopter at Amar Helipad (21000 ft) by pilots of 114 HU, under adverse weather, hostile fire and cramped conditions, is a bewildering example, in the history of Avionics. It was an amazing example of courage, camaraderie, faith and will of our defense forces. It mirrors the unusual challenges of flying in

conditions of low power, Clear Air Turbulence, crevasses, white outs and serious health hazards. No wonder, that Leh Base is known as the Mecca of flying helicopters and our pilots are undoubtedly the best in the world.

Yet another important facet of conducting operations in Glacier region is LOGISTICS. The author has dwelled on it in Chapter VIII. It needs to be understood that Ladakh Region is cut off for 5- 6 month every year, as passes like Zojila, Rohtang and Baralachala close down for 5-7 months due to heavy snows. The Northern Command carries out advance winter stocking for Ladakh when passes are open. In present times it takes 1.8 Lakh Metric Tons of supplies, stores, clothing and ammunition to be carted by Air and Road to Ladakh, then by road and helicopters to units and formations deployed in forward areas and finally by Ponies/Yaks and Porters to the last man on the LC/LAC/ AGPL.. It is the largest logistic effort in any theatre in the world. To support the battle in Siachen glacier, innovative methods had to be evolved like, Flying Foxes hooked on to Aerial Cables, Sledges, Snow Scooters and air drops on forward Dropping Zones. Carrying heavy weapons like artillery, Mortars and Air Defence Guns in dismantled form or under-slung by large helicopters is always risky. No operational plan can succeed if logistics are not in place.

Siachen Glacier being the highest battlefield in the world brings amazing challenges for troops who are assigned on duty there. The terrain and Climate poses tremendous challenges. It takes 3-6 months to train and acclimatize for induction to the glacier. Every soldier wears seven layers of clothing and just bending down to tie your shoe lace is exhausting. Movements are slow and torturous, for wading through heavy snow, climbing ice walls and traversing the crevasses, it requires special skills. Wind speeds, Blizzards, and White out conditions can demoralize the toughest. Troops stay in restricted spaces and suffer privations, cooking, waste disposal, insomnia, lack of appetite and severe head aches, every little facet is a challenge. Nitin has added excerpts of interviews of senior military commanders which nuance the situation aptly. It is simply amazing how our soldiers survive in such conditions.

Finally the author goes on to describe the role of the Medicine men in dealing with health hazards and psychological problems faced by

the soldiers in Chapter XI. Hazards like frost bite, chill blains, High Altitude Pulmonary Edema, Deep Vein Thrombosis and Sudden death are common occurrences in the Glacier. The author narrates personal tales of medical miracles and survivors. During my tenure as Northern Army Commander we were able to reduce medical casualties considerably with the help of our outstanding medical officers. The studies conducted on DVT, Sudden Death and Speedy induction have reduced morbidity rates and provided a boost to the morale of troops deployed in the Glacier. The Medical corps is our savior and good will earner in every respect.

Siachen remains a thorn in the flesh of Pakistan. In the last 30 years we have perfected the art of survival and combat in Glaciers. Our infrastructure, logistics, communications and survival drills have improved many folds. Of late there have been repeated efforts by Pakistan to propose Demilitarization of the Siachen Glacier Region, supported by home grown Peaceniks who support this idea purely for the economic burden, recurring casualties and environmental issues. While their intentions cannot be doubted, it must be remembered that Pakistan has refused to acknowledge the Actual Ground Position of our troops and there is NO reliable method of monitoring or keeping a 24/7 vigil of the remote and forbidden expanse of the Glacier. Pakistan cannot be relied upon nor trusted to honour the commitment as they have shown in the past. Remember Kargil happened in Ladakh when civilian leaders were seriously negotiating peace. We also need to factor the growing presence of Chinese in the Northern Areas/Gilgit & Baltistan, on the pretext of creating an infrastructure for economic sustenance of Pakistan and to protect their energy corridor along the KKH. Pakistan knows that militarily Northern Areas is a remote area thinly held and maintaining troops in Glacier region west of the Soltoro Ridge along external lines of communications is a vulnerability they can ill afford. Hence the proposal to demilitarize Siachen, which they will always be in a better position to occupy at the time of their choosing; agreements be damned! Therefore we need to consolidate on the Glacier and ensure the territorial integrity of our nation.

Nitin Gokhale deserves to be complimented for his stupendous effort to bring to book a grand strategic issue to the public domain. His easy narrative style and anecdotal approach gives a personal

touch to a saga of modern military fighting. I do hope that his book gets translated in as many Indian languages to enable a nation wide awakening to a matter of National Concern.

Lieutenant general kt parnaik, pvsm, uysm, ysm (retd)

Lieutenant General KT Parnaik, PVSM, UYSM, YSM is an alumni of The National Defence Academy, Khadakwasla, Pune. The General Officer has had a checkered career, with a meritorious service profile in his long stint, spanning over 41 years in the Indian Army. He is a graduate of the Defence Service Staff College, Wellington and National Defence College, New Delhi.

Lt Gen KT Parnaik, a third generation officer, was commissioned in and commanded 2 Rajputana Rifles, an illustrious battalion of the Indian Army. The General has a unique distinction of having served along the entire northern borders in various capacities. He was posted on the UP – Tibet border in Dharchula sector as a company commander, Commanded a high altitude division in Sikkim, and a sensitive corps in Assam and Arunachal Pradesh, had two stints in Bhutan and was responsible for the Ladakh Sector in his capacity as Northern Army Commander.

Similarly the general had multiple tenures in J&K as a company commander in Rajouri Sector, Commanding Officer in Kupwara sector and Commanded a sensitive Brigade in the Tangdhar Sector during Operation Parakram. He was also deployed in Gujrat and Rajasthan in the Rann/Desert sectors along the western border. He was appointed the Commander- in- Chief of the most challenging and prestigious Northern Army in Jan2011.

The General participated in Operation CACTUS LILY in 1972, and entire spectrum of counter insurgency operations in J&K and North East. He was awarded Chief of Army Staff Commendation twice in North East and conferred with gallantry awards of Yudh Seva Medal for command of an active Brigade in J&K and Uttam Yudh Seva Medal for his assignment in a sensitive Corps in the North East. The General carries immense operational experience having practically served along the entire hostile

borders of the country from J&K, Ladakh, Sikkim, Bhutan to Arunachal Pradesh.

Well rounded staff assignments include, Colonel General Staff of a formation in counter Insurgency/Counter Terrorism environment in North East, Brigadier General Staff of a Strike Corps and various staff assignment in Military Operations, Military Secretary, Military Intelligence, Operational Logistics and Perspective Planning Directorates of the Army Headquarters.

He has had an international experience of having served abroad in UN Mission at Angola from 1997-99 as Chief of Staff and as the Commandant of Indian Military Training Team in Bhutan in 2007-08. Widely travelled and experienced, the General also headed the Perspective Planning Directorate in Army Headquarters, responsible for Force Structuring and Modernization of the Indian Army.

He was appointed as General Officer, Commanding-in-Chief of the most sensitive Northern Command on 01 Jan 11, responsible for security of J&K. He served as the Northern Army Commander for over two and half years, a period which saw peaceful summers and marked lowering of violence in J&K. He was responsible for envisioning & implementing a proactive & synergetic strategy to marginalize the terrorist, minimize infiltration and he brought about a sea change in the environment through a well conceived perception management strategy. For his outstanding leadership, strategic vision & effectively synergizing the operators in J&K, he was awarded the Param Vishist Seva Medal in 2012.

The General Officer has an in-depth knowledge of issues impacting J&K as well as the North East, two of the longest running insurgencies/proxy war in the country. Having been a part of the Unified Command in J&K as well as Gauhati, he is aware of the aspirations and mechanizations of the population as well as the security dimensions of the regions.

Apart from an extremely successful Army Career, the General is a keen sports man, passionate philatelist and pursues many hobbies and interests. He was elected as the Colonel of the Rajputana Rifles in Apr 2007 and has provided a vision for the Regiment for an all-round growth, focusing on training, motivation and welfare of officers and men of the oldest rifle regiment of the Indian Army.

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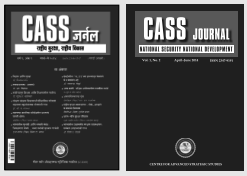

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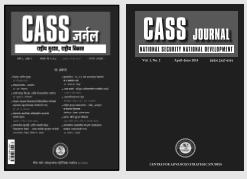

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