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Editor's Note

At the outset, I must thank the readers for their overwhelming response to the inaugural issue of CASS Quarterly Journal. The issue was released in Pune by Shri Shekhar Dutt SM, Hon'ble Governor of Chattisgarh on 10th January 2014. The Centre has also brought out a transliterated version of this Journal in Marathi, so as to reach out to wider readership. On 25th February 2014 the Journal in Marathi was released by Dr SB Mujumdar, Founder President of Symbiosis and Chancellor of Symbiosis International University, Pune and Dr Anil Kakodkar, Former Chairman of Atomic Energy Commission and Secretary, Department of Atomic Energy.

As the first quarter of 2014 gets over, the world is already witnessing some very important events across the continents. Some of the experts hope that the events in Ukraine do not lead to 'return of the Cold War'. Then there is realignment between US and Iran, which will have important effect on the politics of Middle East. While Pakistan continues to be in the throes of unending violence, our other neighbour China is also witnessing increasing incidents of violence in Xinjiang region. Added to such important geopolitical events we have witnessed one of the severest and unexpected weather patterns from North America through Europe to India. It seems that the environmental and weather uncertainties resulting into disasters and their mitigation will be one of the important challenges in the coming years for most of the countries.

For us in India the forthcoming general elections of May 2014 will

witness a record participation by young voters, who wish to be active stake holders in the country's future. Their aspirations for better governance will hopefully dictate comprehensive developmental policies and their implementation by the new Government.

Towards the end of this year withdrawal of US and other Western troops from Afghanistan will also have important bearing on the entire Indian subcontinent. One hopes that the current stability is not hampered as it can only bring in more violence and terrorism at the peril of much needed economic progress of the region.

In late February this year, the unfortunate spate of incidents involving Indian naval units resulted in resignation of an upright Naval Chief, Admiral DK Joshi. This unprecedented move has once again brought into focus the vexed issues of civil-military relationship. While some of these important events have been discussed by eminent authors in the April issue, others will continue to be focussed in the next issue of CASS Journal.

Happy reading and best wishes,

Jai Hind

20th March 2014

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

Asia 2050: Technology Landscape

Dr. Raghunath Mashelkar and Dr. Vinod Goel

Predicting the Future

As we come to the end of the first decade of the twenty first century, it is interesting to ponder over the future that lies four decades hence. But, to begin with, let us ask as to whether, four decades ago, would we have been able to predict today's scenario of technology? No way. Four decades ago, there was no internet, no world-wide-web, no laptop, no mobile, no space vehicles, no iPods, no iPads, no stem cell technology, and yet all these dominate our lives today. So, it is a difficult exercise to predict the technological landscape of Asia four decades from now. However, we will make efforts to take a good guess as to what future technology could be, and how that technology could influence future Asia.

Rapidly Changing Asia

One of the most dramatic changes taking place in Asia pertains to the changing scenario in India and China. China already is critical for the wellbeing of the global economy. India soon will be. China is presently the world's third largest trading nation. India was being considered as a third world country. Today, there are confident predictions that India will move from being a third world country to the third most powerful country in the world. By 2050, almost 50 percent of the world's GDP will be contributed by India and China. This means India and China will have the same share as they enjoyed around the seventeenth century. Indeed, India and China are being considered as the Tiger and Dragon of global commerce. According to Goldman Sachs, India's economy could be larger than Japan's by 2032, while China's could be larger than the Unites States

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by 2039. And their astounding growth rates, if maintained over the next four decades, will create a special position for them, that will alter the geopolitical balance in a way that the commonly expressed view that the 21st century will belong to Asia will no more be wishful thinking, but a hard reality.

Asia as a whole has undergone growth in GDP per capita by seven folds in the past 40 years, and this trend of growth to varying extents depending on specific Asian countries will continue over the next 40 years. The advancements made by Japan, Korea, Taiwan, Malaysia, Singapore, besides India and China will be joined by Indonesia and Vietnam.

Asia will, however, continue to remain an uneven innovator with an uneven growth pattern.

For example, the study carried out by the Centennial Group (supported by the Asian Development Bank) shows that by 2039, India could be one sixth of the global economy with one sixth of the population. But, the study also shows that the average per capita income in India could be seven to fourteen times higher than its south Asian neighbours.

In terms of technological innovations also, Asia has moved unevenly. Japan had made a head start after the Second World War with such rapid progress that it could be called a technological superpower and joined the OECD in 1962 itself. South Korea and Taiwan became technologically advanced nations, thanks to the emphasis on investments in higher education, and science and technology. Singapore joined the club of technologically advanced nations by carving out a niche in specific areas (e.g. biotechnology) and also making innovative changes in public policy on welcoming and encouraging foreign nationals, who achieved eminence in science and technology so that it did not suffer from the disadvantage of having a small human capital base because of its small size.

India and China chose their own way of growth in science and technology.

India had to face two adversities in its journey of technological innovations after it got independence in 1947. First, as a poor country, there was lack of financial resources, so India had to resort to "frugal engineering" meaning creating "more from less" all the time. Second, India had no access to technology ranging from satellites to nuclear power to supercomputers. So, technological development had to be based on a sort of denial driven innovation. India opened up to the rest of the world, when it liberalized its economy only in 1991. Competition

brings the best of technological innovations. Lack of competition in the pre-liberalized era in India meant technological development for import substitution only. A closed economy also meant lack of access to foreign direct investments and lack of access to foreign technology.

A good illustrative example is what Mr. J.R.D. Tata said in February 1978. He said "If Telco (which was the auto manufacturing company of the Tata Group, now called Tata Motors) was allowed to manufacture cars, we would have been as good in it as it was in Tata trucks". But then Tatas were not allowed to do so. It was only in 1993 that Ratan Tata, the Head of the Tata Group was allowed to make 'Indica', an indigenously created "Indian Car". And its success led to the design, development and manufacture of Tata Nano, the world's cheapest car priced at US$2,500. Tata Nano is a product that is a first in the world, from a country which was busy in creating products so far that were first to India. This is just illustrative of the impact that the opening up in 1991 had even on the technological landscape. But, the real impact is even more, when one realizes that it was a post liberalized India that allowed Tatas to acquire Jaguar and Land Rover, not only making it a global auto company, but also giving it access to the superior and cutting edge high technology.

China opened its economy two decades earlier than India did. And it has reaped huge benefits thereby. China is way ahead of India in all technology areas, except in computer software. Their own prowess in all high technology areas such as advanced space technology, aerospace technology, nuclear technology, etc. is well known. Their achievements range from the high speed bullet train to advanced fighter jets, to the navy carrier to advanced nuclear reactors. Massive investments in clean technology are already showing rich dividends. China has acquired the second position after the leader United States in nano technology even after a late start.

In fact, starting late and taking a leading position is not uncommon for China. Take the case of supercomputers. After the US denied supercomputer technology to India in the mid-eighties, India created a Center for Development of Advanced Computation (C-DAC). And C-DAC created India's first supercomputer PARAM 8000 in the late eighties. China started its supercomputer initiative ten years later. Yet interestingly, China has taken a huge lead. In the recently announced list of the world's top 500 supercomputers. China has 41 of indigenously developed supercomputers listed, as against India's onlyfour

supercomputers. Even more impressively, China tops the list!

In summary, in Asia's march in the technology space, although both India and China are making progress, the Chinese Dragon is way ahead of the Indian Tiger.

Future Biotech

It is now commonly agreed that the twenty fist century will be the century of biology, just as the twentieth century was dominated by information and communication technology (ICT). These two technologies will continue their strong influence till 2050. Therefore, we will examine the game changing influence of these two technologies in the Asian context.

Similarly, it has been argued that the twenty first century will belong to Asia. Then what will be the Asian position in this century of biology. Or, from a technological angle, where will Asia be in modern biotechnology? Asia could be a leader in modern biotechnology by 2050. It could have a dominant position in a variety of frontier fields like stem cell technology, synthetic biology, pharmaco-genomics and so on.

Let us take the case of stem cell technology first. We have moved from preventive medicine (vaccines) to curative medicine (antibiotics), to predictive medicine (gene therapy) to regenerative medicine (stem cell therapy).

Fundamentally, what is stem cell technology? In the earliest stages, when an embryo gets developed its own cells are only general purpose building blocks. They can become any kind of specialized cells that the body needs. These are the stem cells and their versatility makes them uniquely important for clinical therapy. If one has a heart attack, stem cells have the potential to replace the damaged tissue, turning eventually into a specialized heart muscle as needed. If there is spinal damage, stem cells can potentially replace the lost nerves and restore the ability of a paralyzed patient to walk. It can create a paradigm shift in the way diabetic patients are treated. Stem cells can become pancreatic islet cells, thus enabling a diabetic patient to have normal supply of insulin.

Some of the Asian countries took an early lead in stem cell technology. Today, South Korea and Singapore are counted as being among the leaders. India and China are beginning to build on the easy promise created through judicious investments in human capital and infrastructure.

In India, more than 20 research centers are carrying out basic stem cell research. They are building stem cell based therapies for cancer,

diabetes, heart disease and brain disorders such as Alzheimer's disease. Although China so far has less than ten major stem cell research centers, yet in Taizhou, a spinoff of Beijing University called Beike Biotechnology, is already using stem cells to treat more than 250 patients for diseases ranging from cerebral palsy to optic nerve damage. Many of their patients come from the United States, where therapies based on stem cells are difficult to find.

And this clearly shows the early advantage that countries such as Singapore, Korea, China and India have done through less restrictive policies concerning stem cell research. For the politically powerful minorities of Americans, any therapy based on a material that has been culled from the human fetus is intolerable, because it might encourage abortions to get access to the necessary cells. Most biomedical cutting edge or frontier research in the United States got stalled. In the first few years after the near-total ban on federally funded research in stem cells, several of the leading biologists and research physicians moved to Europe and Asia, who did not suffer from restrictive policies.

In short, Asia has all the competitive advantage to become a leader in stem cell technology and therapy. This unique positioning in regenerative medicine can have an interesting consequence in medical tourism, with a few Americans coming to China for stem cell therapy with the Beike Biotechnology in Taizhou, being just a trickle that can potentially become a torrent.

Another area where Asia could lead is in the new age of "pharmaco-genomics", personalized medicine, in which physicians can select the drugs that are most likely to help a specific patient, while at the same time ensuring that unwanted side effects are not caused. And there are two factors that are in favour of Asia. The first is that the costs of sequencing an organism's genetic material have plummeted dramatically. The dream of sequencing an individual's genetic makeup in perhaps 15 minutes at a cost of US$15 is not too far off. So extreme "affordability" provides ready access to such sophisticated technologies. The second is the vast genetic diversity in Asia which aids research in pharmaco-genomics.

Gene based prevention, diagnosis and treatment could revolutionize the treatment of HIV-AIDs, cancer and so on. Genetic sequencing may be particularly useful in combating infectious diseases through the so called "reverse vaccinology". This refers to the design of vaccines based on computer analysis of the pathogen's genome. Already there is recent

success of the production of a vaccine against group B meningococcus, which had escaped conventional vaccine production methods for over 40 years. And remarkably, developing this vaccine took just 18 months. So reverse vaccinology is far faster and cheaper than previous techniques. A lot of vaccine production work is already shifting to countries such India. Aided by such affordable but advanced technologies, Asia could be a world leader in research, technology and production of modern vaccines.

The field of "synthetic biology" is developing ways to build living organisms. Simple bacteria can be made routinely by inserting synthetic genomes into empty cells. These organisms will not merely duplicate their natural predecessors, but will incorporate whatever traits their designers wish to include in them. From triggering an immune response, to conveying new generic material into human cells, to repairing hereditary diseases, to carrying out industrially useful chemicals – the promise of synthetic biology looks awesome. Although United States has a clear lead in this, it would not be surprising if India and China take a leading position starting with the decade of 2010-20.

The replacement of traditional chemistry by processes modeled on biology will lead the way to biomimetic synthesis, and closely allied to it is bio-manufacturing, the use of cells themselves to produce medically and industrially useful compounds. Cells will be genetically engineered to deliver compounds that nature overlooked. In many cases, the cells themselves become the producer. Already scientists have produced universally acceptable blood from stem cells. Medical researchers have successfully altered complex organs in the human body such as skin, liver, heart and even pancreas. By 2050, these organs will be grown in the laboratory from the recipients own tissue after appropriate genetic repair, and then inserted into the recipient's body.

Another advance by 2050 will be combining engineering and electronics with biological parts to make complex systems. For example, the recent work on creating artificial retinas for the blind that can link to the optic nerve and send messages to the brain. Other experiments are using cells as the serving elements in detectors for pollution, bacteria, nerve agents and many other targets.

By 2050, "biogeneology", which is the study of fundamental processes of aging, could have so advanced that considerable progress would have been made in preventing, delaying or reversing the aging process. By 2050, Asia will see a dramatic extension of life expectancy, as sanitation

standards improve, as more effective treatments become available for infectious diseases, but also through deliberate efforts to treat biological aging as a disease and prevent it.

The following specific life –extending developments are expected to be available even before 2050:

- Almost everyone will have their own DNA sequences. This will give access to a vast database that describes the risks, therapies and best practices based on the characteristics of their own specific genes.
- Mitochondrial DNA will be replaced when damaged by disease or aging.
- Most genetic disorders will be curable through gene therapy, which by 2050 will be a mature technology.
- Age damaged immune systems will be replaced by using fresh cells grown from the patient's own bone material.
- To replace diseased or worn out organs, doctors will grow new ones from the patient's own cells.
- Tissue regeneration will take place without rejection. This will be made to happen, by creating, manipulating and transplanting pristine cells from the patient's own body.

These and other anti-aging therapies will make life spans of over 100 years common place. More importantly, based on animal studies underway at the moment, the "quality of life" will not suffer as it does today, and it will be possible to retain more vigorous mid-life health and energy. This will have a direct effect on the much talked about "demographic dividend" in some Asian countries, as more productive human talent event in later stages of life becomes available.

Computers, Communications and Information Technology

Gordon Moore predicted that computer power will double every two years, but also suggested that the law may not survive beyond 2020, because transitions would have reached the atomic level limits of miniaturization. It took 42 years from 1959 to 2001 for computer speed to increase by a factor of a million. According to Denis Bushnell, who was Chief Scientist at NASA's Langley Research Center, by 2030 computer power is likely to grow by a factor of 100 over that in 2001.

Today's silicon chips will not be nowhere relevant by 2020. They

would have been supplanted by newer, much faster technologies. These will include optical computers, molecular computers, bicomputers and perhaps event quantum computers. Before the end of the first decade of the twenty first century, we saw the launch of IBM's petaflop machine, which is capable of performing 1 million billion floating point operations per second. But within a year, came the announcement of Chinese joining the race with their petaflop supercomputer. As remarked earlier, China has 41 supercomputers listed in the top 500 already, as against India'sfour. Clearly by 2050, both these nations would have consolidated their position in the top league.

An evolutionary change is the growing bandwidth and the use of the internet. By 2020, it is predicted that a combination of fiber optics, satellite based internet backbone services and universal high speed "last mile" connections, will shift all communications to the internet. Traditional telephones would have been replaced by Voice-Over-Internet protocol (VOIP). Use of what is called as Natural User Interface (NUZ) technologies, which do not employ a keyboard, but use touch or gesture would bring dramatic shifts. Similarly, early successes in Conversational Computing (CC) will occur in narrowly focused applications such as in toys and pre-school computer tutors. Within five years, many professional and technical workers will be carrying a chatty cyber-assistant in their cell phones, capable of responding to a large number of routine verbal instructions and work related requests. Conversational computers would become common in customer help lines, tracing lost luggage, citizen complaints, public crime reporting, and warranty fulfillment, etc. By 2050, we will be having a dialogue with our cars, appliances and houses, as conversational computer technology keeps on improving with mature Artificial Intelligence (AI).

Concurrently, the challenges of labour shortages in countries that are having aging populations are being dealt with through the use of robotic technology. In Japan and South Korea, the government is promoting R&D in robotics for the specific purpose of reducing or eliminating their dependence on immigrant labour. It is safe to assume that widespread use of robots will occur in agriculture, transportation and healthcare.

Similarly, limited use of Artificial Intelligence is being made in specialized applications such as medical diagnostics, interpretation of photo-imagery and student counseling. AI based systems would have displaced a growing range of technical and para professional workers,

whose jobs involve rather routine applications of normative and cognitive skills. Evolution of such systems has the potential of reducing significantly off-shore routine white collar work requiring customer support services, back-office financial service operations, etc.

It is conceivable that by 2050, integrated robotics, artificial intelligence and conversational computer capabilities would have measurably reduced labour requirements in agriculture, food processing, manufacturing, in factory built housing, transportation and the services sector, etc. This will have two effects. In mature industrial economies, it will free up scarce live workers for higher value jobs. But, intelligent machines and on-line cyber servants would take away jobs from semi-skilled functionaries in Asia. The cheap skilled workforce had given great comparative advantage to many Asian countries. But, as advances in IT continues to take out routine work from labour intensive economic activities, these could cause significant paradigm shifts in the geopolitical scenarios.

Changing Landscape of Science, Technology and Innovation

There are clear indications that the centre of gravity of scientific research and technological innovation is shifting towards the Asian region. This is due to several reasons.

First, there is massive expansion in the educational and research institutions in some of the Asian countries, notably in India and China in recent years.

Second, there is a step jump in the level of R&D funding by the more advanced economies, especially, in the rapidly expanding economies in Asia, especially in the past decade or so.

Third, the abundant availability of scientific talent at low cost has meant that companies are setting up their R&D centres in countries like India and China. For instance, in India, over 760 companies from abroad have set up R&D centres, employing around 130,000 scientists, engineers and technologists. These centres have started generating significant intellectual property (IP) for the parent organization. Companies see the advantage of the highest intellectual capital generated per dollar spent in India as Jack Welch, the legendary CEO of General Electric put it at the time of the inauguration of the Jack Welch R&D Centre in Bangalore, the second biggest R&D centre of GE after their R&D centre in the US.

Fourth, with opportunities opening up in the leading Asian countries, reversal of brain drain is taking place. A significant number

of employees of multinational R&D centres happen to be the returning highly trained Asians in some of the best centres of excellence in scientific research. Improved economic conditions in these countries has led to the availability of more sophisticated equipment. Advances in information and communication technologies has also meant an opportunity for uninterrupted continuity of contacts with their peers overseas.

Finally, tightening of intellectual property laws in most Asian countries has meant that scientists now have an opportunity to create products that are new to the world (such as entirely new drug molecules), rather than the old way of just doing reverse engineering (such as copying existing drug molecules). Availability of such exciting intellectually stimulating challenges in their countries of origin, has created a great impetus towards driving this great movement from brain drain to brain gain. Apart from this, the countries themselves have adopted proactive strategies. For example, Taiwan brought back the Nobel Laureate Prof Y.T. Lee by first making an extraordinary offer to him, and then making him the Minister of Science and Technology. China has special and extraordinary schemes to draw back the top talent creating special high tech facilities around them, and even giving them differentiated privileges as well as remuneration. Singapore has drawn some of the world's best leading researchers from all around the world by offering them extraordinary facilities and remuneration.

All this augurs very well for setting a stage for Asia becoming a leader in science, technology and innovation by 2050.

Potential Game Changing Technological Breakthroughs

The technological revolutions can bring major changes in the life and work of the generations to come after 2050.

The major challenge is only removing the limits that one sets on one's own imagination. It was Wright brothers, who first thought that a human need not be restricted to ground transport and could fly. Their first attempt to fly took place over a hundred years ago. Today we have transatlantic flights. It was John Kennedy, who said "man on the moon". And a great nation, the United States of America, used all its technological prowess to make it happen. And one can go on with many such examples of human adventurism in thinking. With the current pace of technological change, one can conceive major breakthroughs appearing by 2050 and beyond, with the Asian miracle not only restricting itself to an economic one, but

also a technological one.

How does one build for the humankind a sustainable energy future? There are several "incremental" technological innovations that are currently underway, ranging from increasing the cost effectiveness of solar thermal and solar photovoltaic based energy systems. And, alternative energy systems are being extensively researched. . It is predicted, for instance, that by 2035, 50 percent vehicles will be either electric or they will run on hydrogen. By 2050, it is predicted that 30 percent of our transport could be on alternative fuels, as against near 100 percent being on fossil fuels today. It is also predicted that 30 percent of all liquid fuels will be bio-fuels by 2050.

However, this picture can change dramatically with innovations that will be "disruptive" and not merely "incremental". For instance, the research group of Daniel Locera at MIT in the US has already got a breakthrough on splitting water at room temperature. Tara Motors from India has already partnered with his group to examine the feasibility of doing on board hydrogen generation by splitting water, which could possibly run the world's cheapest car, Tata Nano, developed by Tata Motors as mentioned earlier. If that happens, Tata Nano will run on water! As we write this, it looks like a dream but who knows, within a decade it may become a reality!

After the Nobel Prize winning breakthrough by Bednorz and Muller from the IBM labs in Zurich, showing that transition metal oxides could give a superconductor at temperatures that were much higher than attained earlier, the expectations were raised about superconductors working at ambient temperatures. In the last two decades intensive research work has taken place, but as yet this breakthrough has eluded us. But by 2050, if such a breakthrough occurs, then we will use such room temperature superconductors to design and develop levitating trains, which could break all current barriers on the speeds of such trains.

Similar revolutions could occur in other areas. For example, with the ongoing incremental innovations alone, agriculture will become increasingly automated. Robots will appear in agriculture and fisheries to replace human farmers. Sensor and electronic tagging systems will monitor growth rates, nutrient levels as well as their circulation processes. Results will produce models, which study plant structures from the root to the tip and their growth patterns to increase the intensity of agricultural output and to feed the ever growing global population. Let us not forget that

by 2050, we will have to feed around nine billion people, a significant portion being from Asia!

As land and water become scarce, modern biotechnology will continue to make advances to give us the breakthroughs to create crops that can be grown under saline conditions, and that can use just a fraction of the water and nutrients that we use today.

The danger of climate change will again be tackled through technology. Physical carbon sequestration could be aided significantly by "biosequestration" through microalgae, which uses carbon dioxide most efficiently and converts the carbon dioxide, water and nutrients to lipids by photosynthesis, which in turn are converted to bio fuels. Thus coal based power plants with biosequestration by microalgae could produce a closed loop system with no carbon dioxide release, and mitigation of climate change.

Most significant discoveries and breakthroughs during the twentieth century came from the Western world exclusively. They comprised integrated circuits, which brought information and communication technology revolution, which changed the world. They comprised the discovery of the structure of DNA, which has led to recombinant DNA technology, which is game changing for the whole humanity. With the changing landscape of science, technology and innovation in Asia, it is not unlikely that some of the potential breakthroughs that we have described and will be game changing, might come from Asia!

But before such dreams become realities, we have to look at some harsh Asian realities on the ground, and act on them innovatively and with determination. We describe both the problems and the solutions in the following section.

Asia as an Inclusive Innovation Leader by 2050

Despite the rise of Asia as an economic power, there will be disparities of income as well as opportunities for a vast number of Asians by 2050. The challenge will be to not only aim for growth, but inclusive growth. This will require Asia to master and lead in what might be termed as 'inclusive innovation', which creates products and services which are available, affordable and accessible to the Asians, who, for various reasons, will continue to remain at the Bottom of the Pyramid (BoP).

Enterprises have always tried to get more (performance) from less (resources) for more (profits). This needs to change for getting more

(performance) from less (resources) for more and more (people), or those billions of have nots, whose income levels are less than 2 to 4 US dollars a day. This constitutes the essence of inclusive innovation.

The examples of inclusive innovation include the world's cheapest car, Tata Nano (priced at just US$2,500), the world's cheapest mobile phone sets (priced at US$20), the world's cheapest phone call rates (costing just one cent per minute as against eight cents in the US), the world's cheapest cataract surgery (costing just US$30 as against US$3,000 in the US), the world's cheapest laptop (costing just US$35) and so on. And these are not dreams, they are reality. And they have been achieved by using ingenious technological innovations, business process innovations and work flow innovations.

And these great feats of inclusive innovations help firms do well (for their shareholders) as well as do good (for society at large). It helps nations achieve competitiveness for their firms, as well as achieve creation of a more inclusive nation comprising the much needed equitable society. Since affordability and sustainability are the two strategies on which inclusive innovation is firmly anchored, it helps global leadership deal with the challenges of the crisis of global economic meltdown (and no one can guarantee that there will not be another one before or around the year 2050), or deal with the crisis of climate change (with the world still grappling with this challenge as the currently emerging economies continue to consume more and more as 2050 draws near).

And inclusive innovation is not just good for Asia. It is good for the whole world. Jeffry Immelt, the CEO of General Electric and R. Govindarajan, a leading thinker of our times wrote a paper in the Harvard Business Review recently. They propounded an idea of 'reverse innovation'. The GE medical team in India developed a portable electro cardiogram (ECG) machine at a cost that was much less than that of a similarly performing machine in the West. Similarly, the GE medical team in China developed a portable ultrasonic machine at a cost that was a fraction of the cost of a similarly performing machine in the West. And GE found that a market was emerging for these machines in the Western world. They observed that this phenomenon was the reverse of the usual phenomenon, wherein Western researchers would develop an expensive machine in the West and make it affordable to the resource poor world by dropping out certain features and functionalities that were adding to the high cost. They recognized the reversal of this phenomenon, by arguing

that Asian countries such as China, India and others are going to be the hotbeds of global innovations in the future.

Whether it is reverse innovation or inclusive innovation, it is clear that Asian businesses of the future will achieve the twin objectives that are as valuable today, as they will be valid in 2050, for reasons we have explained earlier. And that pertains to the leadership that Asian firms would have achieved in doing good, while they are doing well and creating value for many, when they are creating value for money. These should form a strong foundation on which the Asia 2050 Technology Vision should be based.

Dr. R.A. Mashelkar, FRS

Dr. R.A. Mashelkar, National Research Professor, is also the President of Global Research Alliance, a network of publicly funded R&D institutes from Asia-Pacific, Africa, Europe and USA with over 60,000 scientists.

Dr.Mashelkar was the Director General of Council of Scientific and Industrial Research (CSIR), world's largest chain of industrial R&D laboratories for over eleven years. He was also the President of Indian National Science Academy.

In the post-liberalized India, Dr. Mashelkar has played a crucial role in shaping India's S&T policies. He has been a member of the Scientific Advisory Council to the Prime Minister set up by successive governments for the past three decades.

Dr.Mashelkar is only the third Indian engineer to have been elected (1998) as Fellow of Royal Society (FRS), London in the twentieth century. He was elected Foreign Associate of US National Academy of Science in 2005, Associate Foreign Member, American Academy of Arts & Sciences (2011); Foreign Fellow of US National Academy of Engineering (2003); Fellow of Royal Academy of Engineering, U.K. (1996) and Foreign Fellow of Australian Technological Science and Engineering Academy (2008).

Dr.Mashelkar is on the Board of Directors of several reputed companies such as Reliance Industries Ltd., Tata Motors Ltd., Hindustan Unilever Ltd., Thermax Ltd., Piramal Enterprises Ltd., KPIT Cummins Infosystems Ltd. etc. He chairs the Boards of Reliance GeneMedix and Vyome Biosciences.

In 1998, Dr.Mashelkar won the JRD Tata Corporate Leadership Award, the only scientist to win it so far. On 16 November 2005, he

received the Business Week (USA) award of 'Stars of Asia' at the hands of George Bush (Sr.), the former President of USA. He was the first Asian Scientist to receive it.

Deeply connected with the innovation movement in India, Dr.Mashelkar is currently the Chairman of India's National Innovation Foundation, Reliance Innovation Council, Thermax Innovation Council, KPIT Cummins Innovation Council and Marico Innovation Foundation.

Thirty universities have honoured him with honorary doctorates, which include Universities of London, Salford, Pretoria, Wisconsin and Delhi.

The President of India honoured Dr.Mashelkar with Padma Vibhushan on 26 Jan 2014, Padmabhushan (2000) and Padmashri (1991).

Dr. Vinod K Goel

A former World Bank staff and leading expert on innovation (particularly pro-poor or inclusive innovation), has over thirty years of experience designing, executing, monitoring and evaluating operational projects and policy reforms in Science, Technology and Innovation (STI); private and financial sector development; agriculture and infrastructure development; and public sector performance/enterprise privatization, for clients including the World Bank, Asian Development Bank (ADB), Centennial Group, and Japan International Cooperation Agency (JICA).

In recent years, Dr. Goel has:

- taken the lead in developing projects for the World Bank and Centennial Group (as head of its Global Knowledge and Innovation Practice) aimed at enhancing national innovation systems through investments in science and technology, quality and standards, intellectual property rights, R&D restructuring, technology diffusion and commercialization, venture capital and start-up capital funds, technology parks and innovation centers, in countries such as China, Russia, India, Turkey, Thailand, Vietnam, Croatia, Serbia and Albania. Dr. Goel has also participated in the design and implementation of inclusive innovation policy programs in several countries.
- performed strategy, analysis, project management and operational

work related to private and financial sector development, including leveraging of STI, modernization of business infrastructure, small-medium enterprise development, upgrading capacity of banking sector, livelihood businesses, and growth-promoting policy, regulatory and institutional reforms.

- led and participated in projects on agri-business productivity, extension and inputs; leveraging STI and R&D in the industrial and agricultural sectors.
- led and participated in projects on privatization, capacity building, and institutional reform of state-owned enterprises; sovereign risk analysis; and performance-based resource allocation mechanisms for international financial institutions.

Dr. Goel has also served as President and Life Member of the American Society of Engineers of Indian Origin (National Capital Chapter). He has published numerous books and research papers on a variety of technical and economic matters. He holds a Ph.D. and MBA from Cornell University, a Masters in Dairy Technology from the National Dairy Research Institute in India, and has attended executive development programs at the Wharton Business School.

The Pangs of Modernisation

Air Chief Marshal (Retd.) PV Naik

Introduction

Douhet, Mitchell & Trenchard were the first proponents of air power, as it was then known. They were ahead of their times and consequently, were hounded out by one and all for their heretical thoughts. This article attempts to flag some important aspects of, and share some thoughts on the future of aerospace power and modernization, with special reference to India.

Environment

Today, the South Asian region ranks as one of the three flashpoints in the world along with the Middle East and North Korea. That potential adversaries are nuclear powers with missile capability is a cause for even greater discomfort. It is, on the other hand, also a region with enormous possibilities, some of them unfolding right before our eyes. Within this region lies a group of nations in troubled transition to modernity, their external discourse damned by internal contradictions. In a world moving towards integration, many of these nations remain torn by ethnic and religious strife, economic disparities and political instability. Undoubtedly, it is a new world order that is emerging because of complex relationships, strategic interests and influences. Asia is the happening place for a variety of factors. For obvious reasons, it is full of turmoil and instabilities. Internal dynamics and external influences have led to an increase in the degree of instability and uncertainty. Last but not the least, it is the playground for terrorism.

As a member of this region, India remains vulnerable to the

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disturbances spilling over from her neighbours. India herself is at the crossroads. We witness this giant stirring into wakefulness – into awareness of its power today. This rise in stature brings with it greater responsibilities and a larger role in regional as well as global affairs. This demands not only a change in policy, internal and external, but a fundamental change in our very thinking, ethos and value systems.

Threat Spectrum

India's strategic perspectives are shaped by her history, geography, geo-political realities and the demands of real-politic. Our native culture, our innate traditions of trust and tolerance, as well as our vision of world peace shape our national character, which, in turn, impacts our international relations. These vital parameters are as relevant today as they were earlier. India shares borders with 11 neighbours. Our relations with some are uneasy and with some, hostile. Any unrest within this somewhat hostile neighbourhood spills over into our borders in many forms; and with depressing regularity. Unless these geo-political cross currents affecting us are quietened, they would continue to thwart our desire to move forward.

India is faced with the full spectrum of threats, which emerge from all these issues. The spectrum itself is increasing in complexity and technological sophistication. So, with the spectrum changing as well as being unpredictable, we have to look at full-spectrum dominance. This is equally applicable to all domains, land, sea, air, space, as well as the information domain. Since the focus of this article is on aerospace power, suffice it to say that aerospace power also will have to look in the same direction.

It is, therefore, prudent that we move away from a *threat-based assessment* to a *capability-based approach*. A capability can then be tailored or applied to meet the challenge. The capability will allow us to apply the *right force* in *any form of conflict* across the *entire spectrum*. This will ensure effectiveness as well as efficacy.

What is of concern to us is that the whole focus is on full-spectrum dominance. Yes, it will require new technology, modernisation and replacement of equipment. But, just material-superiority and technology is not enough. Of equal importance is the development of *doctrine, organisation, training* and *education of leaders and people* who can effectively take advantage of the technology.

Modernisation

Defence modernization comprises three disciplines. MAINTAIN – What you have—, UPGRADE—Where there is useful residual life left, ACQUIRE- Where there is no residual life. It is a constant process and cannot be done in fits and starts. India needs quantum improvements in all three aspects.

Reasons are many. We missed out on the window 10 years ago because of a poor economy. We suffer the consequences now. More so now, because the world economy has nosedived affecting FDI inflows. The consequent adverse rupee/dollar ratio is bound to affect our purchasing power. We depend on foreign vendors for most *spares*, *upgrades* and *acquisitions* because our indigenization record is poor. We continue to lose out on pricing and contracts because of delayed decision making. The MMRCA deal for 126+ aircraft is languishing for more than four years. Utility choppers are just about coming in. The need for 40 more SU-30 air craft mooted four years ago, is being re discussed now. Demand for additional Air to Air Refueling (AAR) air craft has been in limbo for four years. The news is that it might fructify soon. The 2014 general election will put paid to any new projects being approved till the formation of the new government. Involvement, commitment and accountability of the bureaucracy is lacking. The Defence Procurement Procedure (DPP) needs refining, which is being done but needs expediting.

We are expected to spend approx USD 235 billion on defence systems over the next 10 years. At 30 percent to 50 percent the *offsets* come to a staggering figure. Are our public and private sectors capable of handling such astronomical deals?

I am confident that Aero India 2015 will showcase India's primacy as a viable market. The rush of fighter air craft vendors may be a bit diluted, but choppers and RPAs will be on display. In addition, the US push will ensure large participation. Such events must be addressed as opportunities to be taken advantage of, in our calculus. Many deals are in the pipeline. The economy is likely to take a turn for the better, since such events are generally cyclical with effects lasting a year and a half to two years. The geopolitical situation in our region would have changed after the US withdrawal from Afghanistan, and any new government is bound to be supportive. Today, we are on a cusp. The ramping up was

expected to start around 2015. Now it may be delayed by a year or two.

If we want defence modernisation to be successful, we must get our act together now. *All* stakeholders including the public/ private sectors, the DRDO and the bureaucracy must be committed, involved and held accountable. They must share responsibility equally with the armed forces. Only then will we be able to take our rightful place in the comity of nations as a secure country with strong and modern armed forces.

Air Chief Marshal (Retd.) PV Naik

Air Chief Marshal PV Naik, PVSM VSM was born on 22 July 1949 and commissioned into the Indian Air Force on 21 June 1969. After initial schooling in the Sainik School, Satara, he graduated with the 33 course from the National Defence Academy.

In a distinguished career spanning forty years, the Chairman COSC and CAS has flown a wide variety of combat and trainer aircraft. After initial training on the HT-2, he has flown the Vampire and the Hunter, and has had extensive operational experience on all variants of the MiG-21. He is a Qualified Flying Instructor with vast instructional experience and a Fighter Combat Leader from the prestigious Tactics and Air Combat Development Establishment (TACDE). He was selected as one of the first eight pilots to convert to the MiG-23 BN in the erstwhile USSR, and was responsible for its induction into the IAF. Besides commanding a front line fighter squadron, he has commanded an important fighter base and air force station at Bidar. He has been the Directing Staff at TACDE and the Defence Services Staff College.

During his career, the Air Chief Marshal held numerous important staff appointments in different headquarters. He was the Senior Air Staff Officer at HQ Western Air Command, the Air Officer Commanding-in-Chief of Central Air Command and the Vice Chief of Air Staff, prior to his appointment as the Chief of the Air Staff. He also took over as the Chairman, Chiefs of Staff Committee on 01 April 2010.

The Air Chief Marshal is a graduate of the Defence Services Staff College, and an alumnus of the National Defence College. He is a recipient of the Param Vishisht Seva Medal and Vishisht Seva Medal.

Security and Cooperation: SAARC and Other Regional Groupings

Amb (Retd) Sheel Kant Sharma

India's profile has almost always been quintessentially trans-South Asian reaching out at least to Asia as a whole and beyond. At the Asian Relations Conference held in Delhi in 1947, Pt. Jawaharlal Nehru welcomed all great peoples from Asia, but this also included Egypt, Turkey and the then Soviet Union and observers were invited from Australia and New Zealand. Nehru's vision was much larger than the geographical boundaries of the India he was born in. In this conference, he supported the "One World" ideal and the United Nations 'emerging from its infancy' but emphasized that, "in order to have One World we must also in Asia think of the countries of Asia cooperating together for that larger goal." He reached out later to all of Asia and Africa in the Afro-Asian Bandung Conference in 1955, and then through the nonaligned movement in 1961 envisioned a group of peoples stretching from Asia and Africa to Latin America and Europe. India carried on with this legacy in its foreign policy in a major role as a leader of the developing world.

Around the same time, regionalism was taking stronger roots the world over. First, it was European integration which commenced in 1953 with the formation of the coal and steel community among wartime foes, France and Germany, joined by the Benelux and Italy. The great French statesman of regionalism Jean Monnet pushed this idea untiringly, sowing the seeds of what fifty years later would emerge as the European Union(EU). The process continued gradually and steadily through the entire Cold War years gaining momentum, with more members and greater areas of cooperation. ASEAN was formed in the 1960s and though India was invited to join it in 1967, Delhi chose to stay out. The League of Arab States was the regional Middle Eastern body almost entirely preoccupied by the Arab-Israeli dispute and related politico-security matters. (The Organisation

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of Arab States(OAS), as the oldest regional association, had been well entrenched since the turn of the 20th century in the western hemisphere as a key regional body, but under the US sphere of influence.)

Influenced by these trends in regionalism, there was a relook, as it were, in South Asia in the 1980s, then comprising nine states, including Burma and Afghanistan, for forging cooperation. A new grouping, namely, SAARC (South Asian Association for Regional Cooperation) was formally launched by India, Pakistan, Bangladesh, Nepal, Bhutan, Sri Lanka and the Maldives in 1985, with the goal of fostering cooperation in economic, social and cultural fields, invoking the shared history spanning millennia. This venture set out to go forward in sync with all other bilateral and multilateral cooperation avenues among the member states, and planned to scrupulously avoid political or contentious issues. Afghanistan was admitted in 2007 as the eighth member. Nine observers were also accepted, namely, China, Japan, South Korea, Myanmar, Iran, Mauritius, the US and the European Union. Australia joined as observer in 2010.

The basic premise behind SAARC was the recognition that the challenges that the region faces cannot be addressed fully, if actions were confined to the national domain. The SAARC Charter underlined this rationale with some prescience by asserting that "in an increasingly interdependent world, the objectives of peace, freedom, social justice and economic prosperity are best achieved in the South Asian region by fostering mutual understanding, good neighbourly relations and meaningful cooperation."

Supporting this line was the rich legacy of historical and cultural ties and commonalities including geographical contiguity among the SAARC members, promising a potential win-win for all in the cooperative process. The journey has continued for 28 years with mixed results. In these years, the focus has grown on setting an appropriate policy framework with a view to making it more conducive to regional economic cooperation, trade and all round connectivity, alongside exchanging experiences and coordination in regard to a whole host of items of national development agendas topped by poverty alleviation, social development goals, combating drugs, crime and trafficking and coping with challenges of disaster management risks, environment and climate change.

A template evolved over the years, but with a huge gap between real actions on the one hand and agreed programmes and declarations on the other through 17 summits and scores of high level meetings involving line ministries in SAARC capitals. The positive side of the balance sheet can boast of continuity of growing engagement despite so many odds, a readiness to meet and explore avenues to strengthen this engagement and a comfort level among the participants.

In addition, the exceedingly difficult bilateral relations among South Asians notwithstanding, the SAARC forums offered a platform to bring together statesmen, political leadership and high officials even in times of enormous strain in their bilateral relations. Two antagonistic nuclear weapon states, humongous armies, tensions and conflicts, mounting indices of poverty and the huge toll of terrorism being the back drop; it is no mean achievement that SAARC has survived for long. SAARC stands today at a low point in its trajectory, having missed a second year without the summit and biannual meetings of the Council of Foreign Ministers and its agenda sunk in bureaucratic morass. The overdue Foreign Ministers' meeting finally took place in Maldives in February 2014.

In contrast, over these decades, regionalism elsewhere registered impressive and enormous gains. With the fall of the Berlin Wall in Europe and vast expansion in European cooperation spanning every aspect of economic, social and political coming together, paved the way for the emergence of 27 strong European Union and the Euro. ASEAN also deepened cooperation and even took up expansion from 6 to 10 to cope with, among other things, a rising China.

In India, the end of the Cold War and economic compulsions for transforming decades of socialistic developmental patterns impelled the government to turn its full attention on economic diplomacy. India thus went all out in the 1990s seeking cooperative linkages in its extended neighbourhood and explored new and innovative regional groupings. While SAARC struggled on, the new initiatives included BIMSTEC (1997), Indian Ocean Countries Arc of Regional Cooperation (IOC ARC, 1997), MEKONG GANGA Forum (2000), Dialogue partnership with the ASEAN (1992) and joining a range of economic and political fora with ASEAN at the core, such as ARF, PMC +1, ASEAN- India summit, East Asia Summit, Asian Defence Ministers plus Meetings (ADMM) and so forth.

Bangladesh, India, Sri Lanka, Thailand and Myanmar at Bangkok formed in 1997 the grouping BIMSTEC or the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation. Nepal and Bhutan joined as members in 2004 at the first summit in Thailand. The BIMSTEC agenda for cooperation broadly mimicked the SAARC agenda - as also the mechanisms, of alphabetically rotating Chairs hosting ministerial meetings - with the important difference that Pakistan was not a member. As a mark of rapid progress, the member countries quickly agreed to include 13 areas of economic cooperation with emphasis on trade and investments. They established the BIMSTEC Free Trade Area Framework Agreement to stimulate trade and investments among the parties, and attract outsiders to trade with and invest in BIMSTEC at a higher

level. ADB which was accepted as BIMSTEC's development partner in 2005, undertook a study to promote and improve the transport infrastructure and logistics among the BIMSTEC countries. Unlike SAARC, BIMSTEC avoided a secretariat until after the summit in Thailand in 2010. India-BIMSTEC FTA had a course different from SAFTA, in that the former also has provisions for agreement in services and investments while SAARC envisions three separate agreements namely SAFTA and SATIS which are already done but still floundering, and a draft on investments is incomplete. The BIMSTEC agenda also included connectivity, particularly transport links as well as energy sector cooperation in a more active mode.

India also took the initiative to found IOR-ARC in 1995. Its membership today comprises 19: Australia, Bangladesh, Indonesia, India, Iran, Kenya, Madagascar, Malaysia, Mauritius, Mozambique, Oman, Singapore, South Africa, Sri Lanka, Tanzania, Thailand, UAE, Seychelles and Yemen. The 19 member countries have been actively engaged in business with each other. Apart from the increasing trade flows and business contacts being mutually beneficial for all, the bilateral annual trade of India and the rest of the IOR-ARC countries is about US $ 280 billion which is almost 10percent of their total global trade of US 3 trillion dollars. Indian imports run approx. US $ 160 billion with US $ 120 billion of exports. Under three separate working groups, the IOC-ARC has a more active orientation in projects in economic and technical cooperation, trade expansion and investments, which are broadly similar areas as the other regional processes. The working groups are on Trade and Investment (WGTI), the Indian Ocean Rim Business Forum (IORBF), and the Indian Ocean Rim Academic Group (IORAG). The Association holds a Council of Ministers meeting once every two years. The working groups also include business and academic representatives, something yet to be acceptable to SAARC. Its secretariat is based in Mauritius, and India is the current Chair and a senior Indian diplomat heads the secretariat.

The IOC-ARC mission comprises of "To promote the sustained growth and balanced development of the region and of the member states, and to create common ground for regional economic co-operation." Among other things, the IOC-ARC has on its plate issues in maritime security and sea piracy which is a growing menace for the Indian Ocean region. India has stressed the need to ensure consensus among the group and to work with like-minded countries. While transparency is emphasized, the group is not seeking mandating for using force.

Although on an entirely different plane, India's multipronged links with ASEAN are also geared to promote all round regional cooperation and stability.

The India-ASEAN dialogue partnership has grown from an initial sectoral dialogue to encompass summits, ministerial meetings, senior officials meetings, and meetings at the experts level, as well as through dialogue and cooperation frameworks initiated by ASEAN, such as the ASEAN Regional Forum (ARF), the Post Ministerial Conference (PMC) 10+1, the East Asia Summit (EAS), ADMM and several sub-regional initiatives like the Mekong-Ganga Cooperation. Demonstrating commitment and shared interest for ensuring peace, security, stability and development in Southeast Asia, India has been party to the Treaty of Amity and Cooperation in Southeast Asia (TAC) since 2003. ASEAN–India Free Trade Area (AIFTA) came into effect on 1 January 2010.

ASEAN-India bilateral trade grew at an annual rate of 11.2percent, from US$ 2.9 billion in 1993 to US$ 12.1 billion in 2003. In the next decade, total trade between ASEAN and India reached US$ 80 billion in 2013 and aspires to touch US 100 billion by 2015, and US 200 billion by 2022. At the ASEAN-India Commemorative Summit held in Delhi in December 2012, the leaders adopted a vision statement. An eminent persons group submitted its report with recommendations for forging an even closer partnership for peace, progress and shared prosperity. The vision statement declared inter alia, "India will support and cooperate closely with ASEAN to realize the ASEAN Community in 2015, comprising three pillars, namely, the ASEAN Political Security Community, the ASEAN Economic Community and the ASEAN Socio-Cultural Community. "They also decided to set up an ASEAN India Centre using existing capacities. The vision statement is a very far reaching document covering all aspects of cooperation between India and ASEAN with definite timelines and goals. The Delhi Summit marked the most important and successful dimension of India's trans-regional outreach in Asia.

The Shanghai Cooperation Organisation (SCO) group - including Russia and China and the central Asian states of Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan - was set up in 2001. Afghanistan is invited to the SCO annual meetings as a guest, while Iran, Mongolia, Pakistan and India are observers. Belarus and Sri Lanka became SCO dialogue partners in 2010 and Turkey in 2012. The early ostensible aim of the group was to curb extremism in the region, and enhance border security, but it was generally viewed as a counterpoise to NATO presence and influence in Afghanistan over broadly the same period – the US asked to join in 2005, but was rejected. Defense and security cooperation is an important part of the SCO agenda. The armed forces of the Shanghai Cooperation Organization members held a "Peace Mission 2012 drill in Tajikistan from June 8 to 14 involving more than 2,000 servicemen from

China, Kazakhstan, Kyrgyzstan, Russia, Tajikistan and Uzbekistan. The scenario envisages joining forces in anti-terrorist operations in mountainous areas against the background of a regional crisis caused by terrorist activities.

As it has evolved, the SCO has sought to develop co-ordinated measures to stabilise economies and maintain growth in Eurasia through multilateral trade and co-operation. The Beijing Summit last June outlined the "mid-term development strategy". The main objective is to "build the SCO as a practical and highly effective platform for cooperation". Building a region with lasting peace and common prosperity marks the core policy guidelines. It was decided to revise the SCO regulations on political and diplomatic measures and mechanisms of responses to events jeopardizing regional peace, security and stability, in order to enhance joint early warning, crisis management, interaction and interoperability (capability). The SCO came up with a comprehensive policy plan of long-term cooperation in tackling strategic issues. It's program of coping with terrorism, separatism and extremism for 2013-2015 specified plans to counter the activities of these "three forces" in the region. Generally, the SCO member states agreed to make the organization an effective instrument of regional security; although an underlying motif appears to be how to position SCO to deal with Afghanistan after the US withdrawal in 2014.

Addressing the 13th Summit of the Shanghai Cooperation Organization (SCO), which opened on 13 September 2013, in Bishkek, the Indian External Affairs Minister Salman Khurshid said that the summit was taking place at a crucial juncture in global politics, with many nations seared by violence and conflict; adding,: "We are keen to deepen our security-related cooperation with the SCO in general and with the regional anti terrorism structure, in particular. [India has long been a victim of terrorism and we are acutely aware of the threat that its perpetrators pose to our people]. We are of the firm view that only multilateral efforts and integrated actions can help effectively counter these negative forces, including the related evils of drug trafficking and small arms proliferation. We look forward to the signing of the model protocol of Intent in the near future as a demonstration of our willingness and commitment," he added.

Showing increasing concern about security-linked challenges which may emanate from the developing situation in Afghanistan, EAM Shri Salman Khurshid expressed strong belief that Afghanistan can successfully complete the security, political and economic transitions in the coming years, and regain its historical place as a hub for regional trade and transit routes. "However, this presupposes fulfillment of pledges made by the international community for security and

civilian assistance to Afghanistan and non-interference in Afghanistan's internal affairs. We see SCO as an important body that can offer a credible alternative regional platform to discuss the challenges related to Afghanistan." EAM Shri Salman Khurshid affirmed that India stood ready to play a larger role in the SCO as a full member, once the organization reached consensus on the expansion process, - "It is our conviction that an expanded SCO will be a more effective body to address the numerous security and developmental challenges that our region faces".

Presidents of Afghanistan, Iran and Turkey attended the 13th Summit and had separate meetings with Putin and Chinese President Xi Jinpeng. China and Afghanistan announced "a new strategic level" of relations.

The SCO presidents signed a number of documents, including the so-called Bishkek Declaration. The declaration reiterates the SCO member states' cooperation and joint efforts against illegal drug trafficking, terrorism, extremism, and separatism. The document also calls for a peaceful solution to the crisis in Syria, joint measures to secure stability in Afghanistan, and further development of trade, transportation, and economic ties between member states.

All things considered, the SCO's evolution as an effective body will have to contend with competing regional interests of Russia and China. Even as it has been concerned about Islamic extremism emanating from Afghanistan, China has opened channels with the Taliban and has the all weather friendship with the Taliban's main external sponsor, Pakistan. Beijing was reportedly in touch with Taliban earlier this year. Russians are more apprehensive about the Taliban and skeptical about Pakistan's role. Like in the past, Russia might not be averse to backing anti-Taliban forces when the chips are down. Moscow has so far repeatedly stressed that the SCO should not look to take on a military role in Afghanistan. Russia looked up to the Bishkek Summit for focus on how the SCO could play a stabilizing role in Afghanistan after 2014 to prevent the country from disintegrating intochaos.

Analysis: Having thus given a longish a description of the status of India's ties with regional organizations, the important point of this article is to see how India is poised to make the best of these arrangements for its own national development and security. The following observations are relevant:

Security and Cooperation

Security and cooperation in South Asia cannot be ordained or gifted from outside the region. It has got to grow from the grassroots among its billion and a half people. SAARC Summit decisions encompass a whole range of themes in this

context, such as people-to-people connectivity, transport and communications, health and education, energy grid, food bank, poverty alleviation, empowerment of women, combating crime and trafficking and fighting terrorism. South Asia is ripe for action in these areas and demands greater coherence of planning and operational will on the part of its constituents.

There are axioms and paradigms which are germane to 'security', but which militate against each other: On the one side is the story written by war theorists of a by gone era, a story rooted in alienation, clash, antagonism, deterrent, zero-sum-games, exclusion, boycott, attrition, scorched earth and annihilation. On the other side is the path of understanding, engagement, inclusion, empathy, interdependence, cooperation, positive- sum- games and bonding among peoples to prevail against impending menaces.

The second path commends itself to South Asia where pursuit or drift of Clausewitzean security seems to have led it nowhere in solving problems. Given the stage of development, governance and polity in the region, seeking security in exclusively conventional terms risks being half-baked and chimerical. Drumming up war hysteria or antagonisms can also lead to catastrophic failures. Severe limitations of policies of *shathe shathyam* (Sanskrit expression which comes close to tit-for-tat) can be perhaps understood in this milieu. Even a tiny lunatic fringe of such large populations, in absolute numbers, can be out of anyone's control.

So, while war can no longer solve problems, nor is it affordable any more given its humongous costs, the path of pursuing cooperation and understanding would not harm anyone. But that path offers no escape from the hard time that conflict imposes on leadership and peoples. It requires discipline, alertness, probity, and integrity of purpose andprovides no room for equivocation and hedging on action.

SAARC premise of consensus has been more limiting than enabling, as regards the unfurling of regional cooperation – its minimalist point being "no objection" but hardly a firm stance for working together.SAARC suffered from skepticism about commensurate returns from a push for regional integration, especially given hard and intransigent positions of neighbours so far, and bilateral routes proving relatively more cost effective and less intractable. Regionalism in SAARC lacks habits of cooperation, hard work, consistency, definite timelines and ownership of diverse national stakeholders.

That India must persist regardless is the *sine qua non*, but the attitude of neighbours is vital. Each of them has had a different narrative. Pakistan's no-holds-barred quest for parity with India dominates all else including SAARC's progress, and Pakistan's engagements with other regional forums such as ECO,

SCO and CICA. Sri Lanka fancies itself as another Singapore or Dubai in the works, and often shows instead of 'win-win', a disposition to 'win and quit'. Bangladesh cooperates but causes agonizing delays weighing all its options all the time. Nepal has been too preoccupied internally and only now shows promise of emerging from the post-Maoist interim peace building phase. Bhutan and Maldives despite their positive attitudes, are far too small to make a big impact. Afghanistan's future stares into an abyss or sustainable development, and national renewal depending upon how the calendar of crucial events of 2014 unfolds.

All SAARC neighbours put a better foot forward when they see India growing fast and steady and walking tall in the big league, as was the case from 2003 onwards till the recent crises. China hovers over South Asia as a colossus and apart from its alliance with Pakistan, its expanding ties with Sri Lanka and Bangladesh might render negligible the value of SAARC in due course. They see China as a balancer of India, and prefer to deal with both either equally, or in a variation of Kautilya's dictum about neighbour's neighbor. Except Nepal and Bhutan, no SAARC neighbor of India has undisputed contiguity with China.

Smart interlocutors of India in the extended neighbourhood have been the Asean members, Singapore, Thailand, Indonesia and Malaysia who tapped opportunities for mutual gain and expanded the relationship from US 2.7 billion dollars in 1993 to US 80 billion in 2013 – even though the potential is still greater. Likewise, the IOC-RIM states too have shown ability to focus on the economy and build up ties. They see commonalities abound in mutual approaches to so many issues in the broad economic spectrum and are quick to act.

India has assiduously forged its greater involvement with ASEAN and East Asia under its look east policy. The trade target of US 100 billion with ASEAN matches that of China despite the huge size of the latter's economy. The geopolitics of Asia favours growth of India's interface with its extended neighbourhood as never before. But India must make haste and move up the ladder before the window closes. To draw complacence from the US 80 billion trade with ASEAN, or US 60 billion plus with China, or US 290 billion in the IOC-ARC betrays lack of ambition, since in the larger perspective these figures hardly compare well either with those of other major emerging economies, or with India's own potential. China trades with South Korea in a range above US 200 billion dollars annually, while Japan-China trade is more than US 300 billion. ASEAN's trade with India is about 3 percent of its global trade.

Look east policy and the regional diplomatic offensive has served to raise India's peaceful, tolerant and friendly profile, wiping out the unfair blemishes of the Cold War era. Fault lies in our domestic inability to gather strength and will

to move with the times. Governance deficit is an unfortunate cliché that sticks easily to India and appears difficult to shake off.

SCO is an entirely different ball game in that China has withheld our joining for a decade despite Russian support. Whenever India gets to join SCO, it will be expected to show a stronger, independent and astute hand. As for the favourable bias given by the historic friendship with the Soviet Union and subsequently Russia, there is much to be said to cherish and nurture this process keeping in view a multi polar world. Some commentators also visualize inherent strains in the Sino-Russian relationship in central Asia, which implies space for India to play a role, or carve a niche for itself. A future perspective cannot be without assessing the fate of globalisation the salient features of which are summarized as follows. Reduced costs of communications, transportation and coordination helped multinational businesses to manage supply chains much more efficiently. Economic advantages accrue not only for manufacturing, but also services and other business functions. These underline the interconnectedness of the global economy, but the entire gamut of related processes is complex. It has been dealt with progressively by combining management training, technology and trade liberalization under GATT/WTO.

"Markets that had local regional or national boundaries have been shedding those boundaries" Michael Spence.

Developing countries – especially emerging economies made use of the opportunities given by these trends in the global economy to what the economists termed 'jump start to catch up growth'. The question is to what extent has this impacted South Asia as a region and whether the positive effects – or even challenges for that matter- of globalization have brought SA countries together as a region.

What is holding up?

- *Infrastructure, Education*: Underinvestment is the main cause. Most common features are lack of openness to the global economy and lack of government investments for infrastructure and education. There is a problem of both quantity and quality.
- *Demographics*: Huge numbers joining the job markets annually, but scant prospects for employment. These put pressures on global concerns like migration. The seamy side of this is international crime, terrorism, human and drug trafficking – all of these afflict South Asia.
- *Poverty trap*: Day to day demands of life in poor societies generate pressures on the polity which inexorably leads to a stampede

where vital investments on longer term plans may get forced out. However, China in the final decades of the last century showed that this poverty trap could be broken.

- *Governance issues*: Dysfunctional governance is a prescription for low growth and for divisive and violence prone politics. The mis-governance trap is far more potent than the poverty trap.
- *Natural resource curse*: Was one of the reasons given for the bottom billion in Africa. In South Asia it manifests of and on to queer the pitch for bilateral or regional cooperation.

Present crisis in global economy

The 2008 crisis in the US impacted consumer attitudes in the world's largest economy. In turn, this led to reduced global demand by a figure which can be as high as US trillion dollars. The Euro zone crisis compounded this situation further and some economists estimated the impact to be upwards of another US 350 billion. This environment pushed growth – and employment – close to a zero-sum game – and protectionist tendencies mushroomed as countries tended to vie for their share of the dwindling market. Developing countries' growth aspirations became difficult to realize, at least not for all countries. In the battle for market share, it is likely that larger countries may prevail, while prospects may diminish for weaker economies. The indications about the post crisis praxis are in this general direction. Hopes for a counter trend may lie in the ability to sustain robust growth of some emerging economies. Much will depend on how South Asians position themselves collectively, or individually in this unfolding scenario?

Inability to forge regional and sub regional linkages of cooperation may cause security and stability in the region to become weak and fragile. The lesson from successes everywhere else is that growth and stability may elude those who pursue isolationism.

Ambassador (Retd.) Dr. Sheel Kant Sharma

Dr. Sheel Kant Sharma holds a Ph. D. in high energy physics from the Indian Institute of Technology, Bombay and belongs to the 1973 batch of India's diplomatic service, IFS. He served as Ambassador of India in Vienna and Permanent Representative to the UN offices including IAEA (2004-08) and as a Governor on its Board of Governors. He headed the foreign office division dealing with South East Asia and the Pacific as Joint Secretary (South) during the initial years of India's Look East Policy (1991-94) and as Joint Secretary (DISA) and Additional Secretary (International Organizations) headed MEA's nonproliferation, disarmament and security division, as also international organizations from 2000-2004. During his career in the foreign service, his diplomatic assignments were in Kuwait, Saudi Arabia, Geneva, Algeria and Vienna; the last one was a stint in IAEA Secretariat. Dr. Sharma was also the Secretary-General of SAARC from 2008-11. IIT Bombay gave him distinguished alumnus award in 2007.

India/Iran – A New Beginning?

Air Marshal (Retd) Anil Trikha

Background

Until the creation of Pakistan in 1947, India and Iran were neighbours. Sharing a common civilizational space over millennia had given birth to a close cultural identity. However, post independence, India and Teheran found each other on different and divergent tracks. Under the Shah, Teheran became a cog in the US led Western alliance against the Soviet Union. On the other hand, India despite its strenuous attempts at emphasizing its non aligned credentials, was perceived to be in the Soviet camp. Shah also found it easier to relate to military dictators of Pakistan rather than the populist, ideologues in India. A weak, unsure, bankrupt India was of little interest to Iran.

Iran's bias against India became clear by its support for Pakistan during the wars in 1965 and 1971. When US suspended military aid in 1965, Iran is reported to have bought for Pakistan 50 F 86 Sabres from West Germany. In 1971 also, it openly sided with Pakistan by calling India the aggressor.

Of course, India continued to be a customer of Iranian oil and some trade flowed in the reverse direction as well. Some high level state visits also took place. But, by and large, Indo Iranian relationship never acquired any degree of depth. Then in 1979, Iran got caught up in the violent whirlwind of its Islamic revolution, and for several decades thereafter virtually shut itself away from the world at large. With the end of the cold war, the world and with it India changed. Under President Khatami, Iran made feeble attempts to break out of its isolation but before much could happen, it was again overtaken by events. President Bush declared it as a state sponsor of terror and a charter member of the 'axis of evil'. The two term presidency of

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Ahmednejad pushed Iran deeper into a the hole than ever before.

India in the meantime moved rapidly towards establishing a strategic partnership with the US. Our relationship with Israel also became multi-dimensional. Though both sides remained politically correct and never made an issue of their different affinities, it clearly imposed limits on what could be achieved. Of course, Iran accepted rupee payments for its oil, but that was more out of necessity imposed by sanctions, than any sudden upsurge of good will.

Geopolitics of South and Central Asia and the Middle East is currently undergoing a tectonic shift. Under the circumstances, it is worth exploring the forces being played out, and how they could impact the future of Indo Iranian relations.

Why Iran could be on the Cusp of a Change

After a prolonged stalemate, finally Iran and the P5 plus Germany have succeeded in reaching an interim accord on Iran's contentious nuclear programme. Accepted wisdom is, that it was the crippling effect of sanctions which compelled Iran to accept tough restraints on its nuclear programme, in return for release of some 6 or 7 billion US dollars of its frozen assets. There is certainly some truth in this. Sanctions were biting hard. Iranian currency had lost nearly 50percent of value and inflation was running at about 40percent. Iranians were generally unhappy with the sorry state that the incendiary rhetoric of their President Ahmadinejad had reduced them to. Evidence of this emerged in the June elections, when fighting on a platform of moderation, Rouhani got a strong mandate. In Iran, the veto on all government policy rests with the supreme leader. The state apparatus under his control has the power to reverse or nullify any government policy or decision, which may not be in accordance with the broad ideology of the state enunciated by him. Therefore, it is safe to assume that Rouhani had the Supreme leader's approval for his more accommodative posture towards the erstwhile detractors of Iran – the United States being on top of that list.

Viewed in the context of the rapidly changing geopolitics of the Middle East and South Asia, there is evidence to suggest that the change of atmospherics in Iran could be signaling the beginning of a process with far reaching consequences.

Iran and the Geopolitical Storm Engulfing the Region

Broad outline of Middle East history tells us that the region has been in a state of turmoil for nearly a hundred years now. Before WW, I there were three centers of power i.e. Egypt, The Ottoman Empire and Iran. WW I changed all that. With lines literally drawn in the sand, the Ottoman Empire gave way to five different states with competing interests. More importantly, it sowed the seeds for a Jewish state to be carved out of erstwhile Palestine. Since the creation of Israel in 1949, the - Arab Israel dispute, and the politics surrounding it had been an enduring feature of the region.

In 1979, Iranians overthrew the Shah. The revolutionary fervour that erupted on Iranian streets, not only alarmed the conservative monarchies in the region, but also added even more fuel to the smouldering anti Israel fire. Through the many upheavals that rocked the region in the following two decades, US policy in the region remained anchored towards cultivation of regional allies to defend its oil interests, to build Israel as the region's pre-eminent military superpower, and to balance the newly emergent revolutionary state of Iran.

With the US launching its global war on terror in the wake of 9/11, this narrative changed dramatically. In a fit of blind rage, the US first picked Afghanistan, and later in 2003, shifted its sights towards Iraq. Iraq proved to be the wrong target. Removal of Saddam Hussein from the region's equation eliminated the principal balancer of Iran's power. Elimination of this pawn from the regional chess board enhanced Iran's influence in the region by leaps and bounds. At the same time, the United States found itself increasingly bogged down first in Iraq, and then in Afghanistan. An Iran largely opaque to the outside world, irrevocably hostile to the United States and Israel, and with an ominous nuclear programme in the basement, was the new reality of the region's politics.

Then in 2010, another phenomenon called '*The Arab Spring*' seized the world's imagination. It seemed, or at least the public was led to believe, that the spark lit by Bouazizi in Tunisia would start a chain of fire cracker revolutions, which would sweep aside the old corrupt autocratic regimes, and a new democratic liberal order emerging out of this churning, would change the political landscape of the Middle East. The expectation was that sooner or later, Iran would also get caught in this maelstrom and produce a similar result. None of that has come true. Tunisia, where the initial spark had started, stood apart for a while. Its European feel seemed to have survived the turmoil. Now the terror of suicide attacks (which were

unheard of earlier), are making themselves felt on Tunisian streets. Libya is in a state of chaos. Outside Tripoli, most of the country is in the grip of Islamist militias, one of which killed the American ambassador in 2012. Egypt the most populous and the most important state in the region is in a turmoil, with the return of the military's draconian rule. Morsi has been put on trial for treason. The choice in Egypt appears to have been reduced to fascists in uniform, or fascists with the Qur'an. Civil war raging in Syria for the last two years has taken a toll of hundreds of thousands. Two million Syrians have fled the country in search of safety. The country is being reduced to rubble. With no end to the conflict in sight, there is fear that the war could spread to engulf the entire region. Iraq though not an '*Arab Spring*' state, is in the throes of extreme sectarian violence. Recently, Fallujah the hotspot of Sunni extremists in the Anbar province bordering Syria was taken over by a clone of Al Qaeda, calling itself the 'Islamic State of Iraq and Sham'. Therefore, instead of a democratic utopia emerging out of the *Arab Spring*', what we are witnessing is a series of failed or failing states stretching from Pakistan to the Maghreb.

The void created by civil war like situation in Syria, Iraq, Libya and the Yemen and brittleness of dictatorial regimes like Egypt has enabled hard line Islamic militants to move to the center stage. Consequently, Al Qaeda and its many regional clones are gaining in strength with each passing day. According to some accounts, Al Qaeda controls more territory today than any time before in its 25 year history.

The United States remains the pre-eminent extra regional player with a vital stake in the Middle East. Saudi Arabia and Israel have thus far been the lynchpins of its policy in the region. The construct of the US - Saudi relationship survived inspite of the ghastly aftermath of 9/11, and despite the fact that 15 of the 19 hijackers were Saudi citizens. In the United States' war against terror, choking sources of finance to the terrorist groups has been one of the.principal weapons. The Saudi government has also moved aggressively against the Al Qaeda cells in its territory. But, while it fights militancy at home, Saudi money has continued to leak towards the factories of *jihad* in Pakistan and elsewhere. It is a well known and widely acknowledged fact, that the fountainhead of extremist political Islam derives both its ideological inspiration and plenty of funds from Saudi sources. With shale oil, the United States would soon be ending its dependence on Middle Eastern oil. While this does not mean that the US would lose interest in Saudi oil, its security interests may compel it to take

a call on Saudi complacency over the widening stain of threats.

Israel resonates differently both at the level of the general public's sentiments, as well as in the politics of the United States. Besides close identification due to their common Judeo Christian roots, Israel is the main bastion of US interests in a region, otherwise inhabited by apparently reactionary forces subscribing to a way of life alien to Western sensibilities. Given the strength of public emotion towards Israel, no political party in the United States can survive the charge of being less than completely pro-Israel. And, of course, powerful Jewish lobby groups with their enormous political and financial clout have ensured that this perception is not allowed to fade from the American consciousness. While there is no attenuation in the Israeli lobby's appeal or strength, a perception seems to be taking hold that no matter how special the relationship, Israel must not be allowed to dictate the foreign policy of the United States. Israel's obstinacy on the issue of West Bank settlements, and the subtle differences between the two parties' response to Iran's nuclear programme is symptomatic. On Iran's nuclear problem, while the US and the rest of the world are viewing the interim agreement as a historical opportunity, Israel calls it a historical mistake.

The conflict in Syria has revealed multiple cracks in the polity of the region. However, and for whatever reasons the conflict might have started, for all intents and purposes, it is now a proxy war between the Saudis and the Iranians. Saudis have been supporting rebels of all descriptions with weapons and funds, while Iranians have been standing behind the Assad regime. Saudis had taken it for granted that Americans would weigh in on their side, and bomb the Syrian regime out of existence. They want to see the demise of the Syrian regime, just as much for their antipathy towards Assad, as to clip Iranian wings.

Viewing it as an ongoing phenomenon of the *Arab Spring*, initially in the West there was much enthusiasm to support rebels. The Assad regime was issued many threats and ultimatums. Under intense pressure to do some thing, President Obama had drawn a red line around employment of chemical weapons. However, when the red line was crossed, Americans stepped back from executing their threat. Now the reality of the situation seems to be sinking in, that affiliate groups of Al Qaeda have by and large hijacked the rebellion, and if they succeed, Damascus could become another beehive of terrorist activity. With adjoining Iraq already teetering on the brink and its disenfranchised *Sunni* minority in revolt, the whole region

could become a black hole of terrorism. Under the circumstances, some sort of a compromise with the Assad regime is very much on the cards. After all, a known devil is any day better than an unknown one. Secretary of State Kerry's statement that Iran could also have a place on the table is revealing of how much and how rapidly the atmospherics have changed.

By the end of 2014, the US is scheduled to withdraw the bulk of its forces from Afghanistan. Looking at the state of play as of now, the Afghan Taliban appears to be the strongest contender to fill the resulting power vacuum. State institutions being fragile and weak, Afghanistan could descend into chaos reminiscent of the 90s. The United States has invested much blood and treasure to prevent such an outcome. Iran also has a vital stake, and has been playing a constructive role for stabilizing Afghanistan. Therefore, it could be a potential ally of the United States in preventing a walk over.

This is broadly the geo-political context in which the United States is engaged with Iran, and in which negotiations between Iran and its interlocutors are taking place in Geneva.

Indian Interests

Iran as a Source of Oil and Gas

The first and most obvious aspect of India's relationship with Iran is India's energy needs. To put it in perspective, India imports nearly 80 percent of its requirements of oil. In 2012, we imported US$ 157 b worth of oil accounting for 34 percent of the total import bill. In the coming years, India's energy requirements and dependence on imports will only grow. Therefore, securing hydrocarbons from reliable and diverse sources has to remain one of our enduring foreign policy objectives. Because Iran is the closest major source, and has traditionally been one of India's principal suppliers, it figures pre-eminently in the calculus of our energy security.

The impact of sanctions can be gauged by the fact that Indian oil imports from Iran fell from 21.2 million tonnes in 2009–10 to about 13 million tonnes in 2013-14. MRPL the largest single importer of Iranian oil had to go as far as Libya for its crude supplies. Imports from Venezuela and Libya obviously cost us more because of higher shipping costs. Iran suffered much more, because since the imposition of sanctions, its exports were reduced to less than half. Therefore, sanctions are hurting both sides, and both have been trying to work around them to minimize the impact.

With the intention to choke the Iranian economy, the United States has in place provisions to penalize all financial institutions which transact business with Iran. Because of their critical dependence on Iranian oil, China, Japan, South Korea and India had got some relief by obtaining temporary waivers. But, to demonstrate their compliance with the sanctions regime, they have to progressively reduce oil imports before seeking renewal of waivers.

Because sanctions were hurting Iran badly, it was amenable to offering concessions. By some innovative thinking in July 2011, an arrangement was worked out by which India would pay for 55 percent of its oil imports in Euros through a Turkish bank. For the remaining 45 percent, a rupee account was opened in the UCO bank in Kolkata. That kept not only oil flowing, but also helped reduce some of the pressure on a falling rupee. With sanctions tightening further, by February 2013, the route for Euro payment was squeezed shut. Iran tried to diversify the currency route. It even tried the Russian rouble . When nothing worked, Iran even agreed to accept rupee payments for its oil. Essentially, it was a barter route. In exchange for oil, India would export goods not restricted by sanctions e.g. agriculture produce, car spares, pharmaceuticals etc. India has a large balance of payments deficit with Iran. Therefore, there was an opportunity to redress the adverse balance. However, the exports basket being limited by sanctions, success has been limited. So, as things stand, Iran has a huge rupee holding in the UCO bank which it has to liquidate through import of Indian goods.

Besides impacting routine oil trade, more serious sanctions may also jeopardize India's long term energy interests vis a vis Iran. Perceptions about India's stance in Iran's spat with the West have not been helpful. In 2005, at the IAEA, India voted in favour of referring Iran to the Security Council for its alleged clandestine nuclear activities. As a direct consequence, Iran cancelled the gas deal under which it was to supply 7.5 metric tons of Liquefied Natural Gas (LNG) annually for 25 years, commencing in 2009. There was a strong perception that India had succumbed to US pressure, because it was looking to sign the civilian nuclear deal with the US. Iran thinks that India pulled out of the IPI deal also for the same reason.

In 2002, ONGC Videsh Ltd had negotiated with Iran to prospect for oil and gas in the Farzad B offshore block. After drilling several exploratory wells, in 2008 the field was declared commercially viable.

Farzad B is estimated to hold potential reserves of the order of 22 trillion cubic feet(tcf) of gas – of which nearly 13 tcf are considered recoverable. A consortium of three state owned Indian companies were to invest US$5.5 billion in developing the field, and another US$2.5 billion for a liquefaction plant. In return, they were to get attractive production sharing contracts (PSC). In a production sharing contract, instead of fixed returns on investment, the operator gets a share of production or revenues in proportion to its investments. This was the first time since the Iranian revolution in 1979 that any entity was being offered a PSC. It was clearly a big deal. In 2010, OVL even submitted a master development plan. But, then for fear of penalties under tightening sanctions, the Indian companies remained reluctant to finalize the contracts. In retaliation, Iran has threatened to cancel both the rupee sale of oil, as well as Farzan B contracts. Reasons are of course political. Iran is keen to demonstrate that in its quarrel with the West, it is not entirely friendless –India on the other hand is tied by its own compulsions.

With the loosening of sanctions, the situation is likely to change quite significantly. Concessional terms which have been on offer for Iranian gas and oil to India are likely to disappear -. simply because, there are more than enough energy hungry buyers for Iranian oil and gas. Iran is also looking to geopolitical opportunities to diversify its markets.

In July 2011 Iran, Iraq and Syria announced that they planned to sign a contract to construct a pipeline running from Iran's rich South Pars gas fields towards Europe. The proposed pipeline would be routed via these countries to Lebanon and then under the Mediterranean to a European country – possibly Greece. In Greece it could plug into the Trans Adriatic Pipeline and supply gas to Europe. Of course, considering the investments required, and the general turmoil prevailing in the region, the project appears to be in the realms of fancy. The essential point however is, that so as not to put its eggs in a single basket, just as India tries to diversify its sources of supply, Iran would be looking to diversify its markets as well. And in an energy hungry world, buyers are likely to outnumber suppliers by a margin.

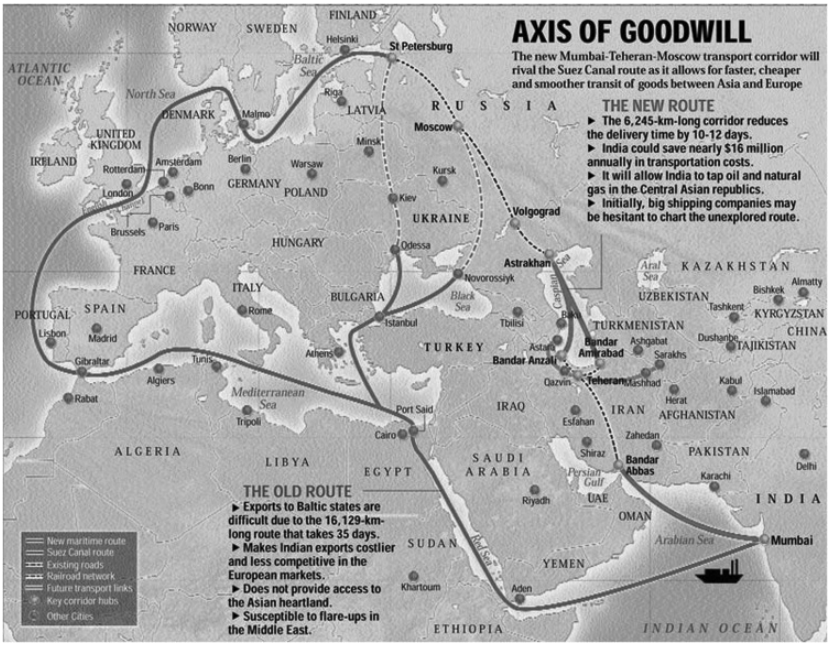
Therefore, India has to be smart about harvesting opportunities as they arise

Iran as a Gateway to Central Asia

While Iran's abundance of oil and gas reserves and its proximity makes it an important factor in India's energy security, its geographical location is also

crucial to India's political and economic interests. Since Pakistan does not allow transit of Indian goods, Iran becomes India's natural gateway to the potential markets of Afghanistan, Central Asia and beyond.

To enhance trade relations between South and Central Asia with Russia and Europe, India, Iran and Russia signed a MOU in St Petersburg in 2002 to develop a North–South transport corridor to move freight to and from South Asia to Russia, Europe and Central Asia through Iran by ship, rail, and road. This *"International North–South Transport Corridor"* will have its starting point from the JNPT Port in Mumbai, to Iranian ports of Bandar Abbas and Chahbahar. The goods would then move overland to Iranian destinations, including ports on the Caspian Sea. From there a number of rail, road and sea routes open up towards Kazakhstan, Turkmenistan, the Caucasian republics and Russia. Because the main corridor has several laterals running across the region, the network can be further expanded to include a vast territories in Europe, and Central Asia.



Map: International North–South Transport Corridor

An idea of the degree of interest in the project can be gleaned from the fact that in addition to India, Iran and Russia – the original signatories to the project, Belarus, Kazakhstan, Tajikistan, Azerbaijan, Armenia, Syria and Oman have also joined the group. Turkey, Bulgaria, Ukraine, and Kyrgyzstan are the other interested parties. The route will reduce transport costs and travel time to destinations in Europe significantly. While the Suez Canal route takes about 45-60 days, the Iran route will take just 25-30 days. Therefore, the project has the potential of weaving a vast area into a mutually beneficial web of commerce. Iran is of course the pivot around which the project revolves.

Iran has a reasonably well developed road and rail infrastructure with its neighbouring countries. The few remaining gaps to facilitate seamless transit of goods – particularly by rail, have been identified, and work is in progress to fill the gaps. Progress has been slow for a number of reasons, including the war in Afghanistan and sanctions on Iran.But, despite US objections to doing any deals with Iran, interest continues to remain alive. In fact, a trial run was supposed to have taken place in 2013.

As a part of the project, India is to invest US $ 100m towards development of Chah Bahar port and a trans-shipment facility at Bandar Abbas.

Iran's Role - Post US Withdrawal from Afghanistan

The United States is scheduled to withdraw its forces from Afghanistan by the end of 2014. As of now, the two governments have not been able to agree on the terms for a *'Status of Forces'* agreement which waild liave enabled the US to maintain a substantial residual military force in Afghanistan after 2014. State institutions of Afghanistan are weak, and therefore there is bound to be a vacuum of authority in the wake of the withdrawal. The Taliban appears to be the strongest contender to fill that void. Such an outcome is a source of deep anxiety for both India as well as Iran. India has invested much blood and money to deny Taliban and its supporters in the Pakistani establishment a free run in post 2014 Afghanistan. Iran on its part, has also been a generous donor of aid to stabilize Afghanistan. Following the 9/11 attacks on the United States, both India and Iran supported the Northern Alliance in its fight against the Taliban.

Iran is wary of a *Sunni*-fundamentalist Pashtun state on its eastern border. Incidents of 1998 when Taliban forces captured Mazar-e Sharif in northern Afghanistan and massacred thousands of Hazara civilians, in

addition to nine Iranian diplomats explain Iranian anxieties. Outraged by the killings and Taliban's horrific treatment of the *Shia* minorities, Iran had then amassed a quarter of a million troops along the border and threatened to invade Afghanistan (Recent Kidnaping). Thus, the mistrust between the Taliban and Iran runs deep.

Sectarian tensions between *Sunni* Pakistan and *Shia* Iran are also never too deep below the surface. Some recent events highlight the uneasy state of the relationship. In an orgy of violence, on Jan 21,2014 *Sunni* extremists massacred 24 *Shia* near Quetta. The incident's emotional impact on Iran could not have been slight. Close its heels on Feb 6, 2014 six Iranian border guards were kidnapped by militants from the Iranian province of Sistan-Baluchistan and taken across the border to Pakistan. Iran was so incensed by the incident that its interior minister Abdolreza Rahmani-Fazil threatened to send Iranian forces into Pakistan if the latter did not act with dispatch to secure their release.

Both India and Iran have a shared interest in shaping a peaceful transition to a moderate order in Afghanistan. To enable India to funnel supplies into Afghanistan, Chahbahar is the crucial entry point. Iran has a developed road network from Chabahar upto the Afghan border. India has built a 215 km long highway connecting Zaranj (border city of Afghanistan) to Delaram on the main ring road highway system. This is part of a garland road network in Afghanistan that forms a circular route connecting Herat and Kabul via Mazar-e-Sharif in the north and also Kandahar in the south, thereby linking all the potential major population centers in Afghanistan. India has also proposed a 900 km railway line from Chabahar to the mineral rich province of Bamiyan to the west of Kabul. Considering the investments involved, that is still far in the distant future.

The shared concerns over post 2014 Afghanistan potentially brings India, Iran and the United States onto a common platform. Given the decades of acrimony between Iran and the United States, it is difficult to imagine that the two can make a common cause on any issue at all. But, interests often count for more than ideology, and can make for the strangest of bedfellows.

Chabahar is potentially the entry point to an alternative access route both to Afghanistan as well as Central Asia. It also gives Afghanistan some relief from Pakistan's stranglehold over its exports by opening up an alternative route.

Chabahar is strategically important for other reasons also. It is located just 72 km west of Gwadar. Gwadar's location fits perfectly with China's "string of pearls" strategy, to secure its oil supply route across the Indian Ocean, to protect its oil investments in the Middle East and to generally diminish Indian influence in the Indian Ocean region. Chabahar is ideally located to keep an eye on Chinese intentions.

Conclusion

Since the hostage crisis in 1979, Iran and the United States have been locked in a hostile relationship. From being America's closest ally and policeman in the region under the Shah, Iran became its bitterest enemy. Iran's hostility towards Israel and suspicions over its clandestine nuclear programme caused the relationship to nose dive to such an extent that every so often prospect of tomahawks over Teheran looked imminent.

Its principal antagonist, the US has been at war for the longest period in its history. Wars in Iraq and Afghanistan have left it exhausted, and it is clearly wary of getting entangled in another conflict.

The geo-political landscape of the Middle East and South Asia is changing drastically. The promise of the *Arab Spring* has failed. The void created by the collapse of state institutions is being filled rapidly by *Sunni* extremist elements.

The rulers of the Kingdom of Saudi Arabia draw their legitimacy from being champions of the *Sunni* faith. Despite their lip service to the war on terror, Saudi funds and its *Wahabi* ideology continue to radicalize vast sections of the Muslim population, stretching from Indonesia to the Maghreb. The United States remains one of the principal targets of Muslim anger. Therefore, sooner or later the US must take a call on its cozy relationship with the Saudis.

Israel is the darling of the United States, both for emotional as well as strategic reasons. While this ardour is unlikely to diminish any time soon, there are rumblings that Israel should not be allowed to constrain US policy options to deal with the rest of the world. Therefore, chances are that the United States would move towards a more balanced relationship with all protagonists in the region.

The newly elected government in Teheran seems to have softened its stand towards the West. It has sufficient weight of public opinion behind it to suggest that the reconciliation process will continue. Of course, these are early days and many interests on all sides remain deeply entrenched

in the hostile status quo between the United States and Iran. Therefore, several bumps along the way are to be expected. A mishap could even put the process in reverse gear. However, current trends appear hopeful. If and when controversies over Iran's nuclear programme get resolved and sanctions lifted, Iran will reenter the mainstream of international discourse. That would be a potential game changer.

India and Iran have strong mutuality of interests. However, historical circumstances haven't permitted their full expression. Geopolitics of the region, coupled with internal changes in Iran are now creating space for Indo Iranian relations to develop for each others benefit. While constraints of sanctions will continue to remain in the near future, and India will have to tread cautiously (lest it be seen to be undermining international efforts to restrain suspected Iran's nuclear ambitions), the door does seem to be opening a crack for India to lay its blueprint for the future.

India also has a vital stake in its relations with the neighbouring GCC countries. Over six million Indian workers earn their livelihoods there, and repatriate billions of dollars to their families back home. So long as the tussle for influence in the region between Iran on the one side, and Saudis along with the sheikhdoms of the Gulf on the other persists, India will have to walk a tight rope to balance its relationships. Tensions in the region are also being cast in sectarian terms of the deepening *Sunni / Shia* divide. For the sake of harmony at home, India must not be perceived to be taking sides in this inflammatory dispute.

The emerging scenario would clearly be as tough a test for Indian diplomacy as any.

What benefits India can harvest from Iran's likely opening to the world would depend much on the alacrity with which our establishment responds to the new possibilities.

Air Marshal (Retd) Anil Trikha

Joined the IAF as a fighter pilot in April 1964. Has flown nearly 5000 hours on fighter and trainer aircraft. Trained as a flying instructor and deputed abroad for flying training of cadets.

Flew a number of missions during the 65 and 71 wars against Pakistan. Was 'Mentioned in Despatches' for conspicuous acts of bravery during the 71 war.

Served as Air Advisor in the High Commission of India in London from 1995 to 1998.

Subsequent appointments include

- Commandant of College of Warfare at Secunderabad,
- Air Defence Commander South Western Air Command
- Commandant National Defence Academy and
- AOC-in-C Southern Air Command.

Recipient of three Presidential Awards for distinguished service during peace time i.e. Param Vashisht Seva Medal, Ati Vashisht Seva Medal, and the Vashisht Seva Medal.

Retired from the Air Force in Jan 2004.

After retirement, appointed Chair Professor of 'Air Power and National Security Studies' in the 'National Institute of Defence Studies and Analysis' at the University of Pune until Sep 07.

Now writes on Strategic Affairs in various journals and newspapers and delivers lectures occasionally at different institutions.

Current Internal Dynamics in Pakistan

Shri Rana Banerji

The May 11, 2013 elections to the national and provincial assemblies marked a significant political watershed in Pakistan, representing the first ever smooth transition to a newly elected civilian government, without military intervention. There was 'normal' transition to a new civilian government after completion of a full term by the previous civilian government, itself elected democratically in 2008.

The election results were pleasing for the conservative forces in Pakistan. Right of centre political parties did well, especially in Punjab and Khyber Pakhtunkhwa (KP). Parties like the Awami National Party (ANP), People's Party of Pakistan (PPP) and Muttahida / Mohajir Quami Movement (MQM-Altaf), which could be deemed either centrist or moderate/ 'secular' suffered reverses, except perhaps in Sindh. The Pakistan Muslim League (Nawaz) obtained a simple majority, with the help of a near landslide in Punjab, while Imran Khan's new Tehrik e Insaaf Party was able to cobble together a coalition government in KP. In a sense, the results accentuated ethnic regionalisation of mainstream political parties.

In the past, whenever Nawaz Sharif came to power with a decisive mandate, he showed impatience in dealing with the entrenched military bureaucracy, which caused his government to come to grief rather peremptorily. This time, he seemed to have acquired greater maturity and political sense. His government has to tackle a number of problem areas, where the traditional or typical politico-military dynamics of Pakistan can play out with unpredictable consequences. Nawaz will have to make important choices while facing the question whether he would like to bridle the military, and how soon or how effectively he would be able to do so.

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Dealing with the Tehrik e Taliban (TTP)

One of the foremost issues would be how to deal with the threat of Islamic terrorism. In the past, the army in Pakistan used the 'Islamic crutch' for symbolism- touting mottos of '*iman*' (belief), *taqwa* (fear of Allah, righteousness of conduct), and '*jihad-fi-sabilillah*' (fight in the cause of Allah) to justify repeated unconstitutional abrogation of the democratic process. It often turned a 'blind eye', not only because it was using Islamic parties to justify its domestic political repression, but also because it was using some of these groups as 'non-state actors' to sponsor low grade 'proxy' trans- border insurgency movements, in Afghanistan, the Indian Punjab and Kashmir.

The army's initial attempts in tackling the Tehrik e Taliban (TTP) militants in the Federally Administered Tribal Areas (FATA) through use of force had mixed results. After suffering initial reverses in 2003-2004, morale dipped to an all time low. Even as Islamic militants continued to attack security convoys with impunity, desertions or tame surrenders of ill equipped policemen or FC personnel continued. Several 'peace accords' with the militants were concluded – Shakai (April '04), Sararogha (Feb '05), North Waziristan (Sept '06) and Swat (May'08) - but all of them proved short-lived.

Pashtun army officers at senior management levels began to question the wisdom of lukewarm battle tactics in counter insurgency operations in FATA and Swat. Some Brigadiers and Majors Generals asked for a re-examination of outdated doctrinal inhibitions and advocated a more wholehearted, classical military response, with strength in numbers. It was decided to deploy larger formations hitherto reserved for facing the Indian threat from the Eastern border to FATA. The army geared up its counter-terrorism (COIN) capabilities in FATA and KP, by bringing in sizable forces from the Eastern sector to undertake 'clear, hold and build' operations.

The Frontier Corps, with Pashtun officers and ranks was given more teeth. In Waziristan, tribal rivalries between Mehsuds and Wazirs were played up, serving or retired Inter Services Intelligence (ISI) intermediaries were deployed to work out local peace pacts, not all of which sustained over time.

However, the situation changed in 2009-2010, when the TTP started targeting the military and police establishments in Rawalpindi and Lahore.

A mosque within Army Headquarters in Rawalpindi frequented by senior army officers, police training schools in Lahore, buses carrying Special Services Group (SSG) personnel outside its headquarters in Cherat and civilian employees from Kahuta being carted through a crowded street of Rawalpindi, were attacked by Islamic radicals.

The tribal militias were well armed and retreated to the hills, or across the border into Afghanistan, every time they were confronted by a major operation of infantry forces in superior numbers, living to fight another day. If uneasy peace prevailed in Waziristan, trouble erupted in Bajaur, Mohmand or Orakzai. Swat was cleared through precision operations and an overwhelming force presence, but Maulana Fazlullah escaped to Kunar, in Afghanistan. He continued to launch attacks against security forces from there.

In a daring jailbreak at Dir (April, 2012), TTP militants released a large number of militants including Adnan Rashid, former air force employee accused of plotting the abortive assassination attempt against former President Musharraf in 2003. In July, 2013 in another daring jailbreak at Dera Ismail Khan, TTP claimed to have released over 230 prisoners. Though warned by intelligence agencies, police deployed at the jail failed to react. There were reports of reluctance even among army personnel asked to join in hot pursuit operations after the incident.

Since 2001, the army has suffered 12,829 casualties in the war against terror, including 3097 killed- with an unusually high ratio of officers- one for every 16 soldiers killed- since it began fighting the *Taliban*. Total army officers killed were estimated at 194.

These 'ghosts now haunt the top military leadership in Pakistan'.[1] On the one hand, senior army leadership has remained conscious of the need to maintain the army's image as 'defender of Islam'. On the other, it has had to address morale issues, and take firm action to hit back when directly confronted in ground combat.This dichotomy continues to plague the Pakistani security forces. The Army leadership has to continually look over its shoulder to take cognizance of the sentiments of a majority of Pak army personnel - officers as well as other ranks (ORs) not sympathizing with the war on terror.

The new civilian politicians appeared keen to pursue peace talks with the TTP. The PML (N) was perceived to be soft on Punjabi sectarian radical groups like the Lashkar e Jhangvi (LeJ) and other Punjabi Taliban, who were found to have links with the TTP, and helped them to attack

the army and police in the past. While Nawaz Sharif was not initially very specific about how he would deal with the *Taliban*, Imran Khan talked of extending an olive branch to the militants. During the election campaign, he was persistently critical of US drone attacks in FATA. To gain populist mileage, he led a 'peace procession' up to Dera Ismail Khan. Lately, jeopardising his party-led coalition government's longevity in KP, Imran Khan's strategy of organising a boycott of NATO truck traffic into and out of Afghanistan seems geared to embarrass the PML (N) leadership at all costs.

Though the Nawaz government has explored the option of roping in Jamiat Maulanas, Fazlur Rehman and Samiul Haq, as well as the Jamaat e Islami leadership (Munawwar Hussain) for mediatory sallies to the TTP, a lot of confusion in approach seemed visible.

The proposal to hold an All Party Conference (APC) on July 12, 2013 did not fructify, as Imran Khan proceeded to the UK for medical treatment for his spinal injuries. He demanded a separate briefing for himself by the Army Chief before attending any such APC. While the generals kept urging the civilians to "take ownership" of the war, neither Imran Khan nor President Zardari, at the fag end of his tenure, seemed particularly interested in bailing out the Nawaz government, when it came to speaking with one voice on terrorism.

An All Party Conference (APC) was finally held on September 09, 2013. This time, Nawaz Sharif and Gen Kayani briefed Imran Khan separately just before the APC meeting. The APC resolution resolved to initiate an inclusive dialogue with all stakeholders to bring peace to the region. It also opposed drone attacks by the US and urged the government to take up the matter in the United Nations. The Nawaz government and the army agreed to resort to political dialogue with the TTP. Gen Kayani was quoted to say, 'The army will follow whatever decision is taken by the government'. Imran claimed that he persuaded Kayani to gradually thin out army presence from FATA.[2] The TTP too welcomed this announcement though later, some factions introduced conditions, not accepting an unilateral ceasefire by renouncing of weapons, and demanding a stoppage of drone attacks by America.

While political commentators in Pakistan initially commended this approach to 'talk to reconciliable militants', appreciating this 'rare civil-military partnership' to deal with the problem, others criticized the rather vague commitment to deal with hard line militants. They wondered

whether this 'Munich/ Chamberlain style appeasement' will lead to a different solution this time.[3]

The killing of 17 Div GOC, Maj Gen Sanaullah Khan Niazi in an IED explosion on Sept 11, was claimed promptly by the Swat branch of the TTP. Which again raised questions about the durability of the peace process. Army Chief Kayani warned sternly that though the army wanted to give peace a chance, its rectitude should not be interpreted as a sign of weakness or incapacity to respond.

The killings of top TTP leaders, Waliur Rehman and Hakimullah Mehsud in drone attacks in North Waziristan were a big setback for the TTP, and effectively put paid to the peace talks, at least in the short-term. A hardliner like Maulana Fazlullah was appointed as successor to Hakimullah Mehsud, despite not being a Mehsud and not having a base in Waziristan. As the recent Nasiruddin Haqqani killing in Islamabad has shown, the new TTP leadership could be increasingly faction- riven in the days to come.

The Pakistan Muslim League (Nawaz) government has shown extraordinary patience in continuing its efforts to engage with intermediaries of the Tehrik e Taliban (TTP), led by MaulanaSamiulHaq and Yousaf Shah of the Jamiat e Ulema e Islam(S) and Prof Ibrahim of Jamaat e Islami (JeI), even opening itself to charges of appeasement from informed political analysts in Pakistan.

The TTP was quite badly hit by the pinpointed air-strikes undertaken by the Army in February, 2014, after the bodies of kidnapped Frontier Corps soldiers were found. However, these actions were stayed. A temporary ceasefirewas declared on March 01, 2014 after one more attempt at peace talks was taken up. It resulted from a position of weakness as far as the TTP were concerned, as their current hide-outs stood revealed and they could not escape to higher mountain reaches immediately, which remained snow-capped. A Committee of civilian bureaucrats has been set up to talk to the TTP, comprising Federal Ports & Shipping Secretary, HabibullahKhattak, FATA Additional Secretary, ArbabArif, former bureaucrat Rustam Shah Mohmand, sole member of the Government's previous team of interlocutors which broke the ice, and Fawad Hussain Fawad, Additional Secretary in the Prime Minister's Office. Three of the Committee members are Pashtuns. The PMO's representation seemed intended to avow the government's serious commitment to the process. The TTP Shoora asked for the talks to be held at a 'safe' location .The

talks are expected to get underway on Tuesday, March 25 though the exact location of the meeting, somewhere inside FATA, was being kept secret. Considerable scepticism is evident regarding their success.

The Nawaz government is also facing difficulties in enunciating its new security policy and in deciding how to co-ordinate decision making – whether through the Defence Committee of Cabinet (DCC), or by reviving the National Security Council (NSC), as has been an old demand of the army. After recent closed door deliberations between the new power brokers in the civilian leadership and the army, it has apparently been decided to follow the Indian model of referring these crucial matters to the Cabinet Committee on Security (CCS), where all three Service Chiefs and the Chairman, Joint Chiefs of Staff Committee would be present, but the civilians would be in a numerical majority. The first meeting of this Committee was held after Kayani's retirement, with new Army Chief, Gen Raheel Sharif in attendance.

On 25 October, 2013, a Pakistan Protection Ordinance, 2013 was promulgated, listing special offences which could be deemed as crimes against the state, and arming police with special powers to apprehend those suspected of waging war against security of the state. The newly set up National Counter Terrorism Authority (NACTA) has drafted an internal security policy document. There has been talk of setting up a 'Task Force' to deal with the problem of terrorism, in all its facets. The document not made public yet, reportedly focuses on capacity building in the police, improvement in intelligence co-ordination, morale, provision of better equipment and training. There is mention of the need to introduce the narrative of peace and de-radicalization, as well as steps to re-integrate reformed terrorists into the mainstream. While these steps may be well intended and reflect, perhaps a seriousness of intent to deal with this grave threat, it remains to be seen how effective it will prove in implementation. Some analysts described this attempt as 'a quick-fix formula'.[4] Also, there is near revolt in the Punjab Police, with officers up to the rank of Deputy Superintendent of Police agitating and lamenting neglect and erosion of powers in the name of empowering a new anti-terror outfit.

Seasoned academics who have long studied civil military relations in Pakistan, claim the country's counter-terrorism policy must observe certain essential principles. First, violence and terrorism must not be tolerated. Second, the primacy of the state must be asserted over all organizations, groups and individuals within its territory. Third, the military must assert

its control over the tribal areas. The confusion over whether the current impasse is 'a problem of capacity' or 'a matter of policy', with militants being given 'space to survive' must end. Fourth, dialogue with TTP must be within the Constitution and fifth, as Pakistan faces different types of terrorism- religious, ethnic, sectarian and nationalist., different strategies are needed to deal with them.[5]

Visiting the Corps Headquarters Peshawar on 21 December , in his first policy statement on the all-important issue of the war on terror, Gen Raheel Sharif declared that the "military will not tolerate terror attacks and effective response will be given to the terrorists".[6] Question marks have again arisen whether the army and the Nawaz Sharif government will respond in a concerted manner after the attack on a military/ Frontier Corps garrison in Bannu in mid January 2014

The strategy that finally emerges will also have to factor in the evolving situation in Afghanistan as US/ISAF troop withdrawals continue in 2013-14. Both the Pakistan Army and TTP seem on board to continue providing safe havens to the Afghan Taliban during this period. However, agreement on the mechanics of peace-making, and talks on power sharing with the Afghan Taliban have proved elusive. A change in Kabul may not solve Pakistan's Taliban problem. Though the American withdrawal will remove a major grievance of the *Taliban* that the Pakistan Army is no longer acting as a tool of foreign interests, radicals holed up in North Waziristan, the suicide bombers, the support network throughout the country, will feel a surge of confidence resulting from the withdrawal. If there is a perception that negotiations achieve a pro-Pakistani power sharing dispensation, the atmosphere may improve, but the underlying problem will not disappear.

The Persisting Alienation in Baluchistan

The Pakistani military establishment has ruthlessly suppressed Baluch nationalism in Baluchistan.

Traditionally, Baluchistan was governed by the British under a three-tier security arrangement. Baluchistan Levies, a paramilitary force comprising mostly local tribes, recruited with the help of tribal Sardars were given responsibility of law and order in rural areas, which were categorized as 'B-Areas' (comprising 95 percent of the area of the province) while urban parts of the province, (main cities), dubbed 'A Areas' (comprising only 5percent of the area), were placed under the police. The Levies were

initially quite successful in bringing in a concept of community policing in the province. They were considered more reliable, efficient and cheap in setting up and were given rudimentary arms and equipment. They used camels and horses for policing. Some critics contended that they were being misused by the Sardars to perpetrate their own vested interests.

During Musharraf's administration, in 2003, the Provincial Government was pressurized to disband the Levies. Police jurisdiction was extended to the entire province. From 2007 to 2009, the entire province experienced police rule. The strength of the police force doubled, and expenditure increased manifold, yet statistics of serious crimes jumped upwards. This move was opposed by all political parties in the province and was challenged in the Baluchistan High Court. Its order in 2010 restoring the system of Levies was welcomed widely.[7]

In 2001, Musharraf announced plans to locate three new cantonments in Baluchistan, at Sui, Kohlu and Gwadar. More than 500 Chinese engineers and workers came in for the development of Gwadar port. This created considerable resentment among the Baluch populace, enhancing fears that the familiar pattern of forcible acquisition of prime agricultural lands, displacement of locals by outsiders, mostly Punjabis and Pashtuns, as had occurred during construction of the high value Gwadar port and Mekran coastal highway would be repeated. On 03 May, 2004 three Chinese engineers were killed in a rocket attack claimed by a Baluch insurgent group.

In recent times, the main counter insurgency role has devolved on the Frontier Corps (FC), which has deployed 33,600 troops in the province. These include a Special Operations Group. Though formally under the Chief Minister of Baluchistan, and accountable to the Federal Interior Ministry, in practice the DG, FC takes orders from the GOC XII Corps, Baluchistan. Its senior command is invariably filled by officers seconded from the army, for deputation periods ranging from 2-3 years. Lower rank and file may be locally recruited, but seldom get promoted to command positions.

Traditionally, very few Baluch joined the army, both at the officer levels or as Other Ranks. Partly, reasons for this have been historical, as the British recruited mostly from the 'martial' races in Potohar (central/ northern Punjab-Chakwal, Jhelum, Campbellpur) and later, Pashtuns from NWFP. The Baluch regiment of the army retained a heavy Punjabi bias in its senior officer echelons- Gen Kayani is from the Baluch Infantry

arm. Several other senior Baluch Regiment officers have held important posts, but these officers have not been known to share any empathy for the Baluch.

Pendency and inadequate payment of Sui gas royalty claims by the Federal government was another issue aggravating Bugti tribesman. On 26 Aug ,'2006 Bugti was killed in what was initially claimed to be an air to surface missile attack by an Army/FC helicopter while he was hiding in a cave in the hills bordering Kohlu/Dera Bugti districts.

Essentially, Musharraf followed a three-pronged policy which has been traditionally employed by the Pakistani military establishment to keep Baluch aspirations in check. While keeping the door open for dialogue with political parties which confined their activities to overt political dissent without indulging in acts of violence, a no-holds-barred military campaign was carried out against Baluch youth– projecting such elements as terrorists. The establishment's response against Baluch nationalists was kept separate from the flank of dealing with *Al Qaeda* and *Taliban* of the Quetta Shoora active along the Afghan –Pak border, who were given safe havens in mosques located on the outskirts of Quetta (Pashtunabad).

After the Bugti murder, the pattern of Baluch resistance changed. Earlier, it depended more on 'nationalist Sardars'- the Marris, Mengals or even Bugti. The Sardars kept their medieval privileges over their own people intact, inuring them from the modernizing influences of 'state generated' development. Since then, there has been a splintering of nationalists. Several factions of Baluch insurgents have sprouted- the Baluch Liberation Army (BLA), led by Hyairbair Marri (currently in exile, in the UK), the Baluchistan Republican Army (BRA) of Brahmadagh Bugti (also in exile, possibly in Switzerland) and the Baluchistan Liberation Front (BLF), led by former Baluchistan National Movement student leader turned militant, Dr Allah Nazar. The latter was arrested by the intelligence agencies on 25 March, 2005 and remained under detention for over a year. He resurfaced on 12 August, 2006 but was again jailed in Quetta for several months. After his release on bail, he went into hiding. He claimed he had been tortured in the prison cells and pledged, thereafter, to 'purge Baluchistan of the Punjabi Army'.

There has been a spate of killings of Punjabi settlers in the province (at least 1200) in the last three years, many of whom were working as teachers, doctors, middle-level bureaucrats and professionals. An exodus of over 20,000 settlers, mostly from Punjab, was reported by the

Human Rights Commission of Pakistan (HRCP) in 2011. The Military Establishment accused nationalists of killing moderate elements settled in the province. Well known poet, Habib Jalib 'Baluch' (a settler from Punjab), was shot by unknown gunmen on 15 June, 2010 for which a hitherto unknown group calling itself '*Baluch Mussallah Difai Tanzeem*' claimed responsibility. Another moderate thinker, Maula Baksh Dasti was killed a month later, on 11 July, 2010. Nationalists deny these allegations and blame intelligence agencies for sending out specially designated 'vigilante squads' to eliminate voices of sanity.

Extremist Islamic sectarian outfits like the Lashkar e Jhangvi (LeJ) joined the fray, sending out 'killer squads' targeting Quetta's hapless Hazaras as well as other shias living in the provinces, or travelling for religious purposes to Iran.

The 'Missing Cases'

Preventive arrests of dissenters by the police and intelligence agencies have been common in Baluchistan. According to a recent Asia Society report, authorities in Pakistan have found it difficult to convict suspected terrorists and criminals for want of proper criminal investigations and lack of evidence for charge sheeting of cases.[8] This has indirectly contributed to the phenomenon of 'disappearances'. When families of dissenters raised a hue and cry, either before a sympathetic and receptive media, or sought legal remedy in courts, often such quests ended in tragedy with the dead body of missing persons being dumped on the road-side in mysterious circumstances. The Baluch diaspora abroad and intellectuals have described these as 'kill and dump operations'.[9]

Recently, in new found judicial activism which may force the FC and Military Intelligence/ISI to behave in a more circumspect manner in future, Chief Justice Iftikhar Chaudhry held several *suo moto* hearings in these 'disappearance cases', castigating the nonchalance of both civilian and military intelligence agencies in the investigation and follow up of such cases. The then Director General, Frontier Corps, Maj Gen Obaidullah Khan Khattak (a favourite of the new Chief Raheel Sharif- now posted as head of Pakistan's Strategic Forces Command) was asked to appear in court personally and was censored. The civil administration and the CM, Baluchistan personally were criticized for dereliction of responsibility.

The army has been quick to deny any culpability about death squads, covert or overt military operations, or missing persons in their custody.

In October '2012, the Inter Services Public Relations (ISPR) issued a press release reiterating the army's full support for the political process in Baluchistan, as long as this remained within the Constitution of Pakistan.

The fractious vote in the 2008 Provincial Assembly elections saw a government coming to power, with 51 out of 65 MPAs becoming Ministers. While all of them partook of state funds and developmental largesse, there was no impact on addressing larger issues.

The Seventh National Finance Commission (NFC) Award increased the share of federal revenues for the state from 5 percent to 9 percent. The Aghaz-e-Huqooq package and the Eighteenth Constitutional Amendment also announced important steps. However, these political initiatives received two types of responses: outright rejection or skepticism about effectiveness of implementation and have so far remained mostly on paper.[10]

Meanwhile, insurgency continues to simmer. Cadres of different rebel groups numbering about 5,000-7,000 remain in the hills. They are ill-equipped in terms of sophisticated or modern arms, and may also be facing shortages of funds. Baluchistan thus represents the 'cumulative consequence of deliberate and exploitative neglect, stupid self-governance, and the arrogant and ignorant use of force, under civilian and military rule, for six decades'.[11]

Returning from three years' self-imposed exile abroad, Baluch leader Akhtar Mengal deposed before the Supreme Court in Islamabad on the situation in Baluchistan(October, 2012). He demanded (i) an end to all overt and covert military operations against the Baluch; (ii) production of all missing persons; (iii) disbanding of all proxy death squads by the ISI and MI; (iv) free political play by all Baluch nationalist parties without interference by ISI and MI; (v) bringing to book all those responsible for killings and disappearances; and (vi) rehabilitation of thousands of Baluch displaced by the conflict.[12]

The May, 2013 elections in Baluchistan again resulted in a fractured mandate in the province. The PML (N) was able to form a government, in alliance with the PkMAP, National Party (NP) of Hasil Bizenjo and Independents. Non-religious Pakhtun parties like the Paktunkhwa Milli Awami Party (PkMAP) of Mehmood Khan Achakzai did better than the Jamiat e Ulema (JuI-Fazlur Rehman) and JuI (Nazariyati). Choosing a leader proved difficult due to competing claims of the Sardars – Sanaullah Zehri and Jangez Marri but finally, a 'non-Sardar' politician from the

National Party, Dr. Abdul Malik Baluch was appointed Chief Minister.

The Baluchistan Nationalist Party (BNP) of Akhtar Mengal participated in the polls in the face of threats from more militant nationalists but could win only two seats at the provincial level. Mengal met Nawaz Sharif on 11 July,'2013 to discuss some of these issues but no details emerged of the road ahead.

Though the new Chief Minister has recently called for an All Party dialogue to deal with the Baluch problem and has said that the onus for further response now rests with the insurgents, there is no guarantee that violent actions by both sides would be stopped. So far, there have been no clear indicators how the military or the nationalists would behave in the changed political ambience after the elections. There were reports of insurgents attacking army or FC personnel deployed for relief and rehabilitation work during the recent earthquake in Awaran.

There is no confirmed evidence yet that the army has stopped being in denial about the extent and depth of Baluch alienation. With this complex backdrop, the Nawaz Sharif government has to find a way to accommodate demands for greater autonomy for the Baluch while balancing against the army's reservations about not exceeding constitutional limits. Differences, if any, between the new army leadership and Nawaz Sharif on how he tackles this issue may well test out, in a broader context, how civil military equations evolve in the country as a whole.

Endemic Sectarian Strife and Shia Pogroms

Pakistan continues to be plagued by endemic sectarian strife. Fanatical groups like the Sipah e Sahaba, now re-named Ahle Sunnat wal Jamaat (ASWJ) and Lashkar e Jhangvi (LeJ) continue perpetrating horrific pogroms of the Hazaras and Shias in Quetta and , elsewhere in Pakistan. Their leaders – Malik Ishaq and Maulana Ahmed Ludhianvi enjoy considerable latitude from law enforcing authorities, despite involvement in criminal actions. There are reports of enhanced support for such organizations within the security forces. This prevents unbiased and objective remedial action by the state to convey a sense of fair play to minority groups in civil society. Observance of Muharram in Rawalpindi this year saw large scale arson and sectarian clashes all over the country. Reprisal killings of Shia and Sunni clerics continue unabated. This violence has cast its shadow on Karachi as well.

Chaos in Karachi

Tackling the law and order situation in Karachi has always had the potential of creating civil–military discord. Chronic ethnic and sectarian violence has plagued the greater Karachi urban agglomeration for the last few years, causing economic and industrial downturn in the erstwhile prosperous business hub and main port of Pakistan. During the last six months alone, 1,726 persons have been killed, compared to 1,205 for the same period last year.[13] There are exclusive 'no go areas' in Mohajir resident localities where Pathans cannot go. New settlements of Pashtuns have taken place in outlying suburbs where land mafias operate. Islamic radicals of Pashtun ethnicity have entered newer settlements and set up mosques which adhere to more violent theological doctrines and preaching.

The Mohajir Quami Movement (MQM) grew phenomenally as an urban political force after the frequent Mohajir- Pathan riots between 1978-1984. Earlier, Mohajirs had come out as a united political force agitating against preferential educational reservation policies favouring Sindhis, announced during Mumtaz Bhutto's Chief Ministership of Sindh in 1977. Despite factional schisms engineered by the ISI in the mid-'90s, which saw violence erupt between factions led by Altaf Hussain and the Haqiqi group led by Afaq and Badr, the MQM could oust the Jamaat e Islami as a political force from Karachi. Subsequently, its leadership grew increasingly powerful and Altaf Hussain started exercising near fascist control over his satraps despite remaining in exile in the UK.

Despite a fractious past, which saw the killing of an Army Major in a Mohajir ghetto of the city, the MQM (A) developed fairly comfortable rapport with the army leadership during the last decade, both under Musharraf and Kayani. The current DG, ISI Lt. Gen Zahirul Islam was previously Corps Commander in Karachi. Lately however, there have been indications of a cooling off of relations with the army, for reasons which are not quite evident so far.

The MQM (A) dominated elections in Karachi's 20 constituencies in the last few elections. In 2008, it won 17 NA seats. The May, 2013 elections have seen some changes. Though it went one better in terms of seats held, winning 18 NA seats with 71.56 percent of the total votes cast, it lost ground to Pashtun backed PTI candidates in some constituencies.The election process was vitiated by reports of violence

and several complaints of intimidation, fraud and ballot rigging. In the Sindh Provincial Assembly it won 37 seats.

The MQM (A) allied with the PPP government at the Centre and in the province after the 2008 elections. The relationship frayed later, especially over implementation of the local bodies ordinance. This time it is not currently in alliance with the PPP led provincial government in Sindh.

MQM (A) leader, Altaf Hussain is in a difficult position following investigations by the British Police in the Imran Farooq murder, search of his house in London and discovery of huge caches of unaccounted foreign currency.

The Karachi police has not been able to effectively control the deteriorating law and order situation. Postings in police stations and other key supervisory jobs in the police became highly politicized and motivated by monetary considerations, designed to preserve various vested interests of crime and drug syndicates. Though there are 106 police stations and 4DIG zones in Karachi, the police are hopelessly outnumbered. The police –people ratio is skewed adversely at 186 policemen per one lakh population, which is below the standard average of 222 for South Asia. It has archaic equipment and its policing records, including vital updates of illegal arms holdings, bad characters' lists etc. have fallen hopelessly behind the pace of burgeoning settlements.

Federal governments have usually taken the soft option of calling in Pakistan Rangers for more effective policing, or curbing frequent spurts of violence. 12,500 of the total force of 25,000 Sindh Rangers are deployed in Karachi. The Rangers are usually headed by army officers on deputation. In the recent past, senior Major Generals have been entrusted the difficult Karachi assignment, often taking over on promotion as three star Lieutenant Generals as GOC of V Corps, Karachi. Demarcation of policing responsibilities between the Rangers and the police has not always been clearly defined. Special operations of search and seizures do take place sporadically, to cleanse the city of hardened criminals, but the effectiveness of these operations wears off in time.

In early September 2013, the deteriorating Karachi law and order situation forced the Prime Minister and Interior Minister to rush down to Karachi and hold all party parleys before announcing a special de-criminalizing drive, to rein in violent cadres of different political and

ethnic forces. Though there was talk briefly of calling in the army, which the MQM (A) supported, consensus prevailed ultimately to let the Rangers execute this drive under notional supervision of the Sindh Chief Minister.

Rangers have been tasked to pick up violent offenders afresh, cutting across party lines and ostensibly without political interference this time. The police top officials have been shuffled and new officers brought in. Initial arrests in the new drive have brought forth the usual squealing and complaints of partisan action from affected parties.

Relations between the PML (N) and MQM (A) have not been very comfortable, with an undercurrent of persisting ethnic discord and suspicion (Mohajir versus Punjabi) dampening development of close political bonhomie. In the past, the army could take advantage of discord between Benazir Bhutto's PPP government at the Centre and the MQM in Karachi. The Nawaz Sharif government will have to keep this in mind while crafting its overall approach to deal with the law and order situation in Karachi.

The Decline of PPP

The 2013 elections left the PPP badly battered and bruised. It was hardly allowed to canvass due to threats from the *Taliban*. Results showed it had been reduced to a mere regional presence, with 33 seats from its rural Sindhi bastion. In 1997, it also lost badly to Nawaz Sharif's PML(N) but received 23 percent of the vote. This time it has fallen to as low a figure as 15 percent. It was routed in Punjab, even from urban pockets of strength. Not only did it not execute programmes relating to bread and butter issues dear to the common man and the urban lower middle classes, its leaders remained scandal ridden and hungry for power and pelf.

The lack of any charismatic leader at the helm was badly felt.In the absence of Benazir, and with her children still remote from the party, the elder scion, Bilawal was rumoured to have differences with his father, Asif Zardari. The latter's 'darbari' culture kept loyal party' jiyalas' at bay.

Though it may be too early to conclude that this result demonstrates the limitations of dynastic politics in South Asia, the PPP seems denuded from 'a victim narrative', having served a full five-year term. More disconcertingly, a third political force has emerged in the shape of the Pakistan Tehrik e Insaaf of Imran Khan, competing perhaps for the same political space, though right of centre in its orientation. It could

even be said that PPP as a political force thrived in opposition under martial law, not in democratic circumstances.[14]

To rise from the ashes, the PPP government in Sindh will have to meet better yardsticks of governance. This may depend on several factors, especially on whether it can forge a new partnership with MQM (A) and also on the evolution of some new leaders from within.

New Army Chief Selected

In a major decision, PM Nawaz Sharif finally selected Lt Gen Raheel Sharif as the new Army Chief on 28 November, 2013, one day before Kayani's retirement. This was a surprise choice as Raheel was third in the seniority pecking order, below Haroon Aslam and Rashad Mehmood. The latter's posting as Chief of General Staff had marked him out as Kayani's favourite. While Haroon was overlooked, Rashad Mehmood has been accommodated in the other, largely ceremonial four stars slot of Chairman, Joint Chiefs of Staff Committee (CJCSC). Raheel Sharif hails from Gujarat, in Punjab. His father was a junior commissioned officer who was given the honorary rank of Major after retirement. His brother, Shabbir Sharif was a martyr in the 1971 war with India. Raheel Sharif belongs to the same 'Kashmiri' biradari (sub-caste) as Nawaz Sharif, but is not a relative. He worked under Lt Gen(retd) Abdul Qadir Baloch, a member of the Nawaz Cabinet, who recommended him, ostensibly because he was known to keep a low profile and did not display political ambitions. However, soon after he became Chief, Raheel has shown that he will follow the consensus of Army Generals in making key appointments. One of the decisions he has taken is to remove the long serving head of the National Command Authority, Gen (retd) Khalid Kidwai, who was replaced by a Kayani protégé, Lt Gen Zubair Hayat.

Musharraf's prolonged holing up at the Armed Forces Cardiology Institute and dilatory tactics by his lawyers seeking to challenge the jurisdiction of the Special Court to try him, and asking for application of the Army Act alone would suggest that the Army leadership is uncomfortable about his indictment for Treason under Art 6 and would try to scuttle this eventuality.

The Musharraf Trial

When former Army Chief, Gen (retd) Pervez Musharraf returned to Pakistan before the May '13 elections, there was speculation about how

vindictively he could be treated if Nawaz Sharif came to power once again. Apart from possible Saudi pressure restraining such a reaction, Nawaz was conscious that the army would not take kindly to berating or humiliating a former Army Chief beyond a point. His main problem on this front came from the former Chief Justice, Iftikhar Mohd Chaudhry, who appeared hell-bent on trying Musharraf for all his past misdemeanours. Registration of murder cases against Musharraf in the Bugti killing and the Lal Masjid operation strengthened this perception. There seemed to be vested interests to selectively punish one person alone, who had rendered the judges impotent in the recent past. A recent order allowing Musharraf bail in the Bugti case may go some way in dispelling this impression, but the Nawaz government has been almost forced to take up treason proceedings against Musharraf. This case has the potential to destabilize civil-military relations in the future. It is interesting that after Kayani's retirement, Musharraf has claimed that he has the backing of the army on the treason case against him, and he was surprised why Kayani did not take a stand against what seemed a clear case of vendetta by one or two persons.[15] Is this a timely warning Nawaz Sharif would do well to heed? Now of course, a new dimension has developed due to Musharraf's sudden heart ailment (02 Jan, 2014) which could lead to unpredictable outcomes.

Cycle of Civil- Military Tensions

In South Asia, political regimes in power have had rather lax standards of financial probity while judging themselves. Past regimes under Benazir Bhutto, Nawaz Sharif or Chaudhry Shujaat Hussain/Pervez Elahi availed of huge loans from state owned banks for ambitious privatization schemes, never to be returned. Politically well-connected industrial empires like the Ittefaq group or the Brothers thrived.[16]

So far, emergence of these new entrepreneurs or business classes has not crossed the path of the military's own ventures into economic and commercial activity but in future this could happen, if the Nawaz Sharif government makes some progress in normalizing trade relations with India, and dissipates the 'bogey' of 'India as the traditional enemy'. The military's appropriation of a bulk resources from the national budget for the defence sector could begin to be seriously questioned.

Recently, there have been reports about the disproportionate clout given to sons and daughters of Nawaz and Shahbaz Sharif (Hamza,

Salman, Hassan and Maryam) in handling mega- development projects in Punjab funded from the state exchequer. As one perceptive commentator observed, 'the more things change, the more fondly, and nostalgically, we remember the past. Impossible as it may sound, the "Dar inflation" the citadel of Islam is now experiencing lends, in retrospect, a kindly gloss to the banditry of the Zardari years. That was open banditry. This is a more closed shop, secrets shared among a narrow circle, and its effects are more insidious'.[17]

Many complex factors confront the new civilian government in Pakistan and raise the more fundamental question as to whether the military and civilians can at all work together to tackle them ? This may require a change of old mindsets on both sides. As a leader with a substantial political mandate, Prime Minister Nawaz Sharif has the opportunity to establish civilian supremacy. However, he has to contend with a strong army which may not quite be in the mood to give up its predominant position in society, and the perks that go with it just yet.

Implications for India

Engaging with whichever government is in power in Pakistan is inevitable for India but in this backdrop, nuances may have to be woven into our responses, to factor in the clout and balance of power enjoyed by various power brokers there.

Immediately after coming to power, Nawaz Sharif made friendly statements about the need to revive good relations with all neighbours, including India. However, the army under Kayani's leadership may have advised a 'go slow', pouring cold water on the somewhat premature euphoria generated among the gullible elements in Indian media circles, and even some sections of the political establishment.

Nawaz Sharif signalled keenness to allow trade relations to flourish though obstacles remain about full implementation of the most favoured nation (MFN) agreement, which may now be referred to by a nomenclature more palatable to the 'religious right' in Pakistan. The 'Track II' process has been revived with the appointment of former Foreign Secretary, Shahryar Khan as Pakistani PM's envoy, to interact with his Indian counterpart, Satinder Lambah. His name would be acceptable to the army in Pakistan.

However, in the short term, it may be premature to expect Nawaz Sharif to deliver on any pious assurances about not letting each other's territory be used by hostile non-state actors. The army may not be ready

yet to give up its option of asymmetric use of such elements like Lashkar e Taiba against India, despite the increasing domestic threat to their own establishment from the Tehrik e Taliban. The recent Line of Control and International Border escalations during the usual infiltration season were evidence of their compulsions. Neither should we naively expect the Pakistani Courts to expedite the judicial process to bring the seven Mumbai 26/11 accused to book.

In the long term, in case power equations between the civilian and military leadership in Pakistan stabilise, India could signal some flexibility on long pending, contentious bilateral issues like Sir Creek and Siachen, provided there is concrete evidence of our concerns being met on the terrorism front.

While generally seeking détente and concrete progress on dispute resolution, Nawaz Sharif will most likely adhere to the generally known consensus positions and advice of the Pakistan Foreign Office and army. While displaying traditional 'Lahori' warmth in his public stance and utterances, Nawaz Sharif will have to find space and equilibrium to tackle domestic priorities first, before extending any comfort to India on substantive issues. India should remain patient and not expect too much to change too fast.

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Shri Rana Banerji

Joined the Indian Administrative Service in 1972 and was assigned the Assam- Meghalaya cadre. After working in the state of Assam for eight years, he joined the Central Government, and retired as Special Secretary, Cabinet Secretariat in October, '2009. In the Cabinet Secretariat he dealt with security and intelligence-related issues impinging on national security policy formulation, with focused expertise on the South Asian region.

After retirement, he headed a task force on intelligence reforms at the Institute for Defence Studies & Analyses, and the report was published by IDSA in May, 2012. He is currently a Distinguished Fellow at the Institute for Peace & Conflict Studies, New Delhi and a Visiting Professor, Pakistan Studies Programme at the Academy of International Relations, Jamia Millia Islamia University, Delhi.

He has written extensively on Pakistan politics and its army, including detailed monographs on the '*ISI- An analytical overview of its organisation & role*' and on '*The Pakistan Army- composition, character & compulsions*.' He has attended several international conferences and seminars and has been a member of several dialogues on India-Pakistan CBMs, trans national crime, money laundering and terrorism and the Indo-Pak-Afghan policy dialogue.

National Knowledge Network (NKN) Initiative: India's e-Science Infrastructure

Professor S V Raghavan

Background

The creation of an advanced cyber infrastructure has been recognized as a critical knowledge resource for further development of science and technology in India. The convergence of research ideas resulting in multi-disciplinary work involving information technology, biotechnology, and nano-technology underscores this urgent need. Interaction among various interest groups and brainstorming sessions have converged to the fact that several scientific departments and institutes for higher education and research benefit from this effort – that too immediately. E-Infrastructure seamlessly integrates heterogeneous partners and annihilates distances through smart ultra high bandwidth networks.

The Genesis

The author originally wrote a report titled *Viswaroopam* in 2003 for the Ministry of Human Resources Development. The main idea was to establish a gigabit level network among leading institutions in the country. The applications envisaged were education and research. Perhaps, the report was ahead of its times then. Neither the users nor the telecom service providers were ready to seize the opportunity. Several years later, the deliberations of the Working Group on "Policies, Administrative Changes for Improvement in S&T[1] Research Environment and Resources" constituted by the Steering Committee on S&T for the formulation of the Eleventh Five Year Plan (2007-2012) chaired by the Principal Scientific Adviser to the Government of India. The result was

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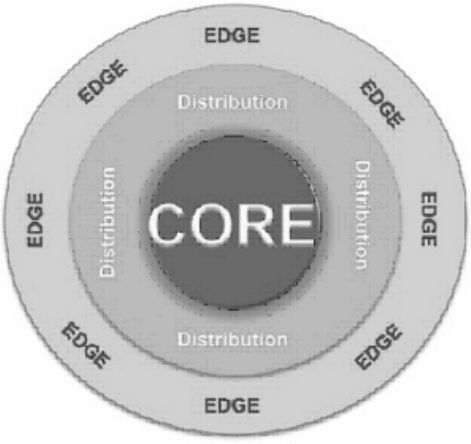
the adaptation of the *Viswaroopam* idea and the report was re-written as "E-Science Infrastructure for Science and Technology" produced jointly by the Office of the Principal Scientific Advisor and the National Knowledge Commission. The report mooted the idea of setting up a multi 10 gigabits per second (10 Gbps) cyber network, along with the National Knowledge Commission, for enabling researchers and academia from different backgrounds and diverse geographies to work closely for developing the critical and emerging S&T areas that would allow them to share and transfer knowledge seamlessly.

The objective and target of the proposed network now termed Integrated National Knowledge Network (NKN), is to interconnect all the stakeholders in science, technology, higher education, research and development institutions in the country at speeds of the order of multi 10 gigabits per second, coupled with low latencies. In the process, it would enable the use of specialized applications, which allows sharing of high performance computing facilities (grid computing), e-libraries and virtual classrooms. In addition, through grid computing, it would be possible to provide supercomputing power in the hands of individual users who, until recently, could not even dream of affording such power. The distributed supercomputing power could be very useful, for example, for climate modeling by scientific experts in different locations of the country, as well as for sharing large volumes of data amongst those experts.

To realize the dream, in 2008, DIT constituted a High Level Committee (HLC) for the establishment of the NKN, with the Principal Scientific Advisor to the Government of India as the Chairman and the Secretary, DIT, as Member-Convener. The design document for the setting-up of the NKN – through a consortium of PSUs was prepared by a Technical Advisory Committee chaired by Dr. S.V. Raghavan, Professor, Department of Computer Science and Engineering, Indian Institute of Technology, Madras, Chennai. It was decided that in the initial phase, NKN would connect about 57 nodes across India. The National Informatics Centre (NIC) was assigned the responsibility of managing the implementation of NKN.

The architecture of the NKN has been designed to be scalable and the network will consist of an ultra-high speed CORE (having an eventual speed of multi 10 gigabits per second), complimented with distribution at appropriate speeds. The participating institutions at the edge would connect to the NKN seamlessly at speeds exceeding 1 gigabits per second or higher, and the network architecture and governance structure shall allow

user institutions an option to connect to the distribution layer through a self arranged/ procured last mile connectivity bandwidth.



The main emphasis in the NKN design is a robust network architecture that enables connectivity across the country - from the Himalayas to Kanyakumari. All vibrant institutions with vision and passion would be able to transcend space and time limitations in accessing information, knowledge, and associated social benefits. In addition, the NKN has been designed to support overlay networks and dedicated networks and to support applications in other sectors like health, bio-informatics, agriculture, e-governance, etc.

Approvals

While the Government of India accepted the report in 2008 with Prime Minister mentioning in Parliament that India is creating a National Knowledge Network (NKN in short). The Prime Minister made a token allocation of Rs. 100 crore for establishing a pilot phase of NKN. Subsequently, the pilot phase of NKN was dedicated to the nation in 2009 by the then President of India. Finally, in March 2010 the Indian Cabinet cleared the prestigious mission mode project NKN to be steered from the Office of the Principal Scientific Advisor to the Government of India with an outlay of Rs. 5990 crore spread over a decade until 2019.

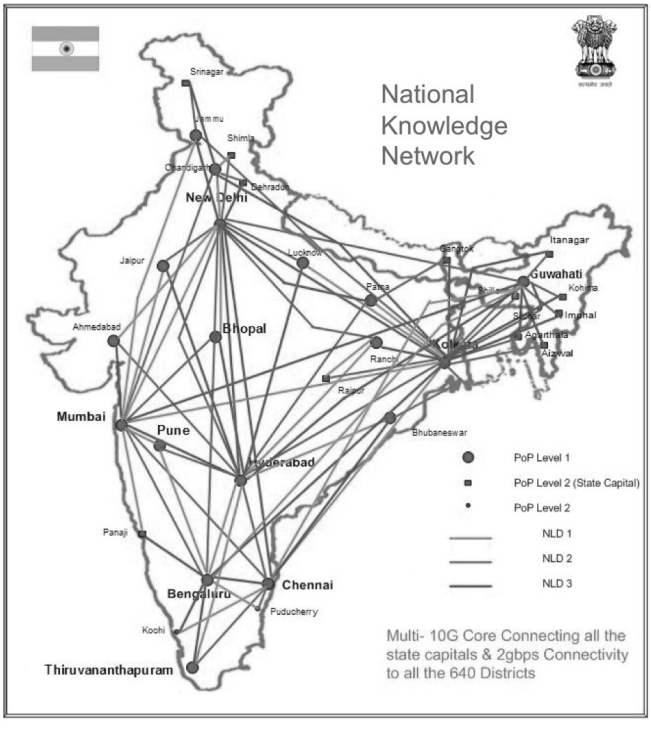
Status

Today, the National Knowledge Network (NKN) of India integrates a spectrum of science and technology institutions that are basically the creators of knowledge spanning science and technology, education, health, and agriculture. For the first time, India is seamlessly bringing together over 100,000 scientists, engineers, educators, and researchers in a single comprehensive network. NKN is the most comprehensive network designed so far in the world, with sharp focus on human development

– improving education, healthcare, and agriculture. Almost all leading institutions of higher education in science, engineering, technology, medicine, and agriculture are part of NKN, along with specialized national laboratories spanning various government departments. User institutions shall benefit by sharing lectures across India. Many educational institutions are planning cooperative programs in specialized areas.

NKN Concept, Design, Architecture, and Characteristics

The National Knowledge Network is an ultra high bandwidth network with a fully connected super core, multi-homed distribution as well as edges, that connects 1500 institutions directly and 30,000 institutions indirectly at speeds exceeding 1 Gbps. The NKN core itself has capacities in multiples of 10 Gbps and will try and maintain dynamic equilibrium with technological opportunities and economic feasibilities as the years pass by. NKN is characterized by high bandwidth and low latency enabling *annihilation of distance* and *instantaneous observation of events*.



NKN is present across India and is planned for a total of 650 points of

presence. NKN is designed to connect all Indian knowledge institutions as well as connect globally. At present, NKN is connected to the European Research Network GEANT and TEIN4. Connection to INTERNET2 of the United States is in advanced stages of planning. Work is under way for similar connections to countries in Asia Pacific, Japan, and Australia. NKN will have physical presence in New York, Amsterdam, Geneva, and Singapore soon. The international links will be operating at speeds equal to or higher than 10 Gbps.

NKN enables closed user groups to be established on demand. As on date, Garuda (High Performance Computing Grid of CDAC) and WLHCG (High Energy Physics) are excellent examples of such collaboration. Both these grids are across India, across government departments, and across multi disciplinary institutions, including several universities. NKN users access the beam line facility in Grenoble, France and University of California, Berkeley, USA.

NKN has four different types of services: special services, community services, generic services, and commodity services:

Special Services focus on high-end R&D interaction such as high energy physics, climate change, and global collaboration on emerging science and technology areas. They manifest as Virtual Private Network Stitching Services [VPN@L2 (Virtual Private Wire Service / Virtual Private LAN Service), VPN@L3] etc.

Community Services enable synergistic collaborative education, research and development, which are domain specific and problem specific, but distributed across organizations in terms of resources and people. Virtual classrooms, virtual laboratories, cancer grid, brain grid, are representative examples. They manifest as Virtual Private Network Stitching Services [VPN@L2 (Virtual Private Wire Service / Virtual Private LAN Service), VPN@L3] etc.

Generic Services focus on providing infrastructure services such as Domain Name Service (DNS), DHCP, Email servers, server farms, secure filtering services for viruses, commonly used software, internet, intranet, network management views, e-mail, messaging gateways, caching gateways, domain name system, web hosting, voice over IP, multipoint control unit (MCU) services, video portals, SMS gateway, co- location services, video streaming etc.

Commodity Services, on the other hand, provide traditional Email access, internet access, and access to worldwide resources, spanning a very broad

spectrum.

The NKN design emphasizes Quality of Service (QoS) as the basis for defining and operating services as opposed to "best effort" services available through "internet like" technologies. By design NKN scales! NKN has a super-core, core, distribution, and edges as an inside out concentric circle design. NKN has the ability to be configured as specialty E-infrastructure, community E-infrastructure, and commodity - infrastructure.

NKN Model Projects

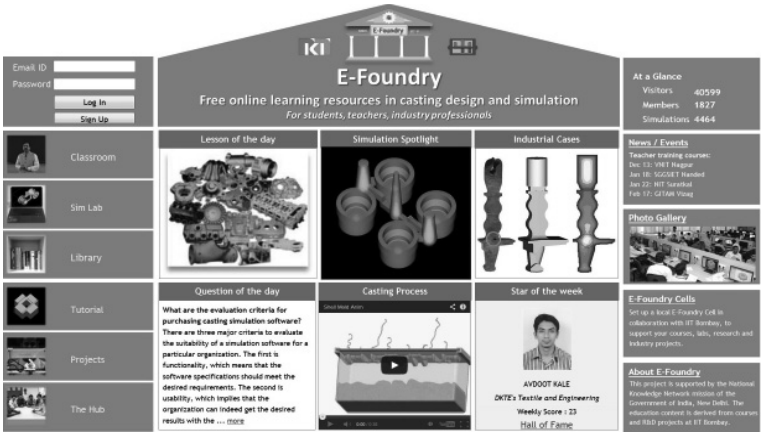
In order to demonstrate the capabilities of NKN – high bandwidth and low latency – NKN launched a series of model projects to showcase the applicability across a spectrum of applications focusing on education and health, and each one with a signature statement. Each project is carefully handcrafted to address a specific challenge. These projects are conceptualized, evolved, and facilitated for implementation.

1. In the area of medical education, NKN launched a model project with AIIMS as the principal investigator, to understand the ICT technology flavor that will match the pedagogy natural to medical education, while using the high speed and low latency offered by NKN. Eight institutions joined AIIMS in this experiment and have come up with solutions after mutual consultations and actual field trials. They now have a template as to what combination is natural and acceptable to their community for skill transfer, knowledge transfer, and knowledge repository creation. It is interesting that they use high-end graphics coupled with animation for "routine" skills Blood and urine samples, blood pressure monitoring, etc.) transfer and direct video for classroom interaction, and a combination to share knowledge about surgical skills that are cardiac oriented.

   The USP of this project is, "Identification of appropriate match between ICT technology and medical application" for finding a solution to knowledge dissemination at a time when faculty are in short supply and the rarest of the rare cases tend to be concentrated in certain parts of the country.

2. In the area of engineering education, there have been several attempts in the past in creating and sharing course material, and the significant one being NPTEL – National Program on Technology Enhanced Learning. But, the problem of continued knowledge

accumulation by the stakeholder community (consisting of professors, students, and practitioners) using ICT remained a challenge hitherto in the absence of an infrastructure like NKN. With IIT Bombay, a model project was initiated in metal casting education. This is an area where the community is small, spread out, and perhaps not that tech-savvy. Besides, experimental facilities are challenges in Tier-2 and Tier-3 institutions. To do it well, requires high bandwidth and low latency. At the same time, many beneficiary institutions are connected through commodity networks using the internet as they are in the private sector.



E-Foundry is a part of the NKN mission to empower teachers to enhance interest and employability of engineering students in the manufacturing sector, mainly metal casting or foundry, considered as the 'mother industry'. Users can freely access the teaching content developed in IIT-B, to update their knowledge in casting design and simulation. NKN E-Foundry resources include video lessons in five parts (introduction, science, engineering, technology, and application), online simulation laboratory (which accepts a 3D CAD model and generates solidification images), a rich library of reference material (animations, presentation slides, paper abstracts, defects museum, industrial case studies, web links), quizzes and tutorials with answers for self-evaluation, a discussion hub for questions and answers, and a projects page with ideas for researchers.

The USP of this project is the establishment of a web based portal that uses computation (high speed) and interaction for

metal solidification simulation (low latency) to impart casting education along with novel experiments using indigenous equipment and set-ups. The E-Foundry Lab established at IIT Bombay has become an attractive model for others, and several institutes are already replicating the experimental and simulation facilities integrated with online learning resources. This approach ensures that the knowledge base will naturally grow with usage and participation, leading to better employability of students and wider penetration of simulation technology in the metal casting industry.

3. Inter-disciplinary research: Three organizations were brought together to demonstrate the power of NKN in multi-institutional interaction. They are, NIC, CSIO, and AIIMS. The basic idea is to use engineering design solutions to solve medical requirements. The CollabCAD platform - software capable of three-dimensional structural simulation with all the engineering nuances – was retargeted to solve personalized dental imaging in 3-D. While NIC took care of the ICT part, CSIO concentrated on the imaging part, and AIIMS articulated the end-user requirements. It is at a stage where multiple 2-D images are used to create s 3-D virtual reality.

   The USP of this project is that all three organizations are using the same image database on the same server for online and real-time manipulation of images, while discussing and annotating on the same image. Such a facility is not available even commercially across the globe.

4. A program has been undertaken in the area of brain imaging and integration of Indian medical imaging research with global programs, with the National Brain Research Centre, Gurgaon as the lead organization. The endeavor is an initiative towards i-Brain (Indian brain grid) that has been enabled as a research infrastructure layer over NKN, and the institutions involved are from the four regional zones of the country. These institutions process and analyze their brain images online and in real-time, in consonance with international standards, such as that of C-Brain and G-Brain. These are the Canadian brain grid and the global brain grid, the protocol development being facilitated by cooperation of McGill University and Canadian Advanced Research and Innovation Network (the Canadian counterpart of NKN). While

the current team will focus on using the infrastructure for studies like neurodegenerative disorders, cerebral stroke, Alzheimer's dementia and cognitive impairment, ICMR is planning to use it as a general purpose infra for several brain related research projects that are multi-institutional.

The USP of this project is establishment of ICT infrastructure by the medical community for a high end use, that too in an interactable and shareable form. The establishment is successfully under way, and the interactability and shareability is under exploration.

5. Using videoconferencing for imparting education is a well-known application. But scaling it to be an immersive experience is a technology challenge even for point-to-point interaction. With Amrita University in collaboration with IIT Bombay, SUNY, Buffalo, and MIT, Massachusetts, USA an immersive classroom that adapts itself to the mannerisms of a "teacher" is being attempted. Initially, video stitching of output from two cameras is being attempted. The idea is that, if one is addressing two sites simultaneously, it will appear as a single classroom at the "teaching" end. The solution requires use of a supercomputer for running the algorithms that decide the "sync" between two camera eyes. This project challenges the reliability and availability aspect of NKN significantly, as the high volume and high-speed computation is in real-time and failure will directly "hit" the classroom experience.

   The USP of this project is automatic aligning of "teacher behavior" and "pedagogy" with the display structure at the receiving end – hitherto an unaddressed issue, even by advanced countries in the world. This is expected to result in a paradigm shift in our perception of large-scale spread of quality education. This project is also likely to create "niche" technologies in several areas.

Each one of these model projects has a theme and a purpose. Success of each one of them will enhance the application potential of NKN in a demonstrable form. Besides, the CollabCAD project may become the technology platform for brain infra. The immersive classroom may be integrated in medical education. The web based portal experience may be adopted by many other practice oriented engineering disciplines. There is definitely scope for *coherent synergy*, which is the underlying theme of the office of PSA.

NKN Applications

There are several initiatives undertaken by NKN connected institutions. Some of them are:

- Countrywide virtual classrooms
- Collaborative research
- Collaborative design in medicine
- Open source drug discovery
- Grid computing
- GARUDA grid
- Linking rural training institute to National Knowledge Network (IISER Pune)

Countrywide Virtual Classroom: The NKN is a platform for delivering effective distance education where teachers and students can interact in real time. This is especially significant in a country like India, where access to education is limited by factors such as geography, lack of infrastructure facilities etc. The network enables co-sharing of information such as classroom lectures, presentations and handouts among different institutions.

Collaborative Research: The NKN enables collaboration among researchers from different educational networks like GLORIAD, TEIN3, GARUDA, CERN etc. NKN also enables sharing of scientific databases and remote access to advanced research facilities. NKN is used extensively by Indian groups in CMS and ALICE experiments of the Large Hadron Collider at CERN, Geneva.

The Large Hadron Collider (LHC) is a large scientific set-up near Geneva, spanning the border between Switzerland and France about 100 m underground. It is a particle accelerator used by physicists to study the smallest known particles, the fundamental building blocks of all things. It will revolutionize our understanding, from the minuscule world deep within atoms to the vastness of the universe. Two beams of subatomic particles called 'hadrons' either protons or lead ions, will travel in opposite directions inside the circular accelerator, gaining energy with every lap. Physicists will use the LHC to recreate conditions just after the Big

Bang, by colliding the two beams head-on at very high energy. Teams of physicists from around the world will analyze the particles created in the collisions using special detectors in a number of experiments dedicated to the LHC.

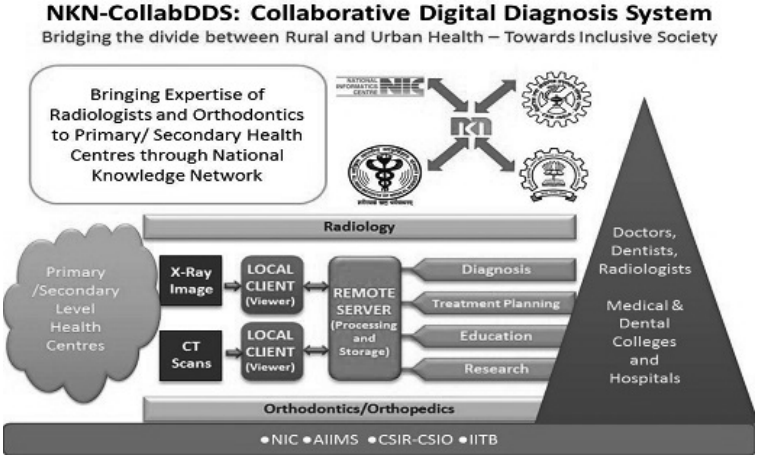
The Large Hadron Collider will produce roughly 15 petabytes (15 million gigabytes) of data annually, enough to fill more than 1.7 million dual-layer DVDs a year! Thousands of scientists around the world want to access and analyze this data, so CERN is collaborating with institutions in 34 different countries to operate a distributed computing and data storage infrastructure: the Worldwide LHC Computing Grid (WLCG).

Data from the LHC experiments is distributed around the globe, with a primary backup recorded on tape at CERN. After initial processing, this data is distributed to eleven large computer centers in Canada, France, Germany, Italy, the Netherlands, the Nordic countries, Spain, Taipei, the UK, and two sites in the USA with sufficient storage capacity for a large fraction of the data, and with round-the-clock support for the computing grid. These so-called Tier-1 centers make the data available to over 160 Tier-2 centers for specific analytic tasks. Individual scientists can then access the LHC data from their home country, using local computer clusters, or even individual PCs.

NKN currently connects two Tier-2 centers namely VECC and TIFR. With a NKN POP in their vicinity, they are instrumental in addressing the growing demand of enhanced bandwidth from different institutions desirous of working on the LHC project. With NKN as the backbone, they can provide network speed for high-end processing multiple and simultaneous transfers of date rates and low latency that real time applications require. NKN also provides multi-gigabit connectivity to the European grid.

Collaborative Design in Medicine: Organizations with expertise in different areas viz. National Informatics Centre, New Delhi, All India Institute of Medical Sciences, New Delhi, Indian Institute of Technology-Bombay, Mumbai and CSIR-Central Scientific Instruments Organization, Chandigarh joined for effective development, implementation and roll-out of an application which could bring a shift in the way in which radiological diagnosis and teaching is carried out. The model project "Network Enabled Medical Diagnosis and Education in Skeletal Imaging using X-Rays" funded by the National Knowledge Network (NKN) was undertaken as proof of concept to provide a network based system for radiological and orthodontic diagnosis using X-Rays. The area of study

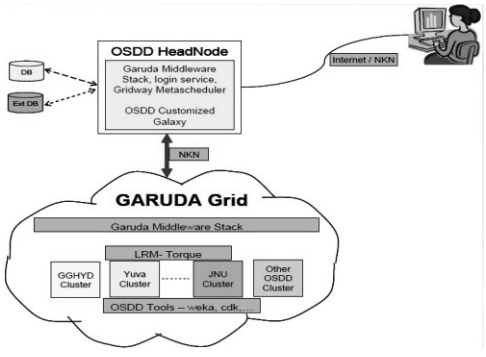
being complicated, required expertise in varied domains such as, but not limited to orthodontics, orthopedics, radiology, computational methods, CAD/ rapid prototyping, image processing and pattern recognition. The project was planned in two phases: the first one being to develop an application, which could enable visualization, and processing of radiological data over a collaborative platform, and second to effectively roll out and enhance the application as per end users needs. The project has been envisaged and is in progress keeping in view two goals. The first one is to connect Primary Health Centers (PHC's) with expert radiologists/ doctors and dentists at medical/ dental colleges and hospitals using suitable information, communication and technology (ICT) tools and channel for real time radiological data transmission. The second objective is to use this platform to build a repository of rare clinical cases for teaching medical and dental students, thus providing these students



with the opportunity to study cases which are currently limited to centers of excellence in the medical and dental field. With this vision an application CollabDDS - Collaborative Digital Diagnosis System - has been developed. The strength of CollabDDS over telemedicine/web based consultation lies in its real time collaborative environment, where both the doctor and expert will view the same image simultaneously. The expert could interpret the image for diagnosis. This kind of collaborative activity amongst PHC's with medical/dental colleges and hospitals and centers of excellence would help to provide improved diagnosis.

Open Source Drug Discovery Using NKN: OSDD is a CSIR-led

Team India consortium with a global partnership. Its vision is to provide affordable healthcare to the developing world by providing a global platform where the best minds can collaborate and collectively endeavour to solve complex problems associated with discovering novel therapies for neglected tropical diseases like malaria, tuberculosis, leishmaniasis, etc. It is a concept to collaboratively aggregate the biological and genetic information available to scientists, in order to hasten the discovery of drugs. This will provide a unique opportunity for scientists, doctors, technocrats, students and others with diverse expertise to work for a common cause. The Open Source Drug Discovery initiative will establish a novel open source platform for both computational and experimental technologies to make drug discovery for infectious / neglected diseases cost effective and affordable to the people of the developing world. NKN connects OSDD partners such as IMTECH Chandigarh, IGIB, JNU, Institute Of Life Sciences, etc. With NKN as their backbone, they have the capacity to provide a distributed environment to all their computing partners. This allows them to provide a unified platform for bio-informatics and an open source platform for drug discovery.



Grid Computing: NKN has the capability to handle high bandwidth with low latency with a provision for overlay grid computing. Some of the grid-based applications are climate change/global warming, science projects like Large Hadron Collider (LHC) and ITER. The NKN can be the platform to realize many such innovative applications. The Garuda Grid has enhanced its power and stability by migrating to NKN.

GARUDA is a collaboration of the scientific, engineering and academic communities to carry out research and experimentation on a nationwide grid of computational nodes, mass storage that aims to provide the distributed data and compute intensive high performance computing solutions for the 21st century. The Department of Information Technology (DIT) has funded the Center for Development of Advanced Computing (C-DAC) to deploy the nation-wide computational grid. The availability of an efficient,

high-speed (multi gigabit) network backbone, the National Knowledge Network (NKN) and Garuda's migration to NKN gives ample opportunity to exploit Gigabit speeds for the scientific and engineering applications being run on the GARUDA. Currently, the highly reliable and available NKN connects the resources of the Garuda grid with a bandwidth of 1 Gbps, with provision of QoS and security. In this collaborative grid project, various resources such as high performance computing systems (HPC) and satellite based communication systems have been committed by different centers of C-DAC and GARUDA partners. The total computational resources available today on Garuda are approximately 65 Teraflops.

A dedicated grid monitoring and management center at C-DAC, Bangalore helps in managing and monitoring all the components of the grid. State-of-the-art display walls and advanced software like *Paryavekshanam* developed at C-DAC help in effectively monitoring the health and utilization of various components of the grid. Applications of national importance that require aggregation of geographically distributed resources have been operational on the GARUDA grid. Resource intensive applications from various domains of e-Science such as bio-informatics, astrophysics, computer aided engineering, weather modeling and seismic data processing - have been provisioned on the operational grid.

Linking Rural Training Institute: Zila Panchayat, Dantewada in the district head quarters that Dantewada, established a rural training institute recently. Motive of this institute is to provide trainings related to skills, skill development and upgrading etc. for the rural youth, artisans and persons involved in the system. Pune based institution Indian Institute for Science Education and Research (IISER) Pune had come forward with different kinds of projects for rural youth, children and artisans of the district, through which periodic training classes are to be conducted for participants of the district through videoconferencing facility. Thus, a videoconferencing set up to cater to the training needs of not less than 100 persons at a time is felt necessary. Zila Panchayat Dantewada came forward to lower the expenditure that would involve in setting up the VC facilities.

NIC district centre had provided a high-speed connection to this node from Zila Panchayat, which is already linked to the LAN of NIC through OFC connection. NIC district centre had further coordinated with IISER Pune and Zila Panchayat in selecting the needed hardware and establishing the VC connectivity between RTI Dantewada and IISER Pune.

Concluding Remarks

E-Infrastructure such as NKN is a moving target. To be in dynamic equilibrium with technological opportunities will continue to be a challenge. One can configure the technology platforms to be flexible, to meet the common objectives at a given point in time. But defining a process to ensure a resilient eco-system to remain current on an on-going basis is harder. Such a process should obviously be adjustable to policy requirements dynamically. The NKN experience underscores this reality.

Acknowledgements

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Professor S.V. Raghavan

Prof. S. V. Raghavan is a distinguished researcher, having more than three decades of experience in the field of teaching, research and administration. He is currently serving as the Scientific Secretary (Government of India) in the Office of the Principal Scientific Advisor to Government of India. Dr. Raghavan is a Professor in the Department of Computer Science and Engineering, Indian Institute of Technology Madras, Chennai and also an Adjunct professor in the Department of Computer Science in IIT Delhi.

Prof. S V Raghavan is the Chief Architect of India's National Knowledge Network (NKN). He is a member of the High Level Committee for NKN constituted by the Prime Minister of India and Chairs the Technical Advisory Committee of the National Knowledge Network (NKN). He is the Chairman, Technical Advisory Committee for defining a resilient architecture and to design the National Optical Fiber Network (NOFN). As the Chairman of NOFN, Professor Raghavan looks at technology options and synergy across government entities such as BSNL, RailTel, Power Grid, NIC, CDOT and USOF for bridging the Digital Divide between urban and rural parts of India to serve the cause of inclusive education and health care. One of the key contributions of Prof Raghavan is the identification of

technological possibilities, using which "more juice" can be extracted from the fiber system, which, he believes, is the buried treasure of the nation. Besides fiber based efforts, Prof. Raghavan Chairs the Direct To Home (DTH) effort of Ministry of Human Resources Development for establishing 1000 DTH channels.

He is a Founder Member of ERNET (Education and Research network); he synergized the reports of National Knowledge Commission and the Office of the Principal Scientific Advisor to Government of India, which resulted in NKN.

He established the office of Dean (Planning) in IIT Madras and served as the Founder-Dean during 2003-2005. During his tenure Prof Raghavan established a fully automated State-of-the-art Data Center and a Campus Network. Combining scientific research and innovation, Prof Raghavan has devised an Infrared Imaging System based on non-invasive method for Breast Cancer screening and transferred the technology to industry. The scholastic article in this subject has appeared in the in the November 2011 issue of the Indian Journal of Medical Research. In January 2013, Vijaya Hospitals, Chennai opened a Brest Cancer Clinic based on his technology.

Prof. S. V. Raghavan has several Publications covering books, monographs, conference proceedings, as well as journal and conference papers. Prof Raghavan is the Chief Editor of the recently launched journal - CSI Transaction on ICT – being published by Springer worldwide. Prof. S V Raghavan represents India in the General Assembly and the Board of Technical Committee 6 on Data Communications of the International Federation for Information Processing (IFIP).

Prof Raghavan has received The Outstanding Alumnus awarded by Anna University (MIT Campus) and the Silver Core awarded by International federation for Information Processing (IFIP). Uttarakhand Technical University awarded him the degree of Doctor of Science in 2011. He is the Chairman, Board of Governors of Indian Institute of Information Technology (Design and Manufacturing), Jabalpur, India. In 2013 he was awarded the coveted Techno visionary Leadership Award by Indian Electronics and Semiconductor Association.

Jammu and Kashmir in Transition: As Worrisome As Ever

Lt Gen (Retd.) Syed Ata Hasnain

Try whatever you wish but it is very difficult to remove the label from Jammu & Kashmir (J&K) of it being India's most serious security problem. The Line of Actual Control (LAC) with China is live because of the massive infrastructure that China is continuing to set up in Tibet and close to the border itself. Many efforts are going on to read the minds of our northern adversary. George Fernandez, some years ago, called China our 'numero uno' adversary and that set the stage for our change in balance. The emphasis on China started appearing in our strategic thinking, while formulation of the Eleventh Plan was underway. It took considerable time to come to such a position, which should have been on our mind right from the time that Deng Xiao Ping articulated his famous 'Four Modernizations' in 1978, wherein the PLA was at the lowest priority. We had a headstart knowing fully well that by 2010 or so, things would begin to change as an economically stronger China would begin to flex its muscles. Resources crunch and a strategic thought deficit prevented us from doing this. The world then was changing very fast and events in Afghanistan and Pakistan kept our strategic emphasis on that region. The later stages of the first decade of the new millennium brought an 'about turn' with the coinage of the term Northern Borders, taking into its scope the borders with Tibet running from Ladakh through the Central Sector and Sikkim to the North East. It coincided with the reduction in militancy in J&K, and Pakistan's increasing commitment to its western border and internal security. 2012-13 have been watershed years in the balancing game between the Northern and Western borders. Both were active, the LAC and the LoC; both were hyped. However, our relatively lower confidence levels on the LAC ensured

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that the tilt in balance remained there.

When we speak of the Western borders, it is usually with focus on J&K and the LoC/AGPL from where the immediate threats emanate. While equipment deficit and quality continues to worry, we always seem to be confident of handling Pakistan. This positive mindset is good, but up to a point because 'Western borders' is not just about Pakistan; it is about the comprehensive capability to stabilize J&K around which the entire standoff with Pakistan is usually based. The question therefore arises – are we balancing our strategic thinking correctly between our perceptions of the two borders. That is what this essay is all about.

The hypothesis must be clear right at the outset. There is no denying that China is the major adversary and we need to continue building our efforts to counter it in a military standoff. Our infrastructure requirements, equipment upgrades and order of battle need a major overhaul which will take us many more years; there cannot be any slack on this. We also need to continue our intellectual and academic study of China, its interests, vulnerabilities and sensitivity. Yet, we cannot wish away the machinations of Pakistan and the enmity of the radical non state actors. Which better area of India can Pakistan exploit than the J&K region where it has kept us embroiled for the last 25 years. In doing so, Pakistan largely supports a grateful China because of the mutuality of their interests to see a strategically weakened India with both internal and external threats.

Pakistan's condition is a matter of worry for strategic observers the world over. It has a self-inflicted perception about India's intent to see it balkanized. The sudden appearance of a thought process in Indian strategic circles against the much touted and believed idea of a stable and united Pakistan being good for India's security, has set alarm bells ringing in Pakistan. This is contributing to its sense of insecurity as much as the uncertainty about the future course of events, and the paranoia about India's ambitions in post withdrawal Afghanistan. Pakistan's security concerns for the time being are therefore in three areas. In priority, the first is its internal security and stability. The TTP is very well entrenched and political interests which are at variance with each other, do not allow a focused address towards its growing strength. Frustration in dealing with it is becoming rife, and the Pakistan security establishment is hugely challenged. The second concern is the space that will be created in Afghanistan by the ISAF's projected withdrawal in the near future. Competing elements for this space will include the Afghan National Army as an entity of the Afghan Government,

the Taliban and Pakistan, with India being perceived by Pakistan as a serious contender too. The third concern is Kashmir and the LoC. Pakistan clearly does not wish to lose the strategic advantage of having kept India engaged in Kashmir for the last 25 years. That engagement is dwindling, because of the failure to adequately sustain the flow of infiltration across the LoC, forces serious unrest in the restive Kashmiri populace, or counter the psychological operations of the Indian Army. Pakistan's security perceptions will be balanced on these three concerns, and any of them can change in priority depending on the opportunities that present themselves, or are manipulated by the wily Pakistan intelligence department.

There are a couple of factors which will impinge on Pakistan's stakes in the balancing game. The first and most significant will be the emerging interest and role of China in South West Asia. China's future economic interests in Afghanistan run deep, and are associated with the mineral reserves which are not yet fully proven. It is already the largest stakeholder and among the first entrants in the minerals game. Even more than this is China's infrastructure interest in creating a trade and energy corridor from Xinjiang to Gwadar through Pakistan Occupied Kashmir (POK). Exploitation of its economic interests in Afghanistan is linked to this aspect. It will offset its almost wholesale dependence on the sealines of communication through the Indian Ocean thereby the threats from the US, Indian, Australian and Japanese navies. Kashmir's proximity to the emerging infrastructure places demands on both China and Pakistan that the Indian military capability should be limited and balanced through engagement in internal turmoil. There is therefore a convergence of Pakistani and Chinese interests to keep the Indian Army well engaged internally in J&K.

The second factor which influences Pakistan is its avowed intent to be the leader, or remain at least one of the most respected members of the Islamic group of nations. Its nuclear capability gives it a special status. However, it is also concerned about the possibility of any of its nuclear assets falling into rogue hands. It is aware that it is playing a difficult balancing act between the West and the Islamic world. It must not be seen to be too closely aligned with Islamic interests that are difficult to define. Fighting its own Islamists, it cannot close all options by declaring war on the Islamists supporting terror in India and specifically in J&K. The LET and the JeM will therefore continue to rule the roost and retain the option of alternating between hibernating at times and upping the ante at other times. This factor is important because it will create lulls in the degree of

terrorist activity that will be witnessed on the LoC, J&K and the rest of India. As we progress into the next few years, the lines will possibly get even more blurred and the defining of Pakistan's interests will be more difficult because of the inevitable linkages between Pakistan's religious sentiments and that of the state of things in the Islamic world.

Are we therefore, in full control to thwart the threats that emanate from Pakistan? Is our attention focused in recognizing the situation in J&K? The common perception appears to dwell on the belief that the events in Afghanistan following the proposed ISAF drawdown and eventual pull out will have little direct effect on Kashmir. This is indeed true, if we view the situation through the prism of 1989 when the then Soviet Union withdrew from Afghanistan. That coincided with the onset of militancy in J&K. An open LoC facilitated the unchecked movement/infiltration of inimical elements and the Indian Army was relatively inexperienced in handling the complex situation that emerged. The situation in J&K has indeed improved, but purely in military terms. The LoC is strongly held. The Indian Army is reasonably well equipped in technical terms and very well prepared in terms of experience, capability and morale. Therefore the very same LoC which provided the highways for infiltration in 1989 and beyond, is virtually a 'no go' for filling up the hinterland areas of J&K. The supporters of this opinion also rely on an assumption that the potential 'mujahideen' will be too busy fighting for space in Afghanistan. Similarly, Pakistan which may not be able to handle two fronts along with balancing its internal security compulsions. I go along with all this and do accept that the possibility of a direct effect on J&K or India as a whole will be of a much lesser intensity than what happened in 1989 and thereafter. However, that is only if we are prepared to understand the threats correctly, carry out a realistic analysis of J&K and do not present a situation begging to be exploited by adversaries. Pakistan is bound to carry out a risk and opportunity analysis, and could well alter its priorities to make J&K its 'Priority 1'.

So, apart from our military readiness to control infiltration how secure are we in J&K today. That is the question which should be needling our minds. Let us start from the military aspects. No doubt, the Indian Army is now quite adept at counter infiltration (CI) and exploiting the LoC fence over the last ten years, but it can never guarantee 'zero infiltration'. Its effectiveness is based upon assumptions and appreciations of traditional infiltration areas. There are too many chinks in the CI grid which can be

exploited by determined terrorists. 2014 could well be a year of desperate mass attempts, which were threatened but not executed in the past. 100-150 well trained terrorists with quality leadership can alter the counter terrorism (CT) situation. Given the fact that there is a large population of frustrated and disaffected, local surrendered terrorists whose integration into society has not even been attempted, the figure of 100-150 can actually be the core around which the new militancy could build. No one is better aware of this than the intelligence agencies.

The disconnect between New Delhi and Srinagar is not political alone. It flows into the security realm in a more marked way with even the Army affected by it. The best example to illustrate this is in the field of equipment needed for the management of CI and sanctity of the LoC, two of the Army's primary tasks. The thermal imaging equipment for night surveillance is now over 10 years old and its effectiveness has been greatly reduced. No efforts have materialized towards the procurement of replacements. Nor have efforts for setting up state of the art surveillance centers moved beyond demonstrations. In the CT grid, while the Army has changed its concept from large scale cordon and search operations, it continues to make too many mistakes and causes unacceptable collateral damage. This gives the required fodder to the separatists to exploit and human rights (HR) activists enough reason to call for lifting of laws such as AFSPA.

While the Army knows the dynamics of the stage of conflict it is now involved in, it has failed to explain the same to the other stakeholders. The unified command reviews situations from a tactical angle, with an approach to arrive at a summer strategy and a winter strategy; it hardly ever reviews the situation to examine what the long term integrated strategy needs to be. If such an approach was followed, it would have emerged that the internal conflict situation in J&K is at an early stage of conflict stabilization. The military part of the remaining CI campaign to be fought by the Army has to be balanced with greater emphasis on perception management, with a clear cut aim. The Army's outreach and capacity to employ soft power exists in as good measure as much as its military cutting edge; it has been unable to explain that it is capable of greater goodwill, in cooperation with all other agencies, which too have to change tack. Repeated calls for withdrawal of the Army only provide motivation to inimical elements. If efforts to convince about the need for a change in integrated approach have failed at the state and command/corps levels these have to be undertaken at the Army HQ

and national (CCS) level. The message in this argument is clear: the task is not yet over and premature decisions about the Army's role may well create conditions which the adversaries are seeking. It also spells that the concept and doctrinal aspects of CI/CT have to be transformed from a military to a quasi-military approach. Perception management has to be undertaken at the national level, to send appropriate messages to the population that its allegiance to India is to its best advantage. Without a national footprint and political support, such a campaign will be a nonstarter.

In a hurry to draw political dividends in an election year, the larger picture must never be forgotten. For example, it may sound very logical that the CT grid must be diluted by the Army, since the presence of a few terrorists does not justify large scale presence of the Army. For arguments sake, this is cogent reasoning but little is realized that there is an inevitable meshing of the CI and CT grids. Terrorists who escape the tiered CI dragnet at the LC always fall prey to the CT grid in the reception areas. Intelligence about potential infiltration does not come from within the CI grid; it is usually available from the CT grid in the hinterland where the population resides. Thus, handing responsibility of CI and CT to two different agencies will break the time tested coordination which has ensured the effectiveness of our operations.

Moving away from the military aspects, it is first the ideological reasons that we need to consider. J&K's transparent and tolerant culture has already been transformed to a highly radical one, especially among the youth. Although pro-Pakistan sentiment may have virtually vanished, anti-Indian feelings are deeply emotional, especially among the post 1989 generation; the ones who witnessed the period of the proverbial midnight knock, violence of an extreme kind and street turbulence. This generation does not think from the head, but rather from its heart and does not see its future linked to India. Its self-esteem has taken a beating and its dignity is perceived to have been trampled upon. Serious security analysts must not go by the observations of tourists and visitors to Kashmir, who only view the peripheral calm which facilitates a good tourist season. There is a seething within and a deep seated angst which is so evident on social media. The appeal of religious faith becomes extreme in such a population. The reader needs to view these observations in the light of the observations made about Pakistan. The resurgence of radical faith is always open to political exploitation. This is the nexus which has not yet fully emerged, but is on the horizon in this region. If recognition of this phenomenon as

a threat does not emerge in the minds of India's stake holders, it will be the greatest folly that we would be committing. Ideological threats do not take long in converting to political threats and ultimately become military threats. There cannot be a better example than Pakistan. The influence of Pakistan's radicalism has not yet made a major dent in J&K, but that time is not too far.

In the light of the above explanation, it is important to remember that anything which adds to the antipathy against the nation multiplies the threat and pushes J&K closer to the ideological influence emanating from Pakistan. We thus have to think through the emotive issues which are preventing integration of J&K. High on the agenda should be the unmarked graves issue, high profile alleged HR violations such as Kunan Poshpura, AFSPA, PSA and land issues such as Tosha Maidan, all capable of raising the ante and emotions on any given day. There are perceptions about each of these which will be exploited to raise temperatures at opportune moments. It is the explanation of each of these and willingness to engage in debate about their final outcome which will be crucial. Each such issue deserves an article/essay by itself. Suffice to say that at this stage when issues are seen through the prism of emotions, it becomes almost impossible to alter perception. Hence, the need for the involvement of many more, in perception efforts at the national level.

A national strategic affairs magazine has recently thrown up an interesting aspect about the Army's commitment in J&K, questioning the effects of CI/CT involvement on the Army's conventional capability in J&K. It is tempting to comment on this although not comprehensively (that will be a separate essay). In all the attempts going on to question the Army's continuing deployment in J&K, not many are aware that almost all the CT responsibility lies with the Rashtriya Rifles (RR). This is perhaps India's finest military experiment which must not be sacrificed by the altar of misinformed ego. The RR's role does not end at the killing of terrorists. Integration was its primary role; killing of terrorists and bringing the situation for conflict stabilization was the secondary goal. Questioning the RR's continuation in J&K is displaying a lack of understanding of ground realities. In another article I did explain how the RR matches and counters the new found military capability of Pakistan's Frontier Corps after its engagement in CT operations.

The intent behind this essay was simply to draw attention to the Western borders with focus on J&K. While doing so, there may have been

an inadvertent attempt to play down the Northern borders. There is no competition between the two borders, as both have adversaries who have a mutuality of interests. The inevitable surmise that must occur to a reader is that the threat from the West is apparently more complex and transgresses the military realm to appear as a more comprehensive one in the shorter term. We need to look at J&K afresh in almost every facet, if we have to prevent its exploitation. Our vision on both borders needs to remain balanced without the timelines of threats.

Lt Gen (Retd.) Syed Ata Hasnain

Lt Gen (Retd) Syed Ata Hasnain, PVSM, UYSM, AVSM, SM, VSM & BAR is a distinguished military scholar with extensive experience in J&K. He commanded India's premier strike corps -21 Corps – before going on to command the Srinagar based 15 Corps in a challenging time, stabilizing the deteriorating security environment in the wake of the street turbulence in 2008-10.

His novel methods of outreach to the public and the media while balancing it with his military strategy in CI/CT operations won him many accolades. He is a Senior Fellow of the Delhi Policy Group and a Visiting Fellow of the Vivekanand International Foundation.

China's Ambitions in the Asia-Pacific

Shri Jayadeva Ranade

This decade has been marked by pronounced Chinese assertiveness for reinforcing its territorial claims--whether on land or sea--and for dominance over what it claims as areas within its sphere of influence. China's growing economic and military might, especially in the wake of the global economic crisis, have given it increased heft in international affairs and the confidence to advance its claims more forcefully. Beijing's perception that the US is on the decline, albeit gradually, makes this period a window of opportunity. Beijing's assessment that this window could begin to close in approximately five years gives its push added impetus. China has chosen the Asia-Pacific as the region where it will first further its ambitions.

The US is central to the realisation of China's ambitions, especially as most of the rival claimants for maritime territories are closely tied to the US through long-standing security arrangements. While Beijing is pushing the boundaries to assert its claims, it does not desire either confrontation with the US, or to spark a conflagration with rival claimants. The latter have the potential to escalate and derail China's current effort to modernise its economy, improve the well-being of its citizens and modernise the military, all of which are essential for the Chinese Communist Party (CCP) to retain its legitimacy.

Beijing's assessment of US capabilities was encapsuled by China's Ambassador to the US, Cui Tiankai, in remarks a couple of weeks ago to a US audience. These simultaneously underlined the important role of the US in the region. Cui Tiankai called for shifting the orientation of Sino-US relations from one of 'crisis management to opportunity management' on the ground that using coercive language is not constructive. He also

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frankly acknowledged that "the United States is a powerful and very strong country…the most powerful and strongest country in the world, and will remain so for many many years to come."

Current tensions in the Asia-Pacific and their effect on Sino-US relations were naturally extant in Cui Tiankai remarks when, referring to the interests of both countries in the Asia Pacific, he asserted that Beijing is not about to withdraw its maritime territorial claims. He said, rather diplomatically, that the "United States' presence, interests, and influential role in the Asia Pacific is fully and widely recognized" and that China welcomes a "constructive role by the United States in the region". Equally important was his observation that "China is also a Pacific country, and China is also an Asian country. Geographically, China is just situated in the center of the Asian continent. And we have been here for centuries, perhaps a little bit longer than the whole history of the United States. So, I think it may be fair to say that neither Chinese nor Americans are aliens from Mars in the Asia Pacific, but we are somehow more indigenous than you are". He warned that "any attempt to manage or manipulate the regional affairs at the expense of China's legitimate interests in the region, cannot be justified, and would indeed be detrimental to the stability and prosperity of the entire region, and eventually will serve nobody's interests".

Similar sentiments were echoed, but far less diplomatically, by Shanghai-based Chinese venture capitalist and commentator, Eric X. Li, recently in Seoul. He emphasized that China had not erred in its actions regarding the territorial disputes in the South China Sea and East China Sea and that history will "probably prove" that China had been pre-eminently agile in dealing with these situations. He declared that China's strategic objective in the region is to change the status quo, which it did not have the power to influence when it was being established, to its advantage while avoiding military conflict. He concluded by stating that China has, and always will, act in its own best national interests and that China's "worldview is to keep out barbarians and not invade them".

Viewed from a geo-political perspective, the current dispute between China and Japan over the Diaoyu (in Chinese), or Senkaku (in Japanese), islands is really not a territorial dispute, but a more fundamental one involving China's national identity and is about China's place in the sun. China, which seeks to cast off humiliations of the past and regain its 'lost' territories and self-perceived rightful status, views repossession of

the disputed territories as recognition of its predominance in the region. Its economic and military 'rise' has given it confidence that the time is opportune to assert its claims and wrest international recognition of its pre-dominant position in the Asia-Pacific. Pertinent are its assertions at the 18th Party Congress and, more recently during the CCP Central Committee (CC)'s Third Plenum in November 2013, that China is a maritime power.

Re-energisation by the US since 2010, of its presence and relationships in the Asia-Pacific are viewed with concern by Beijing. These have served to reinforce the Chinese communist regime's lack of trust in the US, and conviction that it is intent on effecting the 'containment' of China and is therefore attempting its encirclement by 'unfriendly' powers. The sentiment has been expressed by senior Chinese Communist Party (CCP) leaders at important Party functions, including Party Central Committee plenums. The US concept of the 'Asian Pivot' and the TPP and TTIP are seen as additional deliberate attempts to disadvantage China strategically and supplement the US strategy of containing China and placing limits on its influence in the region.

The Trans-Pacific Partnership, or TPP, is a revised version of the US strategy to maintain its lead over other countries and preserve its status as the pre-eminent world power. The TPP is a serious effort to change the rules of the game, as it were, in matters of global trade regulations and laws. It is intended to ultimately replace the GATT and WTO. The US has thus far had detailed discussions on the TPP with the UK, Europe and Japan. Details of the discussions have not been made public and neither have details of the TPP. In fact, there is criticism in Japan that details of the TPP are being closely held by a small group within the government. Concerned that the rules governing the international economy and global trade will change appreciably, disadvantaging China which has benefitted from them over the past couple of decades since it joined the WTO on 17 September, 2001, Beijing has sought clarity on the subject. It was a subject of discussion during Xi Jinping's first visit to the US as China's President for a 'Working Summit' with US President Obama in June 2013. It was disclosed after the Summit that Beijing would be briefed on the TPP regarding its details. In any event, talk of the military component of the US proposed 'Asian Pivot' has receded after discussions on the TPP gained momentum. The implication is that the US and West plan, in preference to a military strategy, to recast international trade rules to their

benefit and to deny China the benefits it has thus far obtained thereby retarding its economic growth. China is, however, actively considering joining the TPP.

With this backdrop, tensions have continued to escalate in the maritime zone surrounding the Sea of Japan and South China Sea, particularly over the past year. China's strategic policy on the South China Sea disputes, formulated way back around 1989, is now being put to test. Beijing's policy remains one of conducting bilateral negotiations with rival claimant nations while steadfastly opposing a regional approach. To implement this policy it is using economic and other levers to cow down rival claimant nations.

As part of '*Sanzhong Dafa*' (or the 'Three Warfares', involving legal, propaganda and psywar) to further its claims, China has over the years also been assiduously constructing a sort of legitimacy for its maritime and land territorial claims. Quite ignoring the fact that the strength and influence of all countries and empires with a long history have waxed and waned over the years, the Chinese communist government has taken China's largest territorial extent as the basis for its claims. As in the case of other territorial and sovereignty claims, China has sought to 'construct' a legitimacy for its maritime claims on the basis of descriptions of sea voyages by the eunuch Admiral Zeng He, historical maps published in April 1935 and February 1948 and, more recently, the legislation passed, or enacted, by the National People's Congress (NPC)—China's version of a Parliament. As Mohan Malik pointed out in the *Diplomat* (Aug 30, 2013), it is ironic that in its territorial disputes with its neighbours like India, Myanmar, and Vietnam, Beijing always insisted that its land boundaries were never defined, demarcated, and delimited. However, in the case of its maritime claims in the South China Sea, it claims otherwise. China's claim that its land boundaries were historically never defined and delimited is in sharp contrast with its stance that China's maritime boundaries were always clearly defined and delimited. This basic contradiction (*ji ben mao dun*) in China's stand on land and maritime boundaries is untenable.

Since Deng Xiaoping launched the modernisations programme in December 1979, the acquisition of naval power consonant with China's anticipated global stature has been a goal. The 'recovery' of China's sovereignty over its land and maritime territories and the sea frontiers claimed by it has been an unwavering priority item on China's

strategic agenda. Deng Xiaoping initiated the process by planning the modernisation of the People's Liberation Army Navy (PLAN) and hand-picked his confidant, Admiral Liu Huaqing, then the only senior PLA officer with a Navy rank, for the job. Admiral Liu Huaqing's immediate focus was to build a credible deterrence that would facilitate unification of Taiwan with mainland China in case the use of force became unavoidable and, thereafter, to allow Chinese naval activity in the Asia-Pacific region. China's military strategic planners and the PLAN higher command has over the years adhered to the plans and doctrine drawn up by Admiral Liu Huaqing. The concept of the first and second island chains took shape from around this time. Recent examples of this, and the Chinese military's growing confidence, are the unveiling of the DF-21 Anti-Ship Ballistic Missile (ASBM) when tension with the US was high over its planned largest-ever joint exercises with the Republic of Korea (ROK) and Japan in 2010, and revival by China of its claims over the Ieodo Rock off ROK and the Saint James' Shoal off Thailand in the midst of escalating tensions in the South China Sea and East Sea.

As was to be expected, tension has risen in the region and China's relations with Vietnam, the Philippines and Japan have been damaged. The other South East Asian countries are seriously apprehensive now of China's 'rise' and talk in South East Asian capitals of its 'rise' being benign has given way to looking for other big powers to take an interest in the region. China is aware of these concerns, but is choosing to ignore them. The internal debate on the continuing benefits of the policy advocated by Deng Xiaoping of '*daoguang yanghui',* ('lie low bide your time'), apparently failed to get adequate support and has died down. The finalisation by Beijing last year of China's Asia Policy would have contributed to the end of such debate.

Beijing has instead chosen to opt for a policy of applying a blend of economic, diplomatic and military pressure on the Philippines and Japan. After an initial show of resistance, Vietnam has presently chosen to lie low and use the 'fraternal' links between the Communist Party of Vietnam (CPV) and the Chinese Communist Party (CCP) to keep bilateral relations in a state of decent repair. The Philippines, unable to withstand Chinese military and economic pressure, but unwilling to acquiesce to China's maritime territorial claims, opted to internationalise the issue. It took the matter of the disputed maritime territories for international arbitration. For this it earned China's ire, which was amply

and publicly exhibited in the remarks of Ruan Zongze, the Vice President of the Chinese Institute of International Studies (CIIS), while on an official trip to Manila on 3 April, 2013. He warned the Philippines, quite pointedly while on Philippines soil, to prepare for a rough four years as a consequence of its action.

Japan is the largest and most powerful country in the region and for various reasons is viewed by Beijing as a serious challenge. Beijing has, therefore, focussed on Japan. It banned the export of rare earth minerals and metals to Japan for three months and later whipped up anti-Japanese campaigns. PLAN ships have sailed past Okinawa into the Pacific and sorties by PLAN aircraft over waters claimed by Japan have prompted Japanese military aircraft to scramble to intercept them. The incidence has increased each year over the past two years with no signs of Beijing backing off from its harsh stance vis-à-vis Japan. Beijing also set up an 'Office to respond to the Diaoyu Crisis' under the direct leadership of Xi Jinping and took things a step further by promulgating the Air Defence Identification Zone (ADIZ). In response, Japan's new Premier Shinzo Abe declared, after his first visit to the US as Prime Minister in this term, that Japan is not and will not ever be a second rate power and also initiated a series of tough measures.

After 11 years of decline, Japan's defence budget for 2013, rose by 0.7 per cent to US$47 billion (4.68 trillion yen). The first Defence White Paper of Prime Minister Shinzo Abe's government, published in July 2013, stressed the need for further strengthening ties with the US. It additionally stated that Japan anticipates greater threats to its national security which require enhanced military capabilities. The tense territorial dispute with China along with North Korea's increasing belligerence were identified among the threats. The paper also hinted at a possible change in the role of the Japanese military from that of a purely 'Self-Defence Force'. These include the development of Japan's ability to launch preemptive attacks on enemy bases abroad and creation of an amphibious force similar to the US Marine Corps. Soon after release of the Defence White Paper, Japan's Defence Minister Itsuno Onodera said that Tokyo needs to be wary of China's maritime expansion in the South and East China Sea. He said "China has made more and more advancement into the seas," and that in the event of a conflict in Asia, Japan could be a key participant. "Japan therefore needs new equipment and must reconfigure its defense. It needs a good defense to protect the country, which means new equipment, new

aircraft, defense systems or cyber protection."

The increase in the defence budget will accelerate modernisation of Japan's Self Defence Forces (SDF). Indication of Japan's intent is already available, albeit subtly, in that Japanese Navy ships deployed in the Gulf now do not refer to themselves as the SDF Navy but only as the Japanese Navy. The Japanese Navy is also already well equipped--like with the Aegis Class Destroyers-- and quite openly confident of taking on and defeating the PLAN. Japan's *Asahi Shimbun* last year reported that Japan's Defence Ministry is planning a new protocol to deal with foreign unmanned aircraft that approach Japan's airspace, like the Chinese military drone that ventured near the disputed Senkaku Islands on September 9. The protocol will include provisions for "necessary measures," or shooting down a drone, if it continues to violate Japan's airspace and poses a serious and immediate danger to the lives and property of the Japanese public. Japan's Defence Minister Onodera described the drones as a "major risk".

Escalating tension has led to a drop in Japan's exports to China, which fell by 16.7 per cent to their lowest in the period January-June 2013 for the past four years, as compared to 14.8 per cent in the previous six months July-December. Imports by Japan from China registered a similar downward trend. This reduction in Japan's exports and imports away from China has been deliberate and occasioned by the deterioration in bilateral relations. According to JETRO, while Japan's direct investments in China for January-June fell 31.1 percent from the previous year to US$ 4.9 billion in 2012, there was a simultaneous 55.4 percent increase to a record US$10.3 billion for the Association of Southeast Asian Nations (ASEAN). This trend, according to JETRO Chairman Hiroyuki Ishige, is likely to continue as Japanese companies seek a safer political environment as well as lower labour and business costs in ASEAN and elsewhere.

Recent developments, however, point to quiet efforts to ease escalating tensions and the sense of crisis. This follows Japan's decision to increase its defence budget. Among the steps taken in recent months to defuse tension, Japanese Prime Minister Shinzo Abe decided not to undertake the usually controversial visit to the Yasukini Shrine in mid-August though at least three Japanese Cabinet Ministers visited the Shrine. Hong Kong authorities meanwhile denied permission to the group of 'anti-Japan' Chinese protestors from sailing to the Senkakus.

The real possibility of the Arctic Route opening for commercial shipping is a new dynamic that offers China an alternative route for sea-

borne cargo which is also shorter and more economical. With a distance of 2,936 nautical miles (5,437 kilometres) China's ships could sail through the Bering Strait through the East Siberian Sea and Vilkitsky Strait before docking at any of the various European ports. Qi Shaobin, a Professor at the Dalian Maritime University, observed that the route will significantly shorten the route between Chinese, European and North American markets. The Chinese ports of Dandong, Yingkou, Qinhuangdao and Tianjin ports will particularly benefit. The Polar Research Institute forecasts that China's sea trade will grow to US$ 6.7 trillion by 2020. The new shipping route will directly benefit China's plans to develop the economy of its north-east provinces.

More concretely, Beijing too appeared to have decided at the highest levels to adopt a policy of easing tensions. At the end of July 2013, China's entire 25-member Politburo (PB) met in a special session to discuss maritime power. Xi Jinping presided. He repeated the resolutions of the 18th Party Congress that China must become a major maritime power and develop its maritime resources. At the same time, however, he resurrected Deng Xiaoping's prescription that 'sovereignty remains ours; shelve disputes, pursue joint development'. Xi Jinping also appeared to echo the policy articulated by China's then President Hu Jintao in 2006, when Hu Jintao had referred to the equal importance of managing the domestic and international overall situations (*guonei, guowai, liangge daju*). Xi Jinping said at the recent Politburo meeting that China must "plan as a whole the two overall situations of maintaining stability and safeguarding rights" (*yao tongchou weiwen, he weiquan liangge daju*). The phrase seems to give equal importance to maintaining regional stability (weiwen) and safeguarding China's "maritime rights and interests" (weiquan). Some days later, China's new Foreign Minister Wang Yi, during a tour of South East Asian countries, said that final resolution of the disputes would take time. He also added that a code of conduct could meanwhile be discussed for minimising maritime problems and disputes, but without outside interference. The latter was clearly a reference to the US and action by the Philippines.

Despite these indicators, China's public stance as articulated by its official media has not relented. It has 'boasted' about its navy's circumnavigation of Japan and disclosed that Chinese ships have spent a record number of hours in territorial waters administered by Japan. In a mandatory training begun in October 2013, the CCP CC's Propaganda

Department instructed all Chinese journalists not to be supportive of Japan when writing about territorial and historical issues between the two countries. Nonetheless, a senior official from the Asian Division of China's Ministry of Foreign Affairs is learnt to have secretly met a high-ranking Japanese counterpart in Japan in early October. During the APEC Summit in Indonesia also in early October, while Beijing declined a formal meeting between the two leaders to discuss the island dispute, Japan's Prime Minister Shinzo Abe shook hands with Chinese President Xi Jinping. People-to-people contact has also increased with a record number of Chinese tourists travelling to Japan last year, and two-way trade continuing to register an increase. Beijing at the same time has opted for a 'no official contact' policy which, reports indicate, will remain in force so long as Shinzo Abe is Prime Minister.

It is more than likely that the US has, from behind the scenes, urged Tokyo and Beijing to tone down rhetoric and reduce tensions. At the same time, Tokyo's decision to enhance its defence budget would have raised anxiety in Beijing and given it cause for pause. Beijing certainly does not want to see a re-armed Japan on its doorstep, especially if it decides to go nuclear. Meanwhile, Beijing's plans to modernise the PLAN and add at least two more aircraft carriers to its fleet to secure dominance over the South China Sea and Sea of Japan are moving ahead. Beijing's pause should correctly be viewed as a temporary stalling and reduction of belligerent rhetoric to gain greater future strategic advantage.

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Contours of China's Ballistic Missile Defence Strategy

Dr. Mrs. Manpreet Sethi

In December 2001, the USA indicated its intention to pursue Ballistic Missile Defence (BMD) in view of the changed threat perceptions. Accordingly, it abandoned the ABM treaty – a bilateral arms control arrangement that it had entered into with the USSR in 1972.[1] Analysts worldwide closely monitored the Russian response to the US decision. There were only a few who were also interested in what the Chinese reaction to the US move would be.

Meanwhile, China closely followed the US and Russia to evolve its own direct and indirect responses to the American BMD. It has increased the pace of its already ongoing strategic modernization to upgrade and replace ageing systems to buttress deterrence, while simultaneously developing its own BMD, but even more significantly, countermeasures to defeat the American missile shield.

Interestingly, China's own R & D on missile defences can be traced back to soon after its nuclear tests in 1964. In August 1965, the Chinese Commission of Science, Technology and Industry for National Defence (COSTIND) submitted a plan outlining missile defence development, and an Academy of ABM and anti- satellite was set up in 1969 to work on *FanJi* or counterattack series of ABM, XianFeng or Pioneer anti-missile super gun, and a land based missile early warning network.[2] However, China is believed to have de-prioritized work on this after the conclusion of the ABM treaty in 1972. But, when the US decided to once again pursue the BMD as a complement to its nuclear deterrence, it evoked adverse comments from China. In 2001, Sha Zukang, Director General of Arms Control and Disarmament in the Ministry of Foreign Affairs

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stated, "China has not and will not participate in an arms race with anybody. But neither will we sit on our hands and allow our legitimate security interests to be compromised by anyone." Accordingly, China has made steady progress in its technological and strategic responses.

This article identifies the major contours of China's BMD strategy. For India, with whom China has unsettled territorial and border disputes, and at a time when increasing assertiveness is evident, understanding China's approach to development and deployment of missile defence is a matter of urgent concern.

Contours of China's BMD Strategy

Every country defines the role of its missile defences based on its threat perceptions. For Beijing, the role of missile defence is to stop degradation of the credibility of its nuclear deterrence. Therefore, it needs missile defences over its operational centers of gravity and key ballistic missile units, or nuclear command and control structures in order to *signal that retaliation would be certain and enough to cause unacceptable damage*. At the same time, it needs countermeasures to degrade the adversary's capability to defend itself. Or, in other words, *ensure that the adversary remains vulnerable to nuclear damage*. It is with these two objectives that China appears to have crafted its BMD strategy. Its contours or main features are identified in the following sub-sections.

Pragmatic Instead of Ambitious

China's efforts are aimed at building its nuclear and missile arsenal, and the attendant capabilities in such a way as to maintain credible deterrence. While there is significant opacity on China's defence spending including budget allocation across different sectors, it is clear that the country has had sufficient resources for over a decade, and has not hesitated to spend on high technology programmes. China's Second Academy and the Shanghai Academy of Spaceflight Technology are known to have been the leaders in research and development of BMD technologies. The missile defence programme includes the fielding of a Patriot like system in the first phase, an extended range anti theatre PAC 3 type of interceptors in the second phase, and research on a THAAD class system in the third phase.

As is evident from the modest capability goals that it has set for itself, it is unlikely that China will fall into the trap of an arms race on BMD with the US. Instead, China has and will continue to focus more on

developing countermeasures to defeat the American BMD. In fact, several Chinese analysts have expressed skepticism over the efficacy of the BMD, and see American efforts in this direction as "more of a waste of US effort than it is a great problem for China".[3] For this reason, it is unlikely that China will invest very heavily on in own BMD. Of course, *China would build some kind of an air and missile defence capability, particularly, to protect the survivability of its counter-strike forces. But, it will be averse to too much resource allocation on this and would rather complement it with other asymmetric warfare or what it calls the 'Assassin's Mace' capabilities.*

Mix of Indigenous Development and Acquisitions

The acceleration of China's strategic modernization has been enabled by two factors -- one, the breakup of the Soviet Union, which provided China the opportunity to get scientists and new technology and expertise from Russia; second, its consistent economic growth, which allowed greater spending on military modernization. A cash rich China has been able to invest in a floundering Russian defence industry to tap its expertise, for joint development of weapon systems that might have taken much longer to build indigenously. Therefore, for China the change in its threat perceptions after the end of the Cold War, timed well with its capacities to handle the new threats such as the American BMD.

China's ABM architecture comprises indigenous SAMs (since the mid-1990s, China has been engaged in the manufacture of its own version of S-300s under the HQ series), kinetic kill vehicles in ASAT role, anti-aircraft artillery to meet cruise missile threat, electromagnetic shells to cause a burst of radio frequency energy to disrupt electronic systems of attacking aircraft or missiles, and air defence lasers, besides a variety of sensors – terrestrial, air borne or space based – and the ability to fuse data.

Amongst the military hardware acquisitions from Russia are the Patriot class S-300PMU long range SAMs in significant numbers. A report in April 2010 revealed the shipment of 15 batteries of advanced SAM systems from Russia to China.[4] Each battery consists of four S-300 missiles. The system has the capability to simultaneously track up to a hundred targets and engage 12 of them. There are also reports of a joint programme between China and Russia on S-400 (HQ-19) as well as S-500 and S-1000 ballistic missile interceptor development. Russia is also the source of an advanced long range radar and space based surveillance systems that would be components of the Chinese targeting architecture

for an ABM system.[5] Various sources reveal that the test demonstrating China's BMD on 11 Jan, 2010 involved the HQ-196 surface-to-air missile equipped with a new exo-atmospheric kinetic kill vehicle (KKV), for use as a ballistic missile defence (BMD) or ASAT system. According to some estimates, China's ABM is likely to be operational before 2025.[7]

This could well turn out to be true since with indigenous developments and foreign acquisitions, China has obviously made substantial progress and a report in 2005 claimed "China's multi-level air and missile defence system – including the S-300 PMU-1/HQ 10, the HQ-15, the HQ-16, the HQ-17 and the HQ-18 has surpassed even that of Russia and is now the best in Asia".[8] Over the decade since then, technological advancements have steadily continued.

Focus on Countermeasures

For China, R & D on countermeasures to defeat an American BMD are perceived as offering greater dividends than a missile defence. China has accordingly developed its countermeasures strategy to complicate, if not defeat, interception in all three phases of flight – boost phase, mid-course and terminal.

Given that an *increasing the numbers of missiles* is the easiest and most workable option to defeat a missile defence since a large-scale barrage of missiles from a wide range of azimuths would stress the BMD architecture, China is known to have simply increased the number of missiles. As pointed out by an analyst, "Overkill, using a multi-layered, multidirectional saturation strategy is reminiscent of China's Korean War 'human wave' tactics."[9] While the emphasis in Chinese nuclear thinking has traditionally been on survivability rather than quantity, the US BMD has certainly changed the calculations of the size of its missiles.[10] Shen Dingli, a well known Chinese nuclear strategist has calculated, for instance, that a "nine fold increase" in Chinese ICBMs capable of hitting US targets would defeat even a BMD system with a "90 percent interception rate, and at a manageable cost of several billion dollars over one or two decades".[11] While such a large addition in the ICBMs is not yet evident, the numbers of medium and short range missiles have certainly increased.

Meanwhile the *types of missiles* has also changed from liquid fuelled to *solid-fuelled, mobile missiles* making them more survivable. The biggest change, however, in missile capability is seen in the *development of multiple*

independently targetable vehicles (MIRV) and maneuverable re-entry vehicle/warhead (MaRV). According to the NRDC Nuclear Notebook, maintained by the *Bulletin of Atomic Scientists*, China has had the technical capability to develop MRVs on silo-based missiles since the late 1980s. However, technical difficulties in miniaturization of warheads slowed the programme. In September 1981, China successfully delivered three satellites with one launch vehicle, and this was the first demonstration of its MRV/MIRV technology. In the early 1990s, China conducted a series of nuclear tests in a bid to develop smaller warheads with higher yield-to-weight ratio. However, placing the MIRVs on mobile missiles was another hurdle and an American intelligence estimate of 1999 placed it as being "years away".[12]

15 years have passed since then, and today China has the capability to MIRV ICBMs. In fact, it is reported that the China Academy on Launch Technologies (CALT) has been working on making multiple reentry vehicles more maneuverable in the terminal phase, thereby making interception virtually impossible. Greater maneuverability of a larger number of miniaturized warheads with a decreased infrared signal makes interception quite difficult.

Use of decoys that mimic the warhead's visual appearance or infrared signature to confuse interceptors is another way of defeating the BMD. Picking out the right warhead from a number of deliberately designed decoys is a challenge, and American tests have not always been successful on this front. China has developed and tested balloons to overwhelm mid-course and terminal defences. The first flight test of DF-31 ICBM was done with decoys on 2 August 1999. It has been reported that "an undetermined number of decoys decoupled from the primary warhead and spread out in different directions when the payload reached space."[13] With rapid progress in China's electronic warfare capability, it is also likely to have equipped its decoys with electronic countermeasures such as radar-jamming signals. Release of chaff just before the release of the warheads and decoys, could prevent radars from assessing the moment of release.

Another method of evading boost phase interception that China has experimented with, is to *undertake a cold launch*, which is able to reduce the infrared signature of the missile by propelling it out of the silo with compressed air or other gas before engine ignition. This delays detection of the missile and makes interception difficult, since sensors do not have sufficient time to detect and react.

Stealth measures that lower the probability of detection are also viable countermeasures. At its famous annual Zhuhai Air Show, China has showcased since 1998, its research and development of coatings designed to deflect radar energy, and its computer programming ability to design stealthy objects. *Trajectory manipulation by either depressing or lofting the missile trajectory* is yet another way to reduce the exposure of the missile to sensors, thus evading defences. Lofting the missile raises the apex altitude and thus increases the reentry speed and makes interception difficult. Similarly, depressed trajectories help the missile to evade sensors.

Meanwhile, development of *land attack and anti ship cruise missiles* (LACMs and ASCMs) offers China advantages in a BMD environment. LACMs equipped with GPS, remote sensing data and digital mapping technology offer accuracy and survivability. They have low take-off weight making them easier to transport and with a low IR signature, they also reduce the warning time for interception. ASCMs have the advantage of neutralizing sea based BMD which could be used by the US for boost phase interception by basing ships closer to Chinese territory. China seeks to counter the US Aegis BMD system equipped with SM-3 interceptor missiles through such developments.

Reports have also surfaced about China's successful deployment of ASBMs with a range of 1500 kms and armed with maneuverable warheads to defeat a ship-based BMD system that are being advertised as 'carrier killers'. These are based on the DF 21C MRBM. There is also believed to be a clear link between the Chinese ASBM and ASAT capability. In the case of both, their "guidance and control packages share a common technological foundation. Both the ASBM and ASAT kinetic kill vehicle require compact and high-speed on-board computing and software."[14]

China's repertoire of countermeasures also includes *targeting the infrastructure of the US BMD architecture*. This would degrade the US early warning, surveillance and interception capabilities. This could be in the form of ASAT attacks on American satellites being used for tracking missiles or aiding the navigation of interceptors etc., or direct attack on ground based radars through the use of submarine launched or land attack cruise missiles, or even indirect electronic or cyber attacks on the C4ISR structure.

Development of Asymmetric Warfare Capability

The most potent countermeasure in China's quiver to defeat BMD is its range of asymmetric warfare capabilities. Several Chinese programmes aim at developing weapons or systems that could attack the vulnerability of the adversary. This has been referred to as China's "Assassin's Mace" whereby it resorts to asymmetric modes of attack in order to create maximum chaos or paralysis in an adversary's decision making. Six of these capabilities are discussed as follows:

Space

While China has publicly maintained opposition to weapons in outer space, there is evidence to prove that the PLA "devoted resources to the strategic operations and technological development of space weapons"[15] from the late 1980s onwards. In fact, the military focus of the capability sharpened in the 1990s, after the Chinese evaluation of the role that space had played in the conduct of US military operations in the first Gulf war.

It is hardly surprising, therefore, that the *Science of Military Strategy* has described space warfare as being "inevitable in future wars and that a space offensive is likely to be a new strategic offensive pattern in the future".[16] Strategic writings in China have referred to space as the new theatre of war. A serving PLA officer, Col Li Daguang has aptly written in his book *Space Warfare* that PLA goals in space have to be to "destroy or temporarily incapacitate all enemy satellites above our territory, [deploy] land based and space based ASAT weapons, counter US missile defence systems, maintain our good international image [by covert deployment], space strike weapons concealed and launched only in time of crisis."[17]

China's approach to use of space is based on extracting benefits of communication, navigation, surveillance and targeting, as well as for developing offensive and defensive capabilities. According to some American estimates, the Chinese vision of space warfare involves "not just denying space to its adversaries, but using space for affirmative ends such as the intercept of ballistic and cruise missiles through space based combat platforms, strikes by space systems on terrestrial targets; and attacks by land, air, sea, aerospace and space vehicles on adversary's space platforms and space based command and control assets and their associated terrestrial nodes."[18]

China's space capabilities have steadily increased over the last decade. For reconnaissance, it has the Yaogan -1, -2, -3, -4, -5, and -6, the Haiyang-

1B, the CBERS-2B satellite, and the Huanjing disaster/environmental monitoring satellite constellation. It has plans for eight satellites in the Huanjing program that would be capable of visible, infrared, multi-spectral, and synthetic aperture radar imaging. While SAR satellites will provide all weather day/night monitoring, electronic recce satellites would detect electronic emissions, electro-optical satellites would be useful for early warning, targeting and mission planning, and a new generation of high resolution recoverable satellites for intelligence and analysis. China's efforts in this direction are focused along two lines – development of strong propulsion carrier rockets to carry digital reconnaissance satellites to form a 24 hour spatial imaging system; development of a new generation of solid fuel rockets to carry micro satellites to establish space networks for precise positioning, communication, electromagnetic jamming and reconnaissance.

On navigation, currently the PRC uses the US global positioning system (GPS), Russia's GLONASS, and its own BeiDou-1 system. The BeiDou-1 consists of three satellites and serves both civil and military purposes, but only over the East Asian region. Plans are afoot for replacing this system with an improved, advanced BeiDou-2/Compass system providing global coverage to China. This would also improve the accuracy of Chinese missiles.

Meanwhile, for communication, China has plans to increase the number of data relay satellites as also the satellite ground tracking stations to provide for seamless data transfer and analysis. Surveillance and communication satellites will also give Chinese cruise missiles and PGMs a near global reach once the constellation of tracking and data relay satellite system (TDRSS) is complete. It would facilitate rapid data transmission by linking disparate satellites instead of depending on one to return in its orbital rotation over a location.

With its own assets in space steadily increasing, 'active defence' is the central component of China's strategy, and it "includes countermeasures such as anti-interference and anti-jamming techniques, and in extreme situations using micro-satellites to actively guard other satellites, act as decoys or even counter-attack."[19] PLA writings emphasize the necessity of "destroying, damaging, and interfering with the enemy's reconnaissance ... and communications satellites," suggesting that such systems, as well as navigation and early warning satellites, could be among initial targets of attack to "blind and deafen the enemy."

It is in this context that the development and demonstration of ASAT

capability, when China shot down its own aging weather satellite (Feng Yun 1C) on 11 Jan, 2007 at a height of 865 km needs to be viewed. This act demonstrated the strides that China had made in sensing, cueing, and guidance technology, and as a corollary in programming software and the advanced algorithms necessary for such capability. China has also reportedly been working on the development of micro and nano satellites technology, to rapidly replace damaged/non-functional satellites and thus reduce its own vulnerabilities. These could also be used as space mines to attack space assets by colliding with them at high velocities. These could be hidden in other satellites to covertly rendezvous with other space assets to perform satellite inspections or other missions to disrupt, degrade or destroy satellites. Space, therefore, offers endless possibilities and China intends to use it for exploiting the US dependence on space, thus crippling its military and civilian activities.

Lasers

Amongst high technology weapons development under way in China, high energy laser weapons research to develop high powered lasers to intercept ballistic missiles and high altitude aircraft, as well as for use in radars and communication stand out for their level of success. China began R & D in this field in the 1980s and in May 1993, it had activated its first Free Electron Laser (FEL). Work thereafter focused on miniaturization of the electronic devices, so as to facilitate their deployment. In September 2006, China demonstrated the use of ground based high power lasers against US satellites. This was an effective demonstration of a capability to dazzle, blind or destroy an enemy satellite, thereby wage an asymmetric war against a conventionally superior nation by striking at its vulnerabilities. There are reports that China has fielded a laser system in Xinjiang.[20]

Electronic Warfare

Recent Chinese military literature places emphasis on "seizure of electromagnetic dominance in the early phases of a campaign, as among the foremost tasks to ensure battlefield success". Reference is also made to the term "integrated network electronic warfare" (INEW) to describe the use of electronic warfare, computer network operations (which themselves include computer network attack, defence and exploitation) and kinetic strikes to disrupt battlefield information systems. This is to be achieved through the deployment of non-nuclear Electromagnetic Pulse (EMP)

warheads, or a high power microwave (HPM) warhead on a short range ballistic missile, such as the DF-15. Such a weapon would have the capability to degrade or destroy microcircuits, computers, radars and sensors, communication networks and other electronic systems.

Besides EMP weapons, China has set up 22 research institutes studying the use of electromagnetic guns which can use a combination of magnets and chemical propellants to give projectiles speed and range, more than can be provided by chemical propellants alone. They have uses for missile defence and strike missions as ballistic missiles. Reports have periodically surfaced on China's development of an "electromagnetic missile" which would provide a burst of radio frequency energy to disrupt the electronic systems of an attacking aircraft or missile. China is also known to possess electromagnetic and electro-thermal guns in its arsenal.

Hypersonic Vehicles

On 9 January 2014, China undertook the first test of an ultrasonic glide vehicle. It would be carried atop an ICBM and then on release, glide and maneuver at speeds of Mach 10 to evade American BMD.[21] Indeed, this was the latest advance in the PLA - directed hypersonic research programme on the military uses of hypersonic vehicles which is believed to be several decades old and receiving assistance from Russia.[22] In early 2007, a French report had suggested that China had tested a scramjet-powered hypersonic test vehicle in 2006. The importance of these developments lies in China having the capability to use these vehicles for their extreme speed and maneuverability levels to defeat the adversary's interception.

Information Warfare

Transiting from the concept of "joint operations" to "integrated joint operations" has meant greater networking of vertical and horizontal military activities. The last two White Papers on national defence have placed special emphasis on operationalising an integrated command, control, communications, computer, intelligence, surveillance, and reconnaissance system built on an elaborate and countrywide fiber optic network, consisting of cellular and satellite communications along with aircraft based and other electronic sensors.

Meanwhile, in order to degrade the network warfare dependence of the adversary, China has sought to develop soft kill as well as hard kill capabilities in the field of information warfare. The former includes

attacks on computer networks, jamming and the use of electronic and high power microwave devices to incapacitate military or civilian computer networks. Ongoing R & D is reported to be exploring the possibility of using HPM as both a sensor and a weapon which first tracks the target and then increases the power and engages it. HPM systems are designated by Chinese military strategists as the superstar of DEW, and can be used as super jammers which focus microwave energy on potential targets. They can engage stealthy air targets and anti radiation missiles. The latter involve ASAT weapons, anti-radiation missiles to destroy radar or communication nodes, or even the use of Special Forces to physically attack electronic targets. Information attack through precision targeting of C2 nodes, computer warfare and a counter-space capability is also a Chinese ploy to offset the strengths of an adversary.

Cyber Warfare

A 2007 assessment ranked China as the "world's number one cyber threat in terms of intent and capabilities".[23] Among the information attack options mention of which is available in Chinese military literature are "planting information mines, conducting information reconnaissance, changing network data, releasing information bombs, dumping information garbage, applying information deception, releasing clone information, organizing information defence, and establishing network spy stations."[24]

With a view to conducting such activities, it has been reported that PLA instituted computer warfare units in 2001 in the Guangzhou, Nanjing and Jinan military regions with 500 specialists each. Reports from five years later suggest the extension of this capability to six of the seven MRs. Obviously the army of Chinese cyber warriors cannot be small, and could pose a meaningful threat to India's critical infrastructure such as telecommunications, utilities, broadcast media, cellular, internet and computer networks.

Conclusion

The examination of China's BMD strategy reveals that China has taken the American BMD capabilities as a serious threat to the credibility of its nuclear deterrence, and has accordingly crafted a multi-dimensional strategy to counter it. Its missile capabilities are steadily transforming from being a legacy force with fixed and difficult-to-deploy systems in to a *mobile and survivable sophisticated and integrated network based on modern*

sensors with advanced capabilities, improved detection, navigation and tracking abilities, and better interception technologies. Most significantly, the BMD components appear to display a *high level of mobility*. At the same time, China's own *missiles have not only increased in numbers, but have also been equipped with greater maneuverability technologies and other counter-measures* to enable them to penetrate enemy missile defences. Another dimension to China's military prowess is added by the *presence of asymmetric warfare capabilities* that are likely to be used with impunity to supplement the China's BMD and counter- BMD capability.

While China has been working towards setting up a sophisticated and integrated air and missile defence architecture, it is still a 'work in progress'. Of course, the country has begun to display far greater confidence in its technological breakthroughs and a lot more is today known about the many fields in which R & D work is going on in the different agencies in China. A combined ASAT, ABM and ASBM capability brings China onto a different plane in the event of military operations.

Several Chinese strategic analysts have pointed out that building a missile defence system is much more costly than an offensive system. They also highlight that it can never be a perfect shield either. Having learnt from the Soviet experience, China is unlikely to undertake an arms race on offence and defence with the US, or even contemplate the erection of a national missile defence over its entire land mass. It is more likely instead to follow Deng Xiaoping's dictum of selective emphasis on a few pockets of excellence, the Chinese BMD will expectedly be of a limited variety to protect critical areas of gravity. But, it will be supplemented with a wide array of other asymmetric capabilities aimed at defeating the enemy's advantage of missile defence.

Notes

1. Formally called the Treaty on the Limitation of Anti-Ballistic Missile Systems, was signed on 26 May, 1972. Its main objective was to restrict the size and locations of deployed anti-ballistic missiles for regional or national defence in order to maintain the primacy of nuclear deterrence based on mutual vulnerability to nuclear attack.
2. Mark A Stokes, *China's Strategic Modernisation: Implications for United States*, Report by Strategic Studies Institute, Army War College, 1999, p. 18.
3. As cited in Lyle Goldstein, in Goldstein ed. (with Andrew Erickson), *China's Nuclear Force Modernization* (New Port, Rhode Island, Naval War College), p. 85.

4. "Russia Ships China 15 S-300 Missile Systems: Report", http://www.spacedaily.com, April 2, 2010.
5. Goldstein, n.3. p. 93.
6. HQ 19 used in the BMD test is believed to have been co-developed or stolen from the Russian S-400 Triumf, according to Ian Easton, research fellow at Washington based Project 2049 Institute. *Defense News,* 20 Jan 2010.
7. Fisher, Jr., *China's Military Modernisation: Building for Regional and Global Reach* (Westport: Praeger Security International, 2008), p. 132
8. Report on HQ-10 available on http://www.missilethreat.com, 21 Sept 2010.
9. Wendell Minnick, "China's Anti-access Plans Worry US Navy", *Defense News*, 24 March 2008.
10. Western sources report that China had deployed two ICBMs in 1981, four by 1987, five by 1990 and 20 by 2004. John Lewis and Hua Di, "China's Ballistic Missile Programs: Technologies, Strategies, Goals", *International Security*, vol 17, no.2, Fall 1992.
11. Kori Uruyama, "China Debates Missile Defence", *Survival*, vol. 46, no.2, Summer 2004, p. 132.
12. National Intelligence Council, *Foreign Missile Developments and Ballistic Missile Threat to the US through 2015*, Washington DC., September 1999, p. 11
13. Bill Gertz, "China Develops Warhead Decoys to Defeat US Defences", *Washington Times*, 16 September 1999, p.1
14. Wendell Minnick, "China Anti-ship Advances Said to Threaten US Pacific Clout", *Defense News*, 21 Sept 2009.
15. Fisher Jr., n. 7, p. 79
16. Ibid, p. 79
17. Cited in Christopher Stone, Chinese Intentions and American Preparedness", *Space Review*, 13 Aug 2007.
18. Mary Fitzgerald, "China's Predictable Space 'Surprise'", *Defense News*, 12 Feb 2007
19. Eric Hagt, "China's ASAT Test: Strategic Response", *China Security*, Winter 2007, p. 34.
20. Fisher, Jr., n.7, p.83
21. Eric Hagt, "China's ASAT Test: Strategic Response", *China Security*, Winter 2007, p. 34.
22. Fisher, Jr., n.7, p.83
23. Fisher, Jr, n7., p. 84.
24. Ibid., p. 118.
25. Ibid., p. 119

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Resolving India's Crisis of Leadership

Vice Admiral (Retd.) Pradeep Chauhan

When, on the 26 February 2014, the highly decorated Chief of the Naval Staff, Admiral Devendra Kumar Joshi, PVSM, AVSM, YSM, NM, VSM, ADC, resigned his commission and abruptly quit high office, the effect within the Indian Navy was as cataclysmic as the eruption of the island of Krakatoa on the 26 August, 1883! Even outside the Navy — and despite the usual preoccupation of the chatterati with political issues in the ongoing runup to general elections — it led to an outbreak of frenzied comments in various forms of electronic and print media. Angry writers poured vitriol and scorn upon those they considered responsible for the fact that the Indian Navy was forced to persist-with and operate what were clearly obsolete and dangerous equipment and surface as well as sub-surface platforms, eventually leading to the entirely avoidable death of two brilliant officers who had been serving aboard the unfortunate Sindhuratna. There were emotive outpourings of all kinds — did the right head roll? Ought not it to have been that of the Defence Minister? Or that of the Defence Secretary? Or those of the Flag Officers Commanding-in-Chief of the Western and/or Eastern Naval Commands? Or, those of the ubiquitous and utterly uncaring officials of the Ministry of Defence (Finance)? Or, all of the above? Although the tragedy has left the nameless, faceless — and most certainly spineless — mandarins of the Ministry of Defence as unmoved as their voluminous files, the debate rages on. Rage and outrage permeate and pervade the internet. Strangely enough, the question, "Who is responsible?" seems to be afforded greater centrality than the question, "How can we fix it?" Although there is nothing that can make things right again for the bereaved families of the deceased officers — Lieutenant Commander Kapish Muwal and Lieutenant Manoranjan

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Kumar — there is much that can and must be done to fix the causative chain. It is, therefore, this that must engage us.

At the very centre of this tornado, of course, lie questions of 'Leadership'. Indeed, as an Indian living in contemporary India, it is difficult to find a more central challenge facing the Republic, than the singular lack of high-quality leadership. It is true that the issue of 'leadership' can hardly be confined to the Armed Forces alone and must apply — mutatis mutandis — to the civilian world as well, most especially the Ministry of Defence (and, in the opinion of this writer at least, the second 'villain of the piece', the Ministry of Defence [Finance]).

However, it is in the Armed Forces that the term 'Officer' is most ubiquitous. Indeed, where the Indian Armed Forces are concerned, the whole business of 'leadership' is inextricably linked to an aggregation of traits (or attributes or characteristics) that are collectively known as 'Officer-like Qualities' (OLQ). Obviously, for 'Officer-like Qualities' (which, in composite form, make for 'leadership') to be identified, it is necessary first to define the term 'officer'. This is particularly germane as there are several *ab-initio* officer-training academies and training-institutions of the regular Armed Forces of India, and an even larger number run by the various paramilitary and police forces. Insofar as the Armed Forces are concerned, the National Defence Academy (NDA) at Khadakwasla, Pune, is a well-established tri-service institution of global renown. In addition, the officer corps of the Indian Army is fed by officer-cadets trained at the Indian Military Academy [IMA] at Dehradun and two Officer Training Academies [OTAs] — one at Chennai and the other at Gaya, quite apart from three 'Cadet Training Wings' [CTWs] in the Army's technical-training institutions such as the College of Military Engineering [CME] at Pune, the Military College of Electronics and Mechanical Engineering (MCEME) at Secunderabad, and, the Military College of Telecommunications Engineering [MCTE] at Mhow. The Navy draws its officers from the very modern and hugely impressive Indian Naval Academy (INA), which apart from running a four-year BTech engineering programme, amalgamates naval cadets on their graduation from the NDA, as does the Air Force, whose officer-corps passes through the Air Force Academy at Dundigal.

An officer may be defined as "An intellectually, physically, emotionally and behaviourally exemplary, courageous and inspirational leader, imbued with a fine sense of pride, honour and integrity, possessing strong

articulation and clear and evident expertise and refinement in multiple domains and deeply committed to the service of his country and the wellbeing of his subordinates".

In all of these *ab-initio* officer-training academies and training-institutions, the deliberate (or even intuitive) 'parsing' of this definition, allows them to create and structure specific training-activities so as to attain each of the several adjectives contained in the definition. ('Parsing' means to resolve a sentence into its constituent parts and analyse each part).

For instance, the generation of the attributes contained in the term *"intellectually…"* would require the creation of a broad-based academic curriculum that provides the requisite broad-based, multi-disciplinary, liberal-education to each cadet, even while concentrating upon a narrower sub-set of those subjects that are most relevant to his or her professional advancement.

Similarly, the attainment of the traits covered by the word "physically…" would dictate a carefully-structured regimen of progressive body-development involving a balanced coordination of all muscle-groups and incorporating cardio-respiratory endurance, muscular strength and endurance, flexibility, and, body-composition. Team sports (often known as 'Troop Games') play a very important role in developing traits of good leadership. Cadets are mandatorily required to play games such as 'basketball', 'volleyball', 'soccer' and 'field-hockey', all of which teach cadets the importance of playing for the success of the team as a whole, and the importance of occasionally sacrificing one's individual chance of glory for the sake of the team. They teach these young men and women to become good team-makers, team-leaders and team-players, while promoting camaraderie, esprit-de-corps, and, a healthy spirit of competitiveness.

Likewise, the achievement of elements governed by the adverb *"emotionally…."* would require the designing and execution of specific activities aimed to promote maturity of thought, consideration for others, counselling avenues and methodologies, the promotion of reflection and introspection, and so on.

Moving along in the same vein, the realisation of qualities relating to the adjective *"exemplary"* drives not only the establishment of very strict norms of behaviour to which the trainers (as also the various members of their families) must compulsorily adhere-to, but also the conscious

creation of a formalised cadet-level hierarchy, involving selecting certain cadets as 'cadet-appointments' and vesting them with both power and responsibility, in order to provide 'exemplars' from amongst the peer-group as well. Thus, at each level of the hierarchy, those placed in power must necessarily exhibit behaviour that stands as a correct example for their peers and subordinates alike.

This always requires moral courage and often requires physical courage as well. Consequently, in seeking to actualise the various facets of courage, situations are carefully created where courage is required to be demonstrated. Much is deliberately made of the display of moral and physical courage, and a series of widely publicised 'positive strokes' creates and reinforces the required values in the minds of the trainee and trainer alike.

Further, the implicit and explicit manifestation of the adjective *"inspirational"* rest on the central belief that human beings aspire to be like those who evoke in them feelings of admiration and, when such 'role-models' are encountered, significant and lasting behavioural-change is evidenced. Every effort is made to provide such role-models from amongst the trainers and this once again demands that trainers subject themselves and their families to a much stricter code of conduct and deportment in all that they do.

'Pride' is an essential virtue in human beings, but needs to be distinguished from 'vanity' and 'pusillanimity'. A person is proud if he is — and thinks himself to be — worthy of great things. If he is — and thinks himself to be — worthy of small things, he is not proud but temperate. On the other hand, if he thinks himself worthy of great things when he is unworthy of them, he is vain; and if he thinks himself worthy of less than he is worthy of, he is pusillanimous. As the Greek philosopher Aristotle put it in his *Nicomachean Ethics*, the *kosmos*, or the whole of virtue, is brought to light in the virtue of *megalopsychia* — translated into English as "greatness of soul" and traditionally in Latin as "magnanimity". The 'great-souled' person deems himself worthy of great things and ***is*** indeed worthy of them. The great souled person, in other words, is a proud person. It is this pride that is sought to be inculcated — pride without vanity. Pride in one's country, pride in one's countrymen, pride in one's attire, pride in one's surroundings. In every institution that endeavours to produce leaders, great effort is made to instil pride but to abjure vanity.

Closely affiliated to concepts of worthiness and pride is "a fine sense

of honour'…" Honour as an abstract concept entails a perceived quality of worthiness and respectability that affects both the social standing and the self-evaluation — both at the individual level and at the collective one (such as family, clan, school, academy, profession, or nation). Of the several senses in which Dr Samuel Johnson defined 'honour', while penning his 1755 classic "A Dictionary of the English Language", perhaps the most relevant to this discussion on leadership is the one where it relates to the "nobility of soul, magnanimity and a scorn of meanness". Accordingly, in institutions that promote leadership, individuals are assigned worth and stature based on the harmony of their actions with a specific code of honour, and the moral code of society as a whole. And yet, despite its centrality to the development of leaders — there appears to be surprisingly little evidence of systematic study of the notion of honour in any of the institutions that seek to promote it. Given the crisis of leadership that the country is in, I, for one, can hardly do better than to recommend two excellent contemporary books — one published in 1994 by the American anthropologist, Frank Henderson Stewart, entitled "Honor", and the other published in 2008 by Professor Alexander Welsh of Yale University, entitled, "What Is Honor? A Question of Moral Imperatives". The former makes the case that there are two types of 'honour' — 'horizontal' and 'vertical'. Horizontal honour is the "right to respect among an exclusive society of equals" and is premised upon a 'code of honour', which stipulates minimum standards that must be reached in order for a person to receive respect within a group, and also specifies behavioural circumstances or happenstances by which honour might be lost. The permeation of 'horizontal' honour through a peer group also requires the existence of a tightly-knit, aspirational and inspirational 'Honour Group' that consists of individuals who understand and have committed to live the code of honour. The cadet-appointments in an ab-initio officer-training institution often constitute such a group. 'Vertical' honour, on the other hand, is about giving praise and esteem to those "who are superior, whether by virtue of their abilities, their rank, their services to the community, their sex, their kinship, their office, or anything else." (Stewart p. 59). 'Vertical honour, by its nature, is hierarchical and competitive. Vertical honour goes to the man who not only lives the code of honour, but excels at doing so. While agreeing with these categorisations, Alexander Welsh makes the important point that for vertical honour to exist, horizontal honour must first be present. In other words, without

a baseline of mutual respect among peers (horizontal honour), winning praise and esteem (vertical honour) means very little. In the final analysis, honour is the quality of knowing and doing what is morally right. In resigning his commission and spurning the loaves and fishes of his office, Admiral Joshi has proffered a powerful example of honour — knowing and doing what is morally right.

At the very epicentre of the miasma surrounding the current crisis of leadership is the notion of 'Integrity'. 'Integrity' is derived from the Latin word *"integritatem"*, meaning 'soundness' or 'wholeness' and denoting a 'perfect condition'. It is thus that the mathematical term 'integer' emerges to describe a 'whole' number. Similarly, to have integrity is to be solid, whole and of sound mind. As perhaps the most central ingredient of leadership, 'integrity' means that what you say institutionally and what you do individually are matched. You walk the talk. A system that operates-upon and promotes integrity may be likened to a series of valves in a fluid pipeline. Unless all the valve openings or flaps are aligned with one another, the flow of the fluid can never be smooth. The whole thing is working well, undivided, integrated, intact and uncorrupted. Sound leadership and integrity are indivisible. This explanation of integrity resonates well with that outlined by Stephen Carter, a law professor at Yale University, who states in his book called "*Integrity*" (Basic Books, 1996), *"When I refer to integrity, I have something very simple and very specific in mind. Integrity, as I will use the term, requires three steps: (1) discerning what is right and what is wrong; (2) acting on what you have discerned, even at personal cost; and (3) saying openly that you are acting on your understanding of right from wrong".* In the course of his incumbency as the Chief of the Naval Staff, Admiral DK Joshi repeatedly emphasised the absolute responsibility that comes with absolute power of warship-command. Thus, when a major lapse occurred on one or another of the surface, sub-surface or airborne combat-platforms of his Navy, he had reminded the Commanding Officer and the Navy at large that along with great power comes great responsibility and, as such, he had little compunction in removing the officer from command. When it was his turn to face an irate nation (even if the nation was being 'spooked' on a regular basis by an increasingly shrill and alarmist section of the media), he demonstrated fully the integrity that lies at the core of all good leaders. He walked his talk, applying to himself the same standards that he had applied to his subordinates.

Poor articulation is the bane of all, but a tiny slice of the Indian intelligentsia. In considering leadership, linguistic felicity remains its broadest underpinning. And yet, most Indians are schooled and brought-up to believe that language is merely a means of communication. In strong opposition to this flawed 'gem' of conventional wisdom, I believe that language is not limited to being a mere means of communication. Language is really a 'mode-of-thought'. If we cannot articulate a complex concept to ourselves, then we can hardly expect to articulate it to anybody else. There is a corollary to this, which is both dangerous and invidious. It is this: if we do not possess adequate linguistic skills to articulate complex concepts to ourselves, then our minds will begin to generate only such concepts as our language skills allow us to speak (to ourselves) in. There is, therefore, a segment of education and training — in each of our institutions of learning — which must allow for a seamless transition between two otherwise seemingly different fields, namely, 'science' and 'technology' (which is the 'applied' aspect of the sciences) on the one hand, and, the 'humanities' or the 'liberal arts' on the other. It is incorrect to hold that these lie in two different 'stovepipes'. The 'humanities' provide and promote the ability to conceptualise, while the 'sciences' provide the discipline through which the concepts that have been conceptualised can be realised. Technology takes this new, 'disciplined-concept', and gives it that degree of form that will enable 'function' to be realised by human beings. If our leaders cannot synthesise these elements of the 'humanities' and the 'sciences', so as to produce viable 'technology', and if they cannot enthuse the populace at large to do the same, we will be forever stuck, blindly chasing the technologies generated by other people.... other countries.... other races.... other communities... other societies. We look with eagerness and yearning for our leaders to take India forward. However, neither they, nor those they lead can do that unless we are able to conceptualise for ourselves. Despite the impressive number of graduates and post-graduates in our country, we can find little or no correlation between these numbers and the pitifully few 'original' research-papers that are generated or accepted. Why is this so? I believe that it is because, amongst many other things, the spirit of enquiry and the innate spirit of curiosity in the intellectual-development of our people has, all too often, been sacrificed at the altar of rote-learning. 'Rote-learning', in our country, has come to be viewed as a bridge, a mechanism, an elevator, an escalator, which will allow us to move from one socio-economic background into

another. Now, that may well be true. It certainly does all that. But it does other things, too. Darker things. It stifles creativity, promotes fear of expression, and militates against the free-thought that is so essential to conceptualisation. Are there alternative solutions? Can 'education', 'training' and 'technology' together bridge these socio-economic gaps that afflict our country? I believe that they can. Sadly, however, even the most experienced leadership-producing institutions of our country (certainly including those of the Indian Armed Forces) have spent relatively little effort in this regard and continue to afford little value to this key aspect of leadership.

Refinement in multiple domains is essential in a leader as soon as he or she begins to interact in a domain even slightly larger than the one he or she originated from. As the level of leadership rises, the domain becomes an international one and words and deeds/actions of the leader begin to have an ever-greater impact upon the 'horizontal' component as well as the 'vertical' component of honour — for example, the avoidance of conduct that will generate embarrassment or shame, and the meticulous adherence to conduct that will enhance the leader's own stature, as also the country's standing and prestige in the comity of nations. It is never too early to bring-in this refinement in multiple domains — the foundations and much of the edifice is either built or marred by the time one's basic education is completed. According to Sigmund Freud's psychoanalytic theory of personality, personality is composed of three elements, namely, the 'id', the 'ego' and the 'superego', which together account for the complexity of human behaviour. Of these, the 'superego' holds all of our internalised moral standards and the ideals that we acquire from both parents and society. In other words, our sense of 'right' and 'wrong'. The superego provides guidelines for making judgements. According to Freud, the superego begins to emerge at around age five and has two parts. The first is the 'The ego Ideal', which includes the rules and standards for 'good' behaviour as determined by parental and other authority-figures. Obeying these rules leads to feelings of pride, values and accomplishments. The second is 'the conscience', which includes information about things that are viewed as bad by parents and society and which brings feelings of guilt and remorse. When our embryonic leaders are denied the degree of exposure — whether direct or vicarious — that will enhance the 'horizontal' and 'vertical' components of honour, defence-mechanisms come into play and the individual begins to deride or make fun of those

behavioural norms that he or she has not been permitted to develop. Thus, apprehension of ensuing embarrassment in, say, handling of all the trappings of 'fine dining', will produce a defence-mechanism that derides the whole business of refinement in dining. The *ab-initio* officer-training institutions of the Indian Armed Forces are at pains to develop in their trainees, multi-domain comfort-levels and refinement. Perhaps our other educational and training institutions would do well to take a leaf from their books.

Commitment to one's country is a sine qua non for a nationalist leader of any hue. Much lip-service is paid to this, but the lack of 'integrity' is striking, especially at the politico-bureaucratic levels. There are altogether too many occasions where smug complacency and crass arrogance of power is particularly visible amongst the administrative services (and, sadly enough, amongst the Ministry of Defence in particular) in whose case the very word 'service' seems an aberration. A famous quotation attributed to Field Marshal SJF Manekshaw, MC, in relation to the abysmal knowledge of the politico-military leadership is telling in this regard: "knowledge of politicians: "*I wonder whether those of our political masters who have been put in charge of the defence of the country can distinguish a mortar from a motor; a gun from a howitzer; a guerrilla from a gorilla, although a great many resemble the latter*." The fact that barely any senior functionary of the government thought it fit to travel to Wellington (Tamil Nadu) so as to pay their respects to the hero of the 1971 India-Pakistan conflict is an abject reminder of pathetic leadership. On the other hand, training establishments and institutions of every kind within the Armed Forces, the Paramilitary Forces and the Police Forces of the country take great pains to inculcate an abiding love for the country in their trainees. The National Anthem is sung with pride and gusto. National symbols are revered and national heroes are remembered and their deeds commemorated. There is none of the mild embarrassment that is all too often seen amongst alumni and students of our supposedly elite educational institutions in respect of expressing one's pride in India and Indian heroes. Once again, an example to look up to and to follow.

A deep and genuine concern for the wellbeing of one's subordinates is a critical attribute amongst officers who would lead their men in times of peace, tension and conflict. It is equally a critical facet of leadership in every sphere and domain and its reiteration across the annals of time

and space by a host of officers and leaders is evidence of its universality. Sun Tzu's treatise on the *"Art of War"* is amongst the oldest in the world and famously cautions leaders to "carefully study the well-being of your men". The Chetwode motto — "The safety, honour and welfare of your country come first, always and every time. The honour, welfare and comfort of the men you command come next. Your own ease, comfort and safety come last, always and every time." — is ingrained in every officer of the Indian Armed Forces and it continues to inspire and guide the actions of the officer corps, long after they have retired from active service. General Colin Powel's well quoted comment is equally relevant: *"Leadership is solving problems. The day soldiers stop bringing you their problems is the day you have stopped leading them. They have either lost confidence that you can help or concluded you do not care. Either case is a failure of leadership"*.

Finally, leadership is not about rank, privilege or perquisite. Leadership is about the well-being of the led…. the well-being of the country. The country's honour, the leader's honour, and, the honour of the led, are not different from one another, as I hope will be evident from this closing quote from *"Democracy in America"* — Alexis de Tocqueville seminal work published in 1840: *"Ranks mix and privileges are abolished. The members of the nation becoming again similar and equal, their interests and needs become identical, and all the peculiar notions which each class styled honour begin successively to disappear. The particular needs of the nation itself become the only source of honour, and that honour stands for the peculiar individual character of that nation before the world"*.

Vice Admiral (Retd) Pradeep Chauhan, AVSM & Bar, VSM, IN

An alumnus of India's premier National Defence Academy at Khadawasla; the Defence Services Staff College at Wellington; the Naval War College at Karanja in Mumbai; and, the prestigious National Defence College at New Delhi, Vice Admiral Pradeep Chauhan retired on 30 Nov 13 after garnering over 35 years of rich and varied experience in the Indian Navy. In his sea-going career, he was singularly privileged to have held command of the Indian Navy's frontline surface-combatants on as many as four occasions, culminating in the command of what was then the Indian Navy's sole aircraft carrier, INS Viraat.

He is widely travelled, with a stint in Antarctica and a three-year assignment in Mauritius under his belt. He set-up the Mauritius National Coast Guard and was its first Commandant. The Admiral was instrumental in the conceptualisation and proving of strategies as well as tactics-of-war for the Indian Navy and has been the Principal Director in the Directorate of Naval Operations at Naval Headquarters, New Delhi. He has served on the staff of the DSSC (Wellington) both as a Teaching DS and as the HOTT (Navy).

Upon his promotion to Rear Admiral in 2005, he was tasked with setting-up a new and vibrant organisational structure at New Delhi that dealt with Naval Foreign Cooperation and Intelligence. Over the next three years, he was hugely successful in bringing abiding centrality to this new set-up and, consequently, in positioning the Indian Navy firmly within India's diplomatic and strategic initiatives. He was promoted to the rank of Vice Admiral in 2009 and was appointed Chief of Staff of the Western Naval Command. After a hectic but hugely successful two-and-a-half years in this high-pressure job, he was selected to mould the future of the officer-corps of the Indian Navy and assumed command of the Indian Naval Academy (INA) at Ezhimala, Kerala.

Upon his retirement, Vice Admiral Chauhan has taken his guard at the crease for his second innings, in Pune, where he is continuing to contribute to the development of maritime and strategic thought in the country.

Air Power and Contemporary Warfare

Air Vice Marshal Arjun Subramaniam

Introduction

After a hiatus of a few years following the euphoria that was generated after the two Iraq wars, and the initial successes of air power in the war in Afghanistan, the global discourse on air power has again picked up, primarily due to the successes notched up in Libya and Mali. While there is no doubt in anyone's mind about the ability of air power to decisively shape the course of conventional conflicts, there is growing realization even in an Indian context, that the probability of prolonged conventional conflict with both Pakistan and China has declined considerably for different reasons, that would not be dwelt upon in this article. However, wise counsel prevails within India's strategic community that sees the inescapable need to retain cutting edge conventional capability as long as the strategic neighbourhood remains as volatile as it is today. It is in this context that air power has to stay *relevant* as a powerful tool of statecraft, and an instrument of deterrence and coercion. This article seeks to reinforce an '*understanding of air power not only as a potent tool of joint war fighting, but also as a critical element of statecraft*.'

Differing Perspectives on Modern Warfare

Current Western perspectives on warfare mainly talk about the dwindling possibility of conventional conflict between nation states with a few exceptions. These would primarily involve coalition operations against failing states, or those states that threaten the Western way of life. Do we see traces of Samuel Huntington and his *Clash of Civilizations*? The four main conflict profiles that find favour in the West are highlighted as follows, and are:

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- State vs Non State conflicts in unstable regions. These could be precipitated by either ethnic or religious differences, energy, or other economic imperatives.
- Continuing global war on terror.
- Global stability operations in the form of peacekeeping or peace enforcements/missions, either under the UN umbrella, or a coalition led by NATO or regional security organizations like the African Union (AU). These operations may have an altruistic agenda of humanitarian intervention, which also furthers the protection of interests and expansion of influence – Libya and Mali have been such interventions in the recent past.
- The fourth emerging face off is the US – China military rivalry, which is likely to sustain, and even fuel the conventional capability build up in the US armed forces in a post ISAF withdrawal era.

What then is contemporary warfare from an Indian perspective? Breaking it down into four scenarios for ease of understanding would be a simple way. The likely scenarios are:

- Full scale conventional conflict involving full mobilisation on two fronts with possible escalation into a nuclear face – off. Probability of this happening is low, but it does not allow India the luxury of not developing adequate deterrent capability. This is primarily to ensure that the probability of a full-blown conflict remains low.
- Limited conflicts in varied terrains based on territorial sovereignty issues and proxy ambitions. Probability of this happening is high with multiple hot spots and triggers – Arunachal, Ladakh, Siachen. Sir Creek and J&K. This profile calls for developing capabilities for a quick response, rapid escalation, decisive action and rapid de-escalation, to arrive at a military end-state that facilitates the achievement of laid down political objectives.
- A scenario that ought to keep India worried is hybrid warfare of the kinds that the *Lashkar-e-Taiba* and *Taliban* are capable of fighting. We have called it a proxy war so far, and I would like to combine the two and call it a '*Hybrid Proxy War*' – primarily because of the nature of the adversary, and the ease with which he can switch between insurgency, terrorism and confronting an established army with conventional firepower and tactics. As a result of the close involvement of the ISI and the Pakistani Army, these hybrid fighters present a grave security challenge to the Indian state. Does

India need to be worried about these fighters in the aftermath of the ISAF withdrawal in 2013 -14? Of course it does.

- The last scenario comprises threats from sub conventional /fourth generation/fifth generation entities that cut across the lower end of the spectrum of conflict. These demand a wholly different set of skills to counter, particularly when dealing with home-grown movements like LWE and insurgents from the North Eastern states. In such scenarios, stability operations would need to be orchestrated by the military alongside typical COIN operations.

Air Power Performance Overview

A broad overview of how airpower has performed over the last two decades commencing with Op Desert Storm in 1991 and ending with Libya in 2011 is important before analyzing its place in modern warfare. The euphoria generated by the success of airpower during Op Desert Storm created unrealistic expectations on what airpower could do, and while it played a decisive role in Kosovo (1999), Afghanistan (2001) and Iraq (2003), chinks appeared in the seemingly all pervasive and war winning capabilities, in terms of offering solutions not only for conflict termination, but also conflict resolution.

In 1999, while airpower did enough to coerce Milosevic and drag him to the negotiating table – the absence of boots on the ground allowed ethnic cleansing to go on for longer than anticipated. Operation Enduring Freedom that commenced in 2001 after the 9/11 attacks, involved one of the most intensive and effective bombing campaigns against the *Al – Qaeda* and *Taliban* in Afghanistan. It had *Al – Qaeda* on the run, inflicted heavy attrition on *Taliban* fighters, but did not end up in a decisive military victory, because of the inability or reluctance to follow up with a decisive surge with boots on the ground campaign. The campaign to defeat the *Taliban* is still on 11 years down the line. Rumsfeld's '*Shock and Awe*' campaign in Iraq in 2003 relied heavily on airpower, and this time in a coordinated air and ground campaign. Saddam was removed, but peace took almost seven years to be achieved. In 2006, Israel attempted to defeat the Hezbollah by unleashing an aerial bombing campaign without a simultaneous ground campaign. While the aerial campaign broke the back of the Hezbollah, it did not result in a decisive victory for Israel, and as far as the world was concerned, it was a military defeat for Israel; a perception that was accentuated by media focus on collateral

damage in Beirut, rather than the destruction of Hezbollah's fighting potential. However, to be fair to the Israelis and notwithstanding popular perception, the Hezbollah has not confronted Israel again is testimony to the serious damage inflicted on its fighting potential by Israeli air power. Israel did not commit the same mistake in 2008 when it went into Gaza and defeated the Hamas decisively in a coordinated air-land blitzkrieg.

Air power continued to feel the pressures of media coverage and poor perception management when General David Petraeus rolled out his air power light COIN strategy in 2008/09 in Iraq/Afghanistan. However, if one looks at the attrition statistics since then, as far as the *Taliban/Al – Qaeda/Haqqani* groups are concerned, most of it can be attributed to drone strikes. What then is a key takeaway? It is that airpower has too many decisive and enabling characteristics to be down for very long. It was just that aerial strategists for too long had relied heavily on air power's offensive capabilities, without realising that its enabling characteristics of mobility and surprise had the ability to decisively impact conflicts at the lower end of the spectrum of warfare. *Op Geronimo*, the mission to eliminate Osama bin Laden changed all that, as all the solutions discussed by the Obama administration had airpower playing a pivotal role in them.

The redemption of air power in recent times was definitely in Libya and Mali where the NATO air forces displayed a maturity that had not been seen earlier. Orchestrating a highly successful and discriminatory aerial campaign, they realised the political objectives of the intervention, and rejuvenated perceptions that air power was indeed a powerful tool of statecraft, if used with caution, particularly at the lower end of the conflict spectrum.

Air Power – India and its Neighbourhood

At almost the same time when NATO was prosecuting its aerial campaign against Milosevic, the Indian army and the Indian Air Force(IAF) were involved in a classic high altitude limited conflict with Pakistan in the Kargil sector. The employment of air power in that conflict and its 'deterrence and conflict termination value' has been extensively debated and written on. Less written about is the employment of offensive air power during *Op Parakram* in 2001, when India and Pakistan almost went to war following the attack on Indian Parliament by the LeT. In July 2001, in an audacious operation in the Neelam Gurez sector, a company strength of Pak Rangers and Mujahids occupied a position on a ridge line about a kilometre inside

Indian territory that gave it good visibility on numerous Indian positions. Though the action reminded one of the initial occupation of the heights in Kargil/Drass/Mushkoh of 1999, the Indian response this time around was different. The Northern Army Commander immediately called his IAF counterpart – IAF fighters immediately swung into action and bombed the location even as a ground assault was planned. The action was so decisive and psychologically impactful that when the assault force reached the location – it had been abandoned by the enemy. In hindsight, had similar action been initiated in 1999 prior to the ground assault, we may have seen a different end-state. Of course, all this is in hindsight and does not factor in the existing strategic realities of the time, and the fact that the Indian army and the IAF had rarely been involved in a joint high altitude campaign, with memories of 1962 lingering on in our psyche.

From an airman's perspective, how does one see the employment of air power in conventional conflicts? All the classical roles of air power are tailor made for conventional conflicts and the IAF is no different. Some of the typical roles of air power that the IAF would consider taking on are highlighted as follows:

- Achieving control of the air through the counter air campaign to ensure that surface forces can achieve their operational objectives.
- Shaping the battlefield to achieve op and tact objectives by conducting a Battle Field Air Interdiction (BAI) and Counter Surface Forces Operations (CSFO) campaign, which causes attrition to enemy land and maritime forces, and allows our own forces the freedom to manoeuvre and operate freely.
- Targeting enemy Centres of Gravity (CsOG) through a strategic air campaign with the aim of depleting his war waging potential and his will to fight.
- Leveraging the non-kinetic and enabling capabilities of air power like mobility ops, CASEVAC, Combat Search and Rescue (CSAR), EW, air-to-air Refuelling and Airborne Warning and Control (AWACS) to further air and surface operations.

In case a conventional conflict blows over into a nuclear conflict, air power is part of the nuclear triad that will support India's nuclear doctrine of massive retaliation in a second strike.

Air Power in Limited and Hybrid Wars

Short and high intensity conflicts leave little scope for air forces to conduct a sequential aerial campaign due to the time-compression imposed on the armed forces to achieve limited objectives. Such conflicts will test the ability of the IAF to carry out parallel operations, and create effects that allow political objectives to be met. Typical triggers could be a large scale terrorist attack, which elicits a swift punitive military response that could commence with a special forces action, and expand to a limited sectoral conflict aimed at either punishing an adversary, or fighting a holding battle against a northern adversary who is seeking territorial solutions to a long standing border issue through swift incursions.

Hybrid wars and sub-conventional conflicts have seen India use air power with extreme restraint, particularly when it comes to using offensive airpower in Kashmir and against Left wing extremists. Instead, the state has relied on the non-kinetic or enabling roles of air power like mobility, logistics support, induction of special forces into a combat zone and casualty evacuation in an attempt to fuse air power into the larger '*Winning Hearts and Minds*' strategy. As far as India is concerned, air power is a key tool of nation building with its ability to execute Humanitarian and Disaster Relief Operations (HADR) across varied terrains and altitudes, reaching out to people and helping the government connect with citizens in remote areas-it has been so since independence.

Deterrence, Coercion and Compellance

If one has to look at larger issues of statecraft, air power without doubt, has been a critical tool of deterrence down the ages. Aerospace power is still the fulcrum of nuclear deterrence, and will continue as long as nuclear weapons proliferate. At the operational and tactical levels, the very fact that IAF MiG–29s and Mirage–2000s were loitering in the Kargil sector, whilst offensive missions were being prosecuted, kept the PAF away from battle–a fact acknowledged by none other than the PAF commanders themselves. The presence of IAF attack helicopters on UN peacekeeping and peace enforcement roles has always created a deterrent effect on militia, whether it was in DRC, Sierra Leone or Sudan. One of the effects of this has been the prevention of genocide in varied situations. The sheer flexibility and deterrent value of IAF airpower has significantly impacted our strategies in UN missions. At the sub-conventional level,

the presence of UAVs and drones over areas that are insurgency prone have the potential of significant deterrence. Need I mention here that it is this factor that has the *Al-Qaeda* and *Taliban* on the run in Af-Pak.

The shooting down of a Pakistani Air Force Atlantique MR by an IAF MiG–21 in 1999, one month after the Kargil war over Kutch, is a classic example of contemporary coercion. So is the Chinese ASAT test of 2007 in which they successfully brought down one of their satellites, sending a strong message to the US that they were a force to reckon with in space, and cannot be messed around with. Another interesting aspect of aerospace coercion is this unfolding debate on '*Weaponisation of Space*'. Star Wars, SDI, technology demonstration of laser weapons etc. These have been nothing but stray manifestations of coercive exploitation. The unfolding debate across global space communities is that weaponisation of space is inevitable, and that this weaponisation could form the heart of deterrent and coercive strategies. Giving specific examples, an ABM capability with good second strike capability is 'good deterrence' whereas ASAT capability is clearly coercion at best. One last example of coercion – a daring strike by IAF MiG – 21s on the Governor's Residence in Dhaka in 1971 during a cabinet meeting, frightened the daylights out of them, lowering the resolve of the East Pak Administration to fight on, paving the way for the Indian army to forge across East Pakistan and capture Dhaka.

Shifting attention to compellance and punishment, which are a notch higher than coercion, in earlier times generally involved limited or all out conventional war, the 1967 Arab – Israeli war and the 1982 Bekaa Valley conflict are classic cases of air power acting as principal tools of compellance, punishment and conflict termination. *Operation Desert Storm* was another classic case of aerospace power being used as a significant tool of compellance. However, air power alone cannot militarily compel an adversary to do what you want him to. It is only synergised boots on ground – air – maritime strategy, which can hold ground, dominate waters and restore the necessary stability and order through sheer physical presence.

While air power in isolation has been successful in coercion, whenever it has tried to go alone with compellance or punishment – there has been less success, Lebanon 2006 being a classic case. Contrary to widespread belief, air power did not fail in 2006. It was leadership that failed in terms of over assessing the capabilities of air power to defeat the Hezbollah. Had Israeli ground forces moved into Beirut after Israeli air power had taken out Hezbollah nodes – we would have seen a different result. So

what do we take home, – it is that air power is an extremely effective 'solo' instrument of deterrence and localised coercion and can be used in isolation, but when it comes to compellance and conflict termination, particularly at the lower end of the spectrum of conflict, it has to be used with surface force action and other instruments of the state. I think much credit must go to the UK and France who led the NATO air campaign for the overthrow of the Gadaffi regime. *Operation Unified Protector* was precise, fairly discriminatory with limited collateral damage and highly effective. All it did was to allow Libyans to chart their own destiny without intrusive military action. Similarly, the French aerial campaign in Mali compelled the *Al-Qaeda* backed rebels to abandon their attempt to overthrow the existing regime.

Stability Operations

Nation building and the ability to restore stability in conflict zones, be it within one's own geographical boundaries, or under an UN mandate is a key tool of statecraft. Insofar, as India is concerned, it is unfortunate that despite dedicating so much efforts over the last 60 years in nation building, it is only now that air power is being showcased as a tool for restoring peace, and providing relief and succour to the needy and displaced. For years, the IAF has been sustaining communities in the north – east; they have been the first on the scene when it comes to natural calamities – *Op Rahat* being a most recent example. For too long the most visible face of the IAF has been through images of destroying targets in firepower demonstrations, or showcasing the kinetic capabilities of air power. The last few years have seen the IAF showcasing its more humane side, and its ability to support joint operations – in short, better perception management and synergy with other tools of governance.

Some Misconceptions

If one has to showcase air power, one has to also be honest about the various misconceptions which exist in the environment, and adopt strategies to address them. Three of the most prevalent misconceptions are highlighted along with some counters.

Air power is politically risky to use and is essentially escalatory in nature.

Air power is not politically risky, in fact it can be a politically decisive tool of force projection, if understood and exploited properly. During the

Kargil conflict, I have no doubts in my mind that boots on the ground ultimately won the conflict for India, but no one can deny that it was the psychological and physical impact of air strikes that paved the way for early conflict termination. Had air power not been used, even Gen Malik acknowledges that the conflict could have dragged on for weeks, or even months. Was airpower escalatory or de–escalatory?

Air power is not suited to sub – conventional warfare and is mainly a tool of conventional war fighting

The sheer flexibility of airpower allows for its imaginative employment across the entire spectrum of conflict. It is just that greater care needs to be exercised while employing it in sub–conventional warfare, particularly if there emerges a necessity to use offensive air power to counter significant escalation by non-state actors.

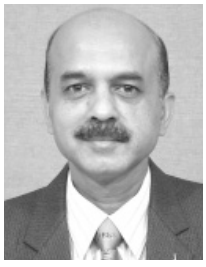
Proponents of air power have being guilty of overreach and suggest that air power can win wars on its own.

A few Western air power strategists have been guilty of overreach in the past, but the IAF is in full agreement that airpower cannot win a war or campaign on its own, but what we also say is that it can play a decisive role if employed in the right manner. Air power is most effective when used in tandem with land and maritime power in parallel. Let us not stereotype air power – let us, instead, try and understand it better as it has the potential to decisively influence the entire spectrum of conflict, and act as a potent tool of statecraft.

Conclusion

Air forces across the world have to accept that the speed with which warfare has changed in the last decade, has caught them on the back foot with the IAF being no exception. While there cannot be any dilution of building conventional capability and infrastructure as long as the border conflict with China, and the proxy war with Islamist flavour with Pakistan continue to simmer, an ambivalent attitude must be maintained regarding air power employment in the fight against LWE/other insurgencies/terrorism. There has to be a concurrent and continuous process of demonstrating both the kinetic and non-kinetic capabilities that air power can bring to bear for the strategic community. This would enable them to choose the right tool to employ in pursuit of both military and strategic objectives.

Air Vice Marshal Arjun Subramaniam



Air Vice Marshal Arjun Subramaniam was commissioned in Dec 1981 into the fighter stream of the IAF. He has more than 3000 hours of flying, mainly on Mig-21s and Mirage –2000 aircraft. He is a graduate of the Defence Services Staff College, has commanded a Mig-21 squadron in the Eastern sector, and Air Force Station Hindan. He is currently, the AOC of Advanced HQ at Pune alongside the Southern Army Command. He is an alumnus of National Defence College and is a PhD in Defence and Strategic Studies from The University of Madras.

His articles on Leadership, Air Power, Joint Operations, India-China relations, Terrorism and Fourth Generation Warfare, National Security and Military History have been published in a number of Professional Military Journals at home and abroad. He also writes in the public domain for magazines like India Today and Indian Defence Review and newspapers like TOI, The Hindu and Indian Express. He has authored a book titled ' Reflections of an Air Warrior' and is currently working on a book - Air Power in Modern Conflict. AVM Subramaniam was awarded the Ati Vishisht Sewa Medal in 2011 and an Honorable Mention by the Raksha Mantri for Excellence in Strategic Studies in 2009.

China's Investments in Outer Space and India

Wg Cdr (Retd.) Ajey Lele

This article attempts to understand the relevance of "space technologies" in the Sino-Indian strategic balance. It is assumed that presently there is common awareness with regard to India's and China's overall growth, geostrategic ambitions and technological accomplishments. The basic purpose of this article is to build a picture about China's progress in a few important strategic arenas of space technologies, and basically compare and contrast them with India's capabilities. The article consists of four sections. Section one offers general introduction, the second section presents an overview of China's overall space capabilities, the third section discusses various drivers of the Chinese space programme and the last section offers some concluding remarks. The assessment is based on drivers undertaken to understand the bearing of the present and future of China's space programme on India. These drivers derive information form contemporary political and technology trends, current debates and technology forecasts. The article measures the developments in China's space programme and attempts to 'situate' them in India's context.

Introduction

Space and cyber are two fields which have emerged during the last few years as important elements of modern day power politics. These technologies have the capabilities to offer asymmetric advantages to a state in the civilian, strategic and economic domains. The relevance of space technologies for socioeconomic purposes is well-understood. Also, presently space is being considered as the fourth dimension of warfare over and above land, sea and aerial warfare. Apart from this, space programmes are generating spin-off technologies which have applications in various

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fields including robotics, communications, imaging, materials, resource management etc.

The term "strategic balance" refers to the relative capabilities of the two sides to achieve their respective strategic objectives in relation to the each other. In case of China, its strategic objective can be considered as reunification with Taiwan on their terms.[1] Alternatively, Taiwan's objective could be to maintain its political independence.[2] In case of the Indo-China relationship ,apart from land border issues a few other issues ranging from economics to power politics were also identified as strategic objectives for both the states. It is important to note that the notion of strategic balance is something more than the simple assessment of military balance between two sides. Also, any military assessment based on the comparison of numbers with regard to military hardware may not present a correct picture. Every such assessment needs to consider the overall risk and threat assessment made by the country for itself, and its response thereof.

There is a view that from the geopolitical and geostrategic perspective, what China is doing currently, and has been doing for some time, is pursuing the role of being an alternate-hegemon. Instead of just forcefully pushing its way as a regional power (although it does that too)[3], China may also increase its hegemonic control by becoming an ulterior-provider of superpower assistance to smaller and poor nations even outside Asia, particularly in Africa and Latin America.[4]

The so called 'rise' of China has already become a reality. Various factors may have contributed towards this rise, ranging from economic development to military power. It is important to note that military power is an offshoot of China's overall strategic vision. Since, officially no Chinese strategic vision has been spelled out, it can be broadly inferred and framed against the backdrop of its economic development, military modernization, achievements in science and technology and investments in research and development.[5]

Generally, advancement of society (for any state) can be viewed to depend on factors like:

1. Security to defend itself against internal and external threats.
2. Economy to produce goods for consumption, provide services, and improve the overall quality of life of its citizens.
3. Education to prepare its citizens so they can benefit from what is already known, and even add to the world's body of knowledge.

Science and engineering contribute in major ways to all these three aspects. China fully realizes that mastery of science and technology is vital for making China prosperous. Chinese culture and traditions have valued education for thousands of years and the trend continues. The only difference is that in the past, people wished to be educated to acquire positions in the government. But, over the last hundred years, people have become more and more conscious about the power dynamics of science and technology. They understand its potential to strengthen a country in general, and the armed forces in particular.[6]

Over the last few decades China has made significant developments in several areas of science and technologies. China is making investments in various technologies from nano technology, biotechnology, information and communication technologies, nuclear energy, clean energy technologies, robotics, rare earths material and other strategic material (mineral) technologies, among others. Their success, particularly in the area of space technology is noteworthy. Their investments in space are with the clear understanding that this technology is one of the exclusive technologies which only a few nations have proficiency in . The investments are both for socioeconomic and strategic purposes. The Chinese are using this technology to increase the economic and military stature of their country, and also to exploit its significance to show the techno-strategic influence of their state.

China has made rapid progress in space, particularly during the last two decades. Interestingly, the global situation in the space area has also developed to China's advantage. While major space powers like the United States (US) and Russia have witnessed some stagnation with their space programme, major agencies like NASA (the US agency, the National Aeronautics and Space Administration) faced budget cuts, but the Chinese space journey has reached new heights during nearly the same period.

In recent times, with the retirement of NASA's shuttle fleet[7] and the surprisingly higher number of failures witnessed by Russia's missions, China's space programme is receiving more attention. China is the only third country in the world to have launched a manned space mission and undertaken a spacewalk. It has also developed a major satellite navigation programme, capable of challenging the supremacy of the US navigation system, and the Global Positioning System (GPS). It also has plans to launch and develop an independent space-station. The first module

of this station has already been put up in space, and also China has successfully carried out docking of the space shuttle (again becoming only the third country to do so) with this module. Because of such significant developments made by China in space, it is interesting to debate the likely future of their space programme. It is important to note that China's space programme is also an important element of its foreign policy architecture.

Overview of China's Space Capabilities

China's space programme came into existence in 1956 even before the first satellite Sputnik was launched by the erstwhile USSR.Their early progress was slow and without much focus. However, by 24 April, 1970 China become a space-faring nation.This was achieved by using the Long March-1 rocket to launch a 173kg satellite called DFH-1/ Mao-1.Initially, it took time to develop the structures required to carry forward the space agenda. Only by 1993, their Ministry of Aerospace Industry was split into China National Space Administration (CNSA) and China Aerospace Corporation (CASC). However, subsequently China made remarkable progress with its space agenda. During 2003,China became a space-faring nation with crews(only the third nation to have this distinction) when it launched its own astronaut by using its own space vehicle. Today, China is considered to have an advanced space programme with moderate financial investments. Their yearly space budget is estimated to be approximately $US 2500 million.

Over the years to carry forward its space agenda, China has successfully built a sophisticated organizational infrastructure supported by R&D facilities and a robust industrial base. It is important to note that no separation is visible between China's civil and military space programme. Their various space activities are happening under the leadership of the army (PLA). There is a perception that the US supremacy particularly in space technologies were visible 'loudly' during the 1991 Gulf War and made China conscious of the fact that space superiority would be the cornerstone for achieving strategic supremacy in future. This made them more conscious about the military importance of space technologies. They also believe that significant achievements in the space domain could add to the international stature of the country in science and technology, as well as in strategic domain.

White Paper (2000)	*White Paper (2006)*	*White Paper (2011)*
1. China has developed four types of satellites: recoverable, remote sensing satellites Dongfanghong (DFH), telecommunications satellites Fengyun(FY), meteorological satellites, and Shijian (SJ) scientific research and technological experiments satellites. 2. First man-made satellite Dongfanghong-I was launched in April 1970. 3. By the year 2000, China had launched 47 satellites of various types. 4. Developed the Long March rockets independently; China conducted 63 launches and 21 consecutive successful flights between 1996 and 2000. 5. Launched and recovered the first unmanned experimental spacecraft 'Shenzhou' in 1999. 6. China explored the upper atmosphere with the help of rockets and balloons from the 1960s. 7. By the mid-1980s, China began to utilise domestic and foreign telecommunications satellites and developed related technologies. It also began using navigation satellites of other countries.	1. China added Earth resource satellites, Ziyuan (ZY) and Navigation and positioning satellites, Beidou. 2. Developed and launched 22 different types of satellites. 3. Long March rockets made 24 consecutive successful flights. 4. Research and development of the 120 tonne-thrust liquid/kerosene engine while the development of the 50 tonne-thrust hydrogen-oxygen engine is in progress. 5. Construction of three launching sites at Jiquan, Xichang and Taiyuan made progress. 6. Research into space environment and also observation, reduction and forecasting of Space debris; and has developed the capability to forecast the Space environment.	1. Long March series of rocket launchers undertook accomplished, with 67 successful launches sending 79 spacecraft into planned orbit. 2. Developed the Fengyun (Wind and Cloud), Haiyang (Ocean), Ziyuan (resource), Yaogan (Remote sensing) and Tianhui (Space mapping) satellites. 3. Initiated the development of a high-resolution Earth Observation system. 4. Launched 10 satellites for the Beidou system and provided services to the Asia-Pacific region. (The number as of 2013 is 16 satellites). 5. Launched and developed the Shijian (Practice) satellites and small as well as micro satellites. 6. Launched the manned spaceship and also achieved Space docking between Shenshou 8 and Tiangong 1, paving the way for the establishment of the Space laboratory and Space Station. (China also successfully launched the Shenzhou 9 (2012) and Shenzhou 10 (2013)). 7. Launched the first lunar probe Chang'e-2 8. Building a new launch site at Hainan. 9. Monitored Space debris and provided early warning against them. 10. Removed aging GEO satellites out of orbit. 11. Working on protecting manned spaceflight from Space debris.

China has made significant progress particularly during the last two decades in the space domain. There is a 'strong' Russian 'footprint' with regard to space technology development in China. However, during the last few years, it appears that China has successfully indigenised their space programme, and currently Chinese rocket scientists are excelling in the relevant technology development fields. It is important to note that China has demonstrated its capabilities in almost every area of space exploration. China has an excellent track record in basic areas of space exploration, like developing and launching satellites for communications, remote sensing, weather and environmental monitoring etc. They also have an important navigational programme. China has made major investments in the human space programme, and is studying the moon with a lot of interest by sending its own satellites. By 2023, it is expected that China would have its independent space-station (Tiangong-3 or Heavenly Palace) operational.

Contrary to its overall reputation, China has been much more open about its space programme and policies. So far, China has published there white papers on its activities and achievements in space. Some the important details from these white papers are as follows:[8]

All these white papers are basically focusing on programmes which can be called as civilian programmes. There is general reluctance to 'advertise' military specific programmes, or discuss the dual-use nature of various programmes. Hence, in order to put in context the Chinese space agenda from a strategic perspective, an attempt has been made to group their various programmes under specific determinants. The following sections discuss the probable drivers of China's space programme.

Drivers of Chinese Space Programme

Broadly, the following drivers can be considered as some of the most influential and important indicators of China's overall space agenda.

- Great power status
- Nationalism
- Military development
- Weaponisation of space
- Socio-Economic and Scientific development
- Deep space ambitions
- Space race

All these drivers have potential (in some form or other) to impact

the future of China's space programme. It needs to be appreciated that various aspects related to the technological developments including major breakthroughs (if any) would directly or indirectly influence all the derivers, hence 'technology breakthrough' has not been considered as a separate driver.

In order to critically assess the futuristic impact of achievements in space for the Sino-Indian strategic balance following these drivers, have been identified as impact drivers, and their further assessment has been carried out. The assessment has been done separately for each of the following drivers. Also, for every driver an evaluation is done from the Indian context.

- Military developments
- Weaponisation of space
- Space race
- Great power status

Military Developments

These could be evaluated for factors like investments in space systems for the purposes of intelligence gathering mechanisms, communication and navigational systems.

Intelligence Gathering Mechanisms

China has begun deploying a robust network of ELINT and imagery satellites in order to locate and track large warships, mobile air defense systems, and other critical defense systems. At least two possibilities exist for an initial space-based ELINT capability: one associated with launches of four pairs of *Shijian*-6 satellites, and the first launch took place in2004, and the other with the*Yaogan*-9, was launched in 2010[9].

On 1 September, 2013 China placed a new ELINT constellation of *Yaogan* satellites into orbit. The three satellites *Yaogan* 17A, 17B and 17C fly in a stable triangular formation. The *Yaogan* 17 triplet joined the *Yaogan* 9 and *Yaogan* 16 constellations of ELINT satellites. In addition to the ELINT constellations, a number of other *Yaogan* satellites carry high resolution optical imaging and Synthetic Aperture Radar (SAR) sensors. These work in tandem with the ELINT satellites, to provide more precise location information on potential high value targets. The ELINT satellites cover a large area of the sea within which the target is identified and located coarsely.[10] Broadly, this ELINT network would assist China in

multiple areas for military operations including naval and air operations, air defence systems, counter-space capabilities and for nuclear forces. This network, coupled with the ground based system like Over-the-Horizon (OTH) radar increases its utility further.It is believed that particularly the recently launched satellites (say *Yaogan 16, 17 etc)* have both ELINT/ SIGINT capabilities. With the October 2013 and November 2013 launches of the *Yaogan* 18 & 19 satellites, China has in place an advanced space capability to identify, locate and track an Aircraft Carrier Group (ACG) on the high seas. This space capability is an important component of an Anti-Ship Ballistic Missile (ASBM) system that China has set up[11].

Communication

China use two types of satellites for secure military communications: the *Fenghuo* and the *Shentong*.The *Fenghuo* series is used for tactical military communications, providing secured digital data and voice communications to Chinese military forces.The *Shentong* geostationary military communication satellites are operated by the army, and their aim is to provide secured voice and data communications services for ground users using Ku-band.

The *Fenghuo* series satellites are designed to provide Communications-on-the-Move (COTM) capability, which enables military users to send and receive communications and maintain situational awareness whilst in motion on land, in the air and at sea. Traditional satellite communications requires users to be stationary, so that the antenna can be pointed towards the satellite, which can be a huge disadvantage in a battlefield. COTM eliminates this need to pause, by having the antenna automatically tracking the satellite in motion.

The satellites belonging to the *Fenghuo* series carry Ku- and Ka-band transponders for VHF data and voice communications. *Chinasat*1A (*Fenghuo* 2)is the latest satellite in this programme and was launched during September 2011.The *Shentong* series geostationary military communication satellite are operated by the PLA to provide secured voice/data communications services for ground users in Ku-band.*Chinasat* 2A (*Shentong* 2)was launched during May 2011 and is one of the recent satellite under this series[12].

Navigation

In the field of satellite navigation, there is a "three-step" plan for the development of BeiDou navigation satellite system. In 1994, the

construction of the BeiDou navigation satellite demonstration system was initiated. In 2000, the BeiDou demonstration system started to provide regional active services.In 2004, China started construction of the BeiDou navigation satellite system, and by the end of 2012, it was declared operational for the Asia-Pacific region[13]. This system with global passive services capability will be completely established by 2020, and would constitute 35 satellites (16 of them have already been launched). Officially, the accuracy of this system has been claimed to be 10 meters.

Situating India

India has much more to achieve in area of military space. The advantage with India is that it has (dual-use) network of remote sensing and earth observational satellites. India's *Cartosat* series of satellites offers sub-meter resolution output. India's defence research organisation (DRDO) is currently working on developing the payload for ELINT. India has launched a communication satellite (GSAT-7) for the Indian Navy, but it would take some more years for launching independent satellites for the army and air force. India's regional satellite navigation system is expected to be ready by 2015.

Presently, China is better placed in all the three areas discussed earlier, however, it is important to note that the quality of India's remote sensing network matches with the best in the world. Now, with the recent success of the cryogenic technology, it is expected that further development of India's Geosynchronous Satellite Launch Vehicle (GSLV) programme would help in launching strategic communications satellites in quick succession.

In general, methodical and timely investments by China has allowed them to possess enhanced network centricity and much enriched C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance) institutions. India needs to expand its space programme significantly from the military perspective.

Weaponisation of Space

China is responsible for making the almost dormant subject of space weaponsiation active, by conducting an Anti-Satellite Test (ASAT) in 2007 (probably this was the third or fourth attempt in which China got success). China has been working on various possibilities of conducting the ASAT test since 2005. They conducted a rocket test (2005) and a likely

flyby of the orbital target (February 2006). Subsequently, two ballistic missile tests (Jan, 2010 and Jan, 2013) that hit unknown targets, but did not create any debris (low altitude tests, may be at around 250km above the earth's surface) were conducted. On 13 May , 2013 China launched a rocket from the Xichang Satellite Launch Centre (called it a high-altitude scientific research mission), which probably was a covert test of a new ballistic missile related to China's ASAT programme.[14]

China has launched a group of three satellites (*Chuang Xin*-3, the *Shiyan Weixing*-7 and the *Shijian*-15) on 19 July, 2013 and has identified these satellites as 'scientific experimentation satellites to perform experiments on space maintenance technologies.' Space analysts are of the opinion that one of these satellites has a robotic arm (mechanical arm), and was used to capture an earlier launched Chinese satellite in space to test the technology, probably for future space-station programmes. However, this technology has significant potential to undertake counter-space activities too.

Over the last couple of years, there have been various unconfirmed reports with regard to China developing expertise in the area of satellite jamming technologies (basically for temporary jamming), including ground based laser jammers. Around 2001, there were some reports about the development of parasitic satellite capable for interfering or destroying the host satellite.

Situating India

With regard to counter-space technologies, India has not expressed any doctrinal vision, neither has it evolved any 'unstated' policy. Theoretically, DRDO could be said to have the capability (not proven) to perform an act of ASAT, by using kinetic kill vehicle (KKV) technology. India can undertake an ASAT as a technology demonstrator. This test could be undertaken in lower altitudes (say 150 km to 250 km range) to avoid any debris problem. Overall, it has been observed that India is much behind China in the counter-space technology area. However, this issue is more of a policy issue than technology problem.

Space Race

It is important to note that the concept of space race should not be viewed on lines similar to the arms race. This is because the arms race is more about trying to match the adversary weapon by weapon, and mostly the

quantity of weapons is believed to be the benchmark for assessment, while the space race is more about perceptions. It is not about matching every programme of an adversary by a similar programme. It is about the growth shown by a state in the space domain, and the challenges it has set for itself. It is about leapfrogging technology.

One issue which often goes unnoticed is that China is using its space expertise to exploit its soft power potential globally. China is providing assistance to African and Latin American states to fulfil their space ambitions. They have already developed and launched satellites for some states in these regions. They are also supporting states from South East Asia and South Asia with their space agendas. Notable examples are Pakistan, Sri Lanka, and Thailand etc. Assistance is being provided in navigational areas too, and China has made agreements with Pakistan and Thailand for using the Beidou navigational network.

Situating India

From the point of view of space technology evaluation, China is much ahead of India in various fields like diversity and magnitude of space programmes, technological progress, trained human capital, financial investments etc.

Programme wise comparison indicates that China is much ahead of India. In the field of satellite navigation as discussed earlier, China has global ambitions and an advanced programme with global reach. They have already made part of their system operational. India is developing only a regional navigational programme. Chinese navigational constellations offers them far better commercial and strategic advantages. In the arena of manned space missions and development of space-stations, China has already made remarkable progress. As of now, India has no plans to develop programmes in these fields. However, it is important to note that such programmes have very limited social and strategic benefits.

China has made considerable progress with its moon programme too. Their third Moon mission, *Change 3*, was launched on 1 December, 2013. This mission was about successfully placing a robotic rover called *Jade Rabbit (Yutu)* on the surface of the moon for collecting observations. Presently, this rover is collecting various observations from the surface of the moon. While in the case of India, the progress with its moon programme has not been very satisfactory. Much delay is taking place after the launch of the first moon mission (2008). India was supposed to

launch its second mission to the moon along with Russia during 2013-14 however, now it is further delayed, and is likely to materialize only around 2017 (India would undertake this mission alone).

Mars is one area where India has succeeded with its first phase during 2013, and it is expected that India's Mars bound satellite would reach its destination after a travelling for nine months. China's first and only attempt to reach the Mars had failed. However, it needs to be appreciated that China's Mars probe called *Yinghuo-1* which (launched during November 2011) could not reach its destination, because of the problems with the Russian rocket, which was carrying the 115 kg probe towards its destination.

There is much talk about the India-China Asian space race. However, this debate appears to be more of an academic debate, and the situation on the ground (and in space) quite different. India's space programme has a socio economic basis, and its investments are undertaken to satisfy its own needs. There are some commonalities in India and China's space agendas, but they are for the purposes of satisfying their own needs. The space agendas of the both states are 'realist' in nature.

Great Power Status

Various achievements in the space arena are also related to prestige, and a demonstrative symbol of national power. For China, space is also about nationalism. They have achieved significant amounts of success with the human space programme. Their moon programme is progressing as planned. China has ambitions of sending a human to the moon (the 2017 moon mission is expected to bring back rock samples and the human mission to the moon could take place around 2030). They perceive that this one act would showcase the greatest expression of their power.

Situating India

India simply cannot match China in this field. What could be in India's interest, is to propose a human programme as a multilateral agenda (on the lines of the international space station, ISS). Particularly, there is need to engage major powers to undertake human missions to the moon and mars as a joint activity. This could prevent duplication of activity (in some cases, reinventing the wheel), allow financial savings and start a healthy process of transfer of technology. Most importantly, it could negate the perceptions about each other's military intentions.

Conclusion

China is 'leapfrogging' in the field of space technologies. They have an autonomous and sustainable space programme. They have a very clear focus in their space agenda. Their progress in the space arena is taking place according to their road-map. Economically, China has evolved as a major power and it is unlikely that in the coming years, their space programme would face any budget related difficulties. China has successfully narrowed down the capability gaps between their space technology proficiencies, and those of the US, the EU or Russia. They are using their space programme both for commercial purposes, as well for establishing their soft power status. However, the Chinese state is working more in 'isolation', and is not very keen to engage other space powers for joint developments. Obviously, there is a strategic dimension to this. China has been brazen with regard to its display of counter-space technologies, and has also ended up adding significantly to the existing space debris chaos.

Numerical and programme based comparison indicates that China is much ahead of India in the space field. At the same time, it is also important to note that India's space programme has a socio economic basis, and India's investments are based on its own requirements and not for completing with any other state.

Mostly, any assessment of Sino-Indian relations needs factoring strategic complexities amongst both the states. This relationship can be considered as a classic case of 'conflict and cooperation'. In very broad terms, the tenets for 'cooperation' could be economic, cultural and people to people contact, while the 'conflict' could be a result of bilateral issues like border problems and regional power dynamics. 'Space' is one area which could oscillate between the realm of conflict, as well as cooperation. It is important to factor 'space' for comprehending the Sino-Indian strategic balance, and the earlier assessment based on specific drivers, indicates that presently both in technological and geostrategic respects, such balance is tilted towards China. It may not be possible to quantify the exact contribution of space towards this. However, there is need for India to make a note of this. From the Indian perspective, there is a need to factor China's military space capabilities and counter-space capabilities in its strategic planning.

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