Space and National Security*

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Introduction

India's National Security is under unprecedented stress today, even 62 years after attaining Independence. While the Country is making good economic progress, next only to China; and with a billion plus population, it is seen as an emerging economic power. It is also being given much credit for quick recovery from the worldwide recession. This has generated a sense of insecurity or jealousy amongst our neighbours – hardening their outlook; rather than seeking partnership in the upliftment of impoverished masses, who are amongst the poorest in the world.

The terrorist groups in Pakistan are growing stronger. the only way for the Government in Pakistan to prevent their ascendance in Pakistan, is to intensify the hate India campaign by engineering events similar to the 26 November 2008 terrorist attack in Mumbai. Our overtures for peace and development have not been incorporated into State policy, and the US policy of buying peace at \$ 1.5 billion per year has not shown any significant change in Pakistan's policy towards terrorism. In fact, this US money probably would also be used for equipping Pakistani Armed Forces with more sophisticated equipment – to be used against India eventually. The stated AF-PAK policy has not yielded any positive results of action against Taliban.

China, an emerging world power in all respects i.e. economy, military, international influence, is guided by the goal of dominating this part of the world at least, and perhaps challenging the USA for first place in the world. China supports other neighbouring countries with long term perspective – of not letting them fall into the US fold. The post LTTE scenario in Srilanka is quite perplexing and the autonomy for minorities may not materialise. India is being projected in bad light to both sides, Government as well as minority Tamils. Its short term and long term consequences could be of serious concern at the State and National levels.

Our Internal Security has taken serious beating in recent past with alarming re-grouping of Naxals in many States, separatists regrouping and large influx of Bangladeshis up to Delhi. India's existence as a sovereign state is at great risk. The danger is however not very obvious to a common man, who is either too busy earning his daily bread or blinded by the spectacle of economic growth and market economy. Policy planners hesitate to talk about it for fears of creating panic amongst the public. It is perhaps for the 'security set-up' to take note of the grave situation and pool all their resources, and plan coordinated action to enable our Armed Forces and law enforcing machinary to secure an edge over our adversaries across the country.

Role of Technology in National Security

Will to safeguard the Nation's honour, National security and willingness to sacrifice are important assets of any country – but not enough. Access to superior technology can also play an important role to safeguard national security. India has been neglecting timely technological advancements in armed warfare for thousands of years, through to the recent times of 1962 and 1965 wars. The role of technology was demonstrated by the use of Nuclear bomb by the USA in Aug 1945 to terminate the Second World War decisively in one stroke. Ever since, technological superiority has been the most important priority goal of all countries. Pokharan I (1974) and Pokharan II (1998) were India's efforts in the same direction. However, 'No First Use' (NFU) principle, though high on morals and effective as a foreign policy instrument, does expose the Country to security risks, unless an effective deterrent mechanism for survival against enemy's nuclear assault is in place.

Future wars will be fought by advancements in technology; and role of men during war would be significantly reduced. Role of men will be very important during the peace time, for preparing and keeping the war machine in absolute state of readiness at a very short time. This is the mantra of current time military powers and nations who look for technological superiority to give themselves an edge over their adversaries. The United States with its engagement in Iraq and Afghanistan has been a pioneer in testing new technologies during these conflicts, partly out of necessity and partly for sharpening their arsenal.

The recent developments by DRDO like acceptance of MBT Arjun, plan to adopt Tejas by Navy, trials of Nishant and induction of Electronic Warfare Systems into the Armed Forces have been very encouraging. The successful testing of the missile interceptor (three out of three successes) makes the missile defence a technological reality. The nuclear deterrent and the partnership approach to deployment is another successful thrust in this direction. A proactive approach to test indigenous technology, and development of partnership approach to refine and bring it upto world standards, would take the Indian Armed Forces to an advantageous position.

The expertise developed for using Satellite Communication in Network Centric Warfare, started in the First Gulf War, has reached a level of maturity. The use of hyper spectral images for detecting Improvised Explosive Devices (IEDs) buried for weeks, use of Unmanned Air Vehicles (UAVs) of various types for imaging, tracking, information gathering and attacking the adversaries locations with precision are developments that highlight the role of technology.

Space Technology in India

Driven by the vision of Professor Vikram A Sarabhai and nurtured by Professor Dhawan's thrust on perfect systems, ISRO has made significance progress in all frontiers of space. PSLV and GSLV II have emerged as

flexible, multipurpose and reliable launch vehicles in 1 ton and 2 ton class Geostationary Transfer Orbit (GTO) capability respectively. The new GSLV III under development would take this capability to 4 ton in a couple of years. The communication satellites in INSAT - 4 class are state of the art satellites with upto 3.5 ton GTO and 6 KW power. Development of high powered satellites in C, S and Ku band has been achieved and developments in Ka band are being pursued. The developments in scientific satellites and exploring outer space with Chandrayan - I and ASTROSAT have brought world wide recognition from scientific community. The remote sensing and its applications into agriculture, planning water management, flood mapping etc., have brought India into No 1 slot in using Space for National development. Indian capabilities in optical and microwave imaging from the Space match with the best in the world. The civilian Space programme of India, led by ISRO has brought us to the forefront in this area.

The capability of Space Technology, however, has not been fully exploited for National Security / Defence. This is partly due to the fact that ISRO is mandated for civilian applications, societal programmes and National development and partly due to lack of institutional mechanism to think that security is an all integrated approach. Our external security has been Armed Forces Centric. There is no mechanism in the Country to connect the internal security agencies like NSG to the security linked technology available in the Country or abroad. It is in this context that National Security Advisory Board (NSAB) has suggested creation of a National Security Technology Directorate under the NSA.

Role of Space Technology - Some Thoughts

Space is a great enabler. Harnessing Space Technology towards National defence would certainly strengthen our Armed Forces. In other areas, both China and Pakistan have better access to superior technology. So far, the technologists outside DRDO and Department of Atomic Energy have not been involved in thinking of National defence, and private companies have been kept out of Defence Production. This has kept a valuable resource of technologists in Council of Scientific and Industrial Research, National Laboratories and Space etc., generally away from National Security. However, in the context of a larger role of technology, it is time that we enmesh technology in our National Security policies. A few examples of how Space Technology can be very useful in National Security, are briefly described in the succeeding paragraphs.

Early Detection of Enemy Missiles Using Geo Satellites. Missile Defence is an essential element of 'No First Use' (NFU) policy, to be able to survive against the first use by the enemy. Ground based Radar Systems have limitations of reaching enemy territory beyond a few hundred kilometers, and a missile arriving at 2.5 km/sec velocity gives very little time to react. The developments in space imaging capability in near infrared spectrum allow tracking of any missile or even aircraft with 100 m resolution in the image plane. Two such geosynchronous satellites deployed at farthest end of coverage (for example at 480E and 93.50E locations) would provide an overall accuracy of about 200 meters within a few minutes of launch. This capability alongwith appropriate database and processing can provide early detection and trajectory prediction of incoming missiles, making the missile defence shield really possible. Other elements of the missile defence have reasonable good maturity and can be integrated in 4 to 5 years.

Border Surveillance. Border Security Force and the Army keep a watch on the 12000 km long Indian border through advance posts on 24x365 basis, a task that is humanly impossible, even if whole of the Army is deployed along the border. Does technology provide a solution? Push broom imaging technique developed by ISRO for imaging payload can be extended for infrared imaging. A 2k x 2k detector assisted by 1.6ì laser can be used in an equivalent Time Division Integration mode to image 5 km of border from a single pole mounted camera. This camera is powered by solar power, has automatic motion detection, algorithms to differentiate humans from animals and connectivity to local and central command through VHF and satellite link. A few thousand such cameras can be effectively deployed for border surveillance. In fact, it is not the space technology but a spin off.

Supporting Soldiers in Advanced Areas. India has developed the capability of terrain mapping the whole world with stereoscopic pictures of 2.5 metre resolution and four metre digital elevation accuracy. The location accuracy may suffer for unknown / unreachable territories where there are no ground truth points, however, relative terrain maps remain valid. Also one metre resolution image from TES and CARTO – 2A satellites further augment the region of interest.

A soldier in the forward areas is unaware of the terrain and what is behind a particular hillock. However, it is within India's capability to design a Ku - band satellite that can communicate with a seven inch display (total weight about 1 kg with battery) to communicate with database and have an automatically downloaded image of his neighbourhood, as his own position is available to the database through a GPS receiver. It also makes individual soldier monitoring possible in Network Centric Warfare. Authentication procedures would make it possible to render it unusable if it falls into enemy hands – revealing his position to the database.

Locating IEDs and Insurgencents using Hyper Spectral Imaging. The US forces suffered a lot in the early years (upto about 2006-07) due to rebel groups using IEDs in Iraq. Hyper Spectral imaging using 240 channels, in six times the visible spectrum, has been effectively used to detect any recent ground digging, inspite of best camouflage. The USA is now developing an intelligent satellite with on board processing for detecting IEDs. The same payload will also monitor environment to trace gases, Green House Gases (GHG) and soil characterisation against the backdrop of global warming. The usage, however, requires a lot of scientific effort in developing algorithms and years of systematic observations.

These are some of the unique applications of Space Technology that are important for National Security. Once, the defence scientific community is involved in conceptual thinking, many more applications would come to be known. It is reiterated that Space Technology is one unique capability which would give an edge to our Armed

Forces. However, right policy framework needs to be put in place.

The USA's Space Policy

The operationally responsive Space Policy Directive by President Bush on 06 January 2005 states, "Demonstrate an initial capability for operationally responsive access to use of Space, providing capacity to respond to unexpected loss or degradation of selected capabilities, and / or to provide timely availability of tailored or new capabilities to support National Security requirements". Responsive space is an affordable, rapid reaction combination of Responsive Payload, Responsive Spacecraft, Responsive Launch Traffic Control which is optimised to provide on demand theatre support, surge reconstitution, augmentation and prompt global strike. Further, the USA declared new 'US National Space Policy' on 31 August 2006 and under the chapter on National Security Space Guidelines not only asked Space to "Support and enable defence and intelligence requirements and operations during times of peace crisis and through all levels of conflicts but use it in whatever way in the National Security interest."

The context of the US Space Policy is just to emphasise that every country formulates it's policies keeping it's own National interest in mind. We have to also look at our own policy framework to check if the present policy, in any way, comes in as an obstacle to our National interest.

Conclusion

National Security today is under great stress. The role of technology is going to be very important in the future wars. The role of man during the war and in the war theatre will reduce further and further as time passes. The role of man in planning during peace time is going to be decisive. Today, National Security is not the responsibility of the Armed Forces alone. All leading technologists have to be harnessed in this business. Space is a great enabler and has the potential to provide an edge to our Armed Forces, which would bring a historical change in the National Security policy of India. By integrating Space Technology, the Indian Armed Forces can get into an advantageous position vis-à-vis its adversaries. If our existing National Policy on Space is coming in the way, then, this is the right time to change it immediately, to strengthen our overall security set-up. Our Space Policy should be made responsive to the National Security needs.

*Text of the Talk delivered at USI on 01 Oct 2009.

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Journal of the United Service Institution of India, Vol. CXXXIX, No. 578, October-December 2009.