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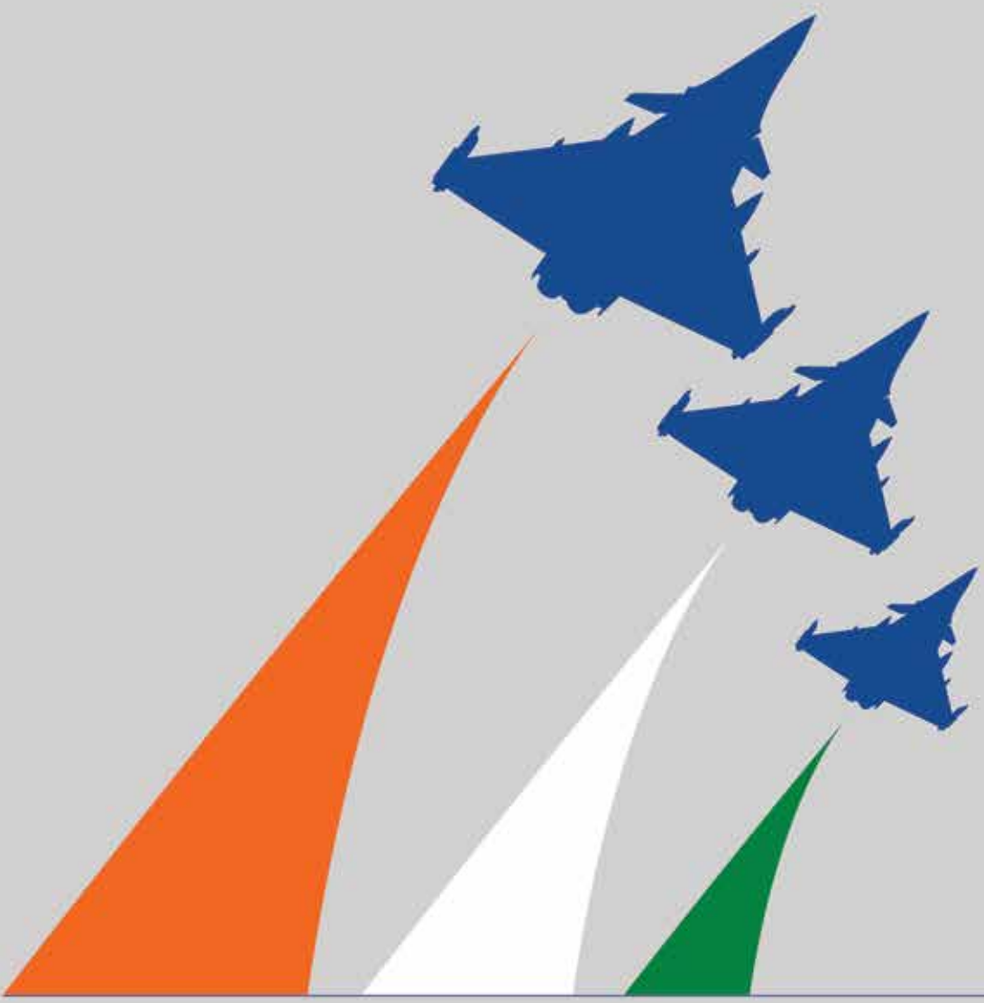

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JOURNAL OF THE CENTRE FOR AIR POWER STUDIES

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EDITOR'S NOTE

The lead article in this issue of *Defence and Diplomacy* is by **Lt Gen Syed Ata Hasnain** on the evolution of political Islam. Writings on radical Islam are increasing and, quite often, the term is used synonymously with terror. The article traces the history of political Islam and shows how it was born in West Asia but nurtured in South Asia. The depiction of the major movements that shaped its character and altered it from time to time is instructive. Radical Islam occupies centre-stage in any discussion of current events or strategic discourse and the article lays the ground for a clearer understanding of a movement that is gaining in strength and significance. The world has tried to contain the problem militarily without much success and, possibly, the radicalism has to be defeated ideologically.

A contract was recently signed by India for the acquisition of Apache and Chinook helicopters. They will make a valuable addition to the Indian Air Force (IAF) hardware and we carry two articles on the subject by very experienced helicopter pilots. The first one is by **Air Vice Mshl Bahadur** wherein he analyses the capabilities and utility of the two different types of helicopters. The possible missions for which the two types of helicopters could be tasked are different and quite unique. In comparison to the other helicopters with the IAF at present, the new acquisitions will be far more advanced technologically and with much greater capabilities. However, both machines will require extensive training of air and ground crew and, possibly, some rehash of our operational philosophy. In the second article, **Wg Cdr Narang** correctly argues that imports should be only a stop-gap arrangement and must not be perpetuated. Indigenisation and 'Make in India' have to be resorted to. There are challenges to be

overcome but if China and Pakistan can do so, we should also be able to manufacture such machines in the country in the not too distant future.

On November 15, President Obama signed the US Commercial Space Launch Competitiveness Act 2015 that will permit extraction of minerals, water, etc from asteroids and the moon. The law is a major change from the earlier universally accepted formulation that space was to be used for the benefit of humanity. Now, with the Act, the principle of 'finders keepers' has been accepted. With that, the space race will accelerate and conflict could well follow commercial competition. In a wide ranging article, **Air Cmde Radish** argues that as one of the major space-faring nations, there is an urgent need for India to officially and formally define the place of space in our national security calculations. A policy document is called for that will inform about the work of the different users of space. The author traces the history of projected military use of space and cautions that we should take note of China's growing capabilities. We should have the capability for adequate Space Situational Awareness (SSA) and the means to adopt a deterrent posture. He draws a parallel between nuclear deterrence and space deterrence.

In another article on the space issue, **Arjun Subramanian P** emphasises the increasing salience of space in our everyday lives, and the importance of space assets in military planning and operations. There is a growing sentiment that given the near inevitability of warfare in space, the ability to launch satellites on demand will become inescapable. The article addresses China's rapidly growing space power, its military space programme and the progress made by it towards a rapid launch capability.

Much has been written about the growing Chinese capabilities in the cyber domain and the manner in which they have capitalised on knowledge so acquired for effective intelligence. There is also justified apprehension that they will be able to use the knowledge to advantage in any military conflict. In a refreshingly different approach to the subject, **Wg Cdr MK Sharma** discusses China's cyber security issues. He argues that there is a number of infirmities in the Chinese networks and we can take advantage of such limitations. He discusses in some detail the work done or being done in China

towards cyber security and examines the possible faultlines in the country's policy. The article is well worth reading to better appreciate the Chinese capabilities and weaknesses in this important field.

The issue carries two more articles associated with China. In a theoretical study, **Temjenmeren Ao** discusses the basis of land and sea power. Makinder and Mahan are quoted extensively and the author suggests that the realisation of the importance of sea power came to the Chinese relatively late but they are now catching up. Paradoxically, the salience of air power has been given a miss! **Sana Hashmi** writes about the unresolved border dispute between China and Bhutan – the only other country, besides India, in South Asia, with an unresolved border problem with China. The resolution of the China-Bhutan border issue is important to us because of the proximity of the Siliguri corridor. There is a need for the tri-junction of the India, China and Bhutan borders to be well, and advantageously, defined. China is offering inducements to Bhutan by agreeing to give more land for some adjustments in the tri-junction area. Bhutan has resisted the temptation. A resolution of the border dispute is still some way off and some arm-twisting by China cannot be ruled out. It is in India's interest that its consent and involvement are part of a comprehensive solution.

The last three articles take on disparate themes. **Gp Capt Ashish Gupta** discusses the possible role of neurotechnology in warfare. It is well accepted that yesterday's science fiction is today's reality. Neuroscience and neurotechnology have already proved their worth in medicine in, *inter alia*, the treatment of Alzheimer's and Parkinson's diseases. Unfortunately, there is a flip side with military applications, where the adversary's brains become targets and neuroweapons are used to control behaviour and responses. If such capability really comes to pass, victory could be achieved without firing a shot in anger. The author traces the history of such attempts since World War II and examines the feasibility of fielding such weapons. Unfortunately, no treaty proscribes their use and it is a frightening thought that neuroweapons could become weapons of war.

Cruise missiles, their advancements and uses demand continued attention. In a timely article, **Gp Capt Vivek Kapur** goes back in history to the days of World War 1. Since then, there has been a sea-

change in the capabilities and effectiveness of cruise missiles. With progress, their salience as war-making weapons has also increased, with distinct operational advantages.

In the final article in this issue, **Manisha Chaurasiya** addresses the role of civil society in nuclear security. Nuclear security is much too serious a subject and government agencies need any help that they can get. Civil society can, indeed must, contribute to ensuring a safer world. It has been active since 1945 and rendered great service towards the embargo on nuclear testing, arms control measures and horizontal/vertical spread of nuclear weapons and fissile material.

Happy reading.

THE EVOLUTION OF POLITICAL ISLAM: HOW ISLAM GOT RADICALISED

SYED ATA HASNAIN

Some years ago, rarely would you find people eager to study culture or faith. That trend is changing rapidly with the desire to know more about religious and ideological conflicts. The driver for this change is radical Islam to which we can link many of the ongoing problems of West, Central and South Asia. Security practitioners usually are aware of the current narrative of these trends. However, most understanding is perfunctory and without background clarity. It needs to be seen how radical ideology spread through the 20th century to a level where in the last 15 years or so, it has come to occupy the dominant space in international threats.

This essay is simply an attempt to join the dots of history to help ascertain how *radicalism* afflicted Islam. It is not an attempt to explain the social or ideological aspects of the faith but concentrates on the well-known events of history to draw its conclusions and provide an uncomplicated rationale to the reader. There is much more than just the Shia-Sunni conflict of which people are usually aware. The issue to take notice of is how the movement towards political Islam

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progressed on two parallel tracks in West Asia where it was born and South Asia where it was truly nurtured.

As Islam spread geographically after its birth in the 7th century AD, it was influenced by local cultures, an inevitable phenomenon. Sensing a diluting effect over almost ten centuries, a counter movement commenced from Arabia in the 18th century, to primarily re-Arabise Islam, rid it of the external cultural influence, and return it to its original form. Perhaps, it would be good to recollect that some of the best synthesis of the Islamic tradition, culture and faith came about in the Indian subcontinent, among others, in the form of the Bhakti movement. The Sufi school of thinking flourished in India and, to a great extent, in the egalitarian society of Turkey. The arts, music and painting were deeply associated with Islam in India and Turkey. The founders of the movement to stop Islam's further supposed dilution came to be known as the *Wahabis* (name taken from the founder of the counter movement) but preferred to be called *Salafis* as they wished to disassociate themselves from any attempts to iconise the founder; the *Salaf* being interpreted mostly as the period when supposedly the faith was at its purest in the pursuit of all the original practices. Some consider the *Salaf* as the period of the first three generations after the passing away of the Prophet. Others have also suggested that the *Salaf* was the three hundred years after the Prophet. The *Salafis* are a sub-set of Sunni Islam although every Sunni is not a Salafi and, importantly, violence does not form a part of every *Salafi's* core belief. There are sects within the *Salafi* strain which believe that if Muslims do not subscribe to practices recommended by them, they cease to be Muslims and are apostates. It is such belief which is considered radical and extreme and is at loggerheads with the tolerance and freedom to pursue faith as one wishes. Radicalism is usually seen in any faith as a phenomenon driven by alienation of any form, social or political.

Colonialism had a huge diluting effect on Islam, especially in Egypt from where the counter movements started. There were no attempts to seize the diluting effect of Islam in its own desert territories where its shrines existed and where large parts of the Islamic world, just as in West Asia and parts of South Asia, were under colonial control or the rule of the Ottomans. There was

considerable Western influence on local societies of the regions ruled by the colonial powers. However, no effective pan-Islamic identity, bonding or ideology emerged to resist it. The first stirrings of a response against the actions of the colonists came in 1896 when Theodor Herzi outlined his vision of a Jewish state which would run counter to the interest of the Muslims. In the Balfour Declaration of 1917, the United Kingdom became the first world power to endorse the establishment in Palestine of a "national home for the Jewish people", at the cost of the Palestinians. The two World Wars came in the way of any serious efforts towards countering the effects of the colonial presence. However, stray efforts such as the Khilafat Movement were made in South Asia. The Muslim Brotherhood (MB) in Egypt was founded by Hasan al Banah in 1928. The MB quickly its spread influence in other Arab territories; it was essentially a movement to arrest the growing Western influence on young Arabs in the colonial territories but also took upon itself the role of protection of Islamic values. Its strong presence in the Arab world of today continues to drive Islamic puritanism. MB has major differences with the Saudis which are more to do with interpretations; the puritanism followed by the two is almost common but MB strongly believes in the unity of the clergy and the rulers which the Saudis do not believe in. The Saudi Royal house believes in clear-cut division in responsibility between the rulers and the clergy.

The nationalist struggle in India also threw up Muslim nationalism with the desire for an independent state of Pakistan. In 1942, Maulana Abul Ala Maududi gathered the latent passions of pan-Islamism and founded the Jamaat-e-Islami, again, a movement to spread the fundamentals of Islam, prevent their dilution and give Muslims a more distinct identity. This movement had no mean achievements in the growth of radicalism and has a strong and sometimes potentially violent presence all over the subcontinent. Another movement in India called the Tablighi Jamaat was founded to prevent the reconversion of Meo Muslims in the Mewat area around Delhi; this movement remains active even today, taking the form of roaming clubs of young men who preach the essentials of a

puritanical approach to the faith. Pakistan's former cricket team under Inzimam ul Haq was greatly influenced by the Tabligh.

Very few people subscribe to the creation of Pakistan as an important landmark in the history of the run-up to the rise and manifestation of radicalism. In fact, some events—the partition of India and the creation of the state of Israel—were significant in this regard, giving rise to pan-Islamic sentiments. These by themselves were benign emotions which, over a period of time, mixed with the sentiments of other events, created a persecution complex and then a militant response. Both events had an Islamic connection, the former creating an Islamic state following a distinct desire to protect an Islamic identity in the subcontinent. The latter did exactly the opposite; it destroyed an Islamic identity and set up the potentially unending rivalry between Muslims and non-Muslims which took on global overtones. 1947-48 were watershed years in the world's inter-faith relations and the festering rivalry since then (Kashmir and Palestine, wholly unconnected, have yet drawn religious passions) has been one of the cornerstones for the rise of radical ideology. When passions of perceived deprivation rise, it is easier to spread radical thought, which justifies violence. Through the Fifties and Sixties, the problem created by the loss of identity of Palestine led to greater pan-Arabism and Islamic solidarity, although politically or militarily these nations could not unite. Earlier, the cause against Western colonialism and later against Israeli occupation, helped set the agenda for more vocal Islamic solidarity through the Organisation of Islamic Conference (OIC). The military defeats of the Arab armies at the hands of Israel in 1948, 1956 and 1967 were also a cause for continued rabid feelings against the West for having supported Israel. Ideologically, following in the footsteps of al Banah and Maudidi, was the rise of Syed Qutb, the Egyptian ideologue who advocated extreme *Salafism* and militancy as a counter to the West and Israel. Qutb's thoughts radiated through much of the Islamic world but Nasser imprisoned and then hanged him in 1966. Nasser was a secularist but Qutbism continues to live in Egypt even today and Qutb's radical writings are often discussed and inspiration taken from these. The first militant movement against Israel commenced under Yasser Arafat with the founding of the Palestine Liberation Organisation (PLO) in 1964. It

became particularly strident in its terrorist campaign after the Arab defeat of 1967.

It was the Yom Kippur War of 1973 which empowered the Arab (sometimes read as Islamic) world. Defeated in battle but not disgraced, the Arabs and, tangentially, the Islamic world, discovered the power of oil, as energy prices sky rocketed and oil cartels such as the Organisation of Petroleum Exporting Countries (OPEC) ruled the roost. Symbolically, anything which empowers the weak adds to civilisational and religious rivalry. This is exactly what happened with the Arab discovery of financial power. The subsequent economic boom witnessed in the oil rich states helped to attract labour from South and Southeast Asia. The labour camps where many poorer Muslims lived to earn and provide a better life to their families back home, became the nerve centres in which much of radical Islam was preached. Their poverty and misery ascribed to the West by clerics and other sponsors, these radicalised individuals preached the same to their families, helping in the spread of the emerging ideology of hatred against other faiths, and complete confidence only in the puritanical practices of Islam.

Interestingly, the violent overthrow of a monarchy first came in the Shia world. The Iranian Revolution of 1979 paved the way for others to start speaking more about protection of the faith. Its symbolic message to the rest of the Islamic world was huge. The rise of Iran's puritanical Shiaism had no universal ambitions but it inspired a *Salafi* revival. Coincidentally, in the same year (1979), the Afghan War broke out with the Soviet invasion and the next decade was to provide radical Islam's biggest surge. International Mujahideen, from diverse areas of the earth, fought the Soviets under US sponsorship. Pakistan became a frontline state and a horde of displaced people/ refugees from Afghanistan became near permanent guests of the UN agencies and Pakistan. The refugee camps again proved to be the breeding grounds of radicalism. The subsequent withdrawal of the Soviets ten years later was ascribed to the military victory of Islam's perceived torch-bearers. The campaign was orchestrated by Pakistan's Inter-Services Intelligence (ISI), giving a huge fillip to its reputation and confidence in running and handling subterfuge. Pertinent to mention here is that Pakistan's late President Zia ul Haq

had laid the foundations for a greater role by Pakistan in the Islamic world. He perceived Pakistan having everything except the money to be the flag-bearer of Islam. That shortcoming could be overcome through greater passion and demonstrated commitment to the faith. The nuclearisation of Pakistan was a manifestation of this. Through the mid-Eighties, Pakistan became increasingly radicalised, with its army following that path too, unlike Turkey or Egypt where the army remained the guarantor of secularism.

For the House of Saud, it was a great opportunity. Fearful of a full *Salafi* footprint which could exponentially increase the clergy's power within Saudi Arabia, the Sauds sponsored the spread of radical *Salafi* ideology in Afghanistan and Pakistan, much to the clergy's happiness. The Pakistan Army and the ISI became its virtual facilitators. Hundreds of *madarsas* were opened in the refugee camps and in semi-urban areas of Pakistan where the reach of government education was poor. Money power found its way into every facet of Pakistan's religious institutions, including various high profile mosques. For Saudi Arabia, it offered a strategic advantage too: the surrounding of Shia Iran. The radical *Salafi* culture spread into Afghanistan and with Pakistan playing a major role, the Taliban came into existence. Unsure of what exactly was happening in the Af-Pak region and still grateful to Pakistan for its role in the defeat of the Soviets, the US bankrolled even the creation of the Taliban who were none but radical young leaders from the Afghan refugee camps.

There were other areas where interesting events were taking place concurrently. The first was Bosnia, where one of East Europe's only Muslim majority nations was seeking independence, supported by the West. Mujahideen from Afghanistan gravitated towards Bosnia to help fight the post-Cold War period's first ethno-religious war. Similarly, Pakistan seized the opportunity to recruit the same Mujahideen to bolster its efforts at proxy war in Kashmir which was far from being a religious conflict. Yet, Pakistan's efforts at giving an Islamic colour to it did succeed to some extent. These bits and pieces game, in terms of turbulence in many parts of the Islamic world, helped create an environment of mistrust against non-Islamic countries. It led to closing of ranks and increase in radicalism. The

symbols of Muslim identity became objects of hatred as did certain types of clothing, the head scarf and the *abaya*, all over the West.

Once the historical dots are in place, it becomes evident that the rise of radical Islam was not a one-off event or a contribution of any brief period of recent history. It is the brooding contempt of some followers for what was perceived as historic wrongs, the appeal to the principles of the faith in its original form, shorn of modernity, to shake off the supposed contamination by alien cultures and the inability of any moderate counter-narrative at any time through the 20th century, that has brought Islam to its current status. In addition, the absence of a scientific and investigative temper has robbed it of progressive values, with faith-based aspects ruling the daily lives of people to such an extent that faith itself becomes near obsessive.

In the last 15 years or so, the narrative could also have been dictated by the US intent of supplanting Western liberal democratic values in the Islamic world, particularly where monarchies and dictatorships ruled. The Arab Spring remains unclear as a phenomenon. The political realities of individual nations prevented a powerful counter-narrative from taking shape. Radicalism found itself as an expression of nationalism in the case of the Chechens in Chechnya and the Uighurs in Xinjiang. The geographical confines and strong repression prevented these movements getting linked to the larger radical cause.

More than any state, it is the non-state actors that have given substance to radical Islam. The silence of states and their reluctance to act against proliferating trends over the years; and, in some cases, the acquiescence of state authorities to exploit non-state actors as strategic assets, have furthered the radical capability. The classic case is Pakistan about which enough has been written. The other explanation for even some moderate Muslims supporting radicals without believing in the ideology is the action-reaction theory. The acts by non-state radicals inevitably lead to state reactions against moderates, creating turbulence in their lives. This too has a proliferating effect which is a part of a radical strategy to enhance their outreach.

This essay will remain incomplete without a reference to the role of the Islamic diaspora in the Western world. Most expatriate communities which migrated and strived for a better life in the West, did not integrate and held on closely to their cultural moorings,

living in similar community neighbourhoods but remaining good citizens, grateful for the better life. In many cases, this is true of the Islamic diaspora too, except that a part of these communities not only chose not to integrate but also attempted to change the ways of the host populace. It was commonplace, ten years ago, to hear that reformation within Islam to drive it towards modernism would arise from the West. This is no longer true and, increasingly, the Islamic diaspora in the Western world no longer drives change.

The last word has to be on the current scourge – the Islamic State; it deserves an essay by itself but just a bit on the ideology it has adopted. Abu Musab al-Zarqawi, the Jordanian Al Qaeda leader killed in a drone attack in June 2006, was largely responsible for the most radical ideology within the ranks of Al Qaeda, including the gruesome and depraved treatment of prisoners. The availability of the deposed Baathist leadership, the Syrian civil war and competition within Al Qaeda, combined with the depraved ideology, led to the creation of the Islamic State, which was quick to declare a Caliphate with its leader, Abu Bakr al Baghdadi as the caliph. The IS, with territory under its belt, huge funds, leadership, administrative organisation and proximity to the symbols of Islamic power (the holy shrines) perceives itself the closest to the idea of a Caliphate, entertains ideas of power above Al Qaeda, and is working from the inside to the outside for its international empire. Its capability cannot easily be dented militarily without a more serious and coordinated effort against the financial conduits and flow of international fighters.

Radical Islam will continue to dog the world as a major issue related to international security. Already its networks are seen to be proliferating through Africa, West and Southwest Asia. However, the bulk of Muslims reside in South Asia and in Indonesia. It is their attitude which will dictate the future. As Islam struggles for modernity, this process of churning that it is undergoing at present, will continue for a few generations. Ideological battles for modernism within faiths usually take many generations. Islam and, in turn, the rest of the world has much uncertainty cut out for the future.

A previous version of this article was published by Lt Gen Ata Hasnain (Retd) in Defence and Security Alert, March-April 2015.

NEW ROTARY WING ACQUISITIONS: OPERATION ENHANCEMENT OF IAF

MANMOHAN BAHADUR

INTRODUCTION

The Rotary Wing (RW) fleet of the Indian Air Force (IAF) has got a shot in the arm with the signing of contracts for 15 CH-47F Chinook and 22 AH-64E Apache helicopters. It is understood that the helicopters will start coming in after three to four years to replace/augment the Mi-26 Heavy Lift Helicopter (HLH) and Mi-25/35 Attack Helicopter (AH) fleets respectively. This article examines the impact of their induction on the vertical lift potential of the IAF, especially accretion to its tactical and operational capability. Since the two helicopters are of different 'categories,' and, hence, with different roles, the analysis would be conducted separately for each machine.

HEAVY LIFT

India had inducted the Mi-26, still the biggest helicopter in the world by a large margin, in 1986. Four helicopters were bought and a Helicopter Flight was set up at Chandigarh. With a payload capacity of 20 tonnes – internal carriage or underslung – the Mi-26 revolutionised carriage of heavy and odd size/shape cargo. Thus,

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transportation of bulldozers (dismantled into two or three pieces) for the tasks of the Border Roads Organisation (BRO) helped in speeding up the construction of roads in the hilly border areas. Similarly, the Mi-26 carried assemblies and sub-assemblies of rockets and launch vehicles of the Indian Space Research Organisation (ISRO) and Defence Research and Development Organisation (DRDO) to their launch sites. No other helicopter could have achieved this task, with the alternative being road movement and its attendant risks, plus further dismantling of equipment for carriage. In the case of bulldozers, the alternative was even more sub-optimal as only the smaller ones could be underslung by the Mi-17s in even smaller dismantled configurations. The Mi-26, whose cockpit can be pressurised to a positive pressure to fly in a Nuclear, Biological, Chemical (NBC) environment, was also used in an unconventional role in the aftermath of the Bhopal gas tragedy; an Mi-26 was specially configured to spray water over a tank containing toxic chemicals that was overheating and threatening to explode.

The Mi-26 had its downside too, the most obvious being the requirement of a large sized helipad or cleared area for take-off and landing; associated with this was the extremely heavy rotor downwash that it generated and the consequent threat of flying debris and a mini dust storm in its wake. A major cause of this was the extremely high basic empty weight which stood at 28.2 tonnes, with the maximum Airframe Unit Weight (AUW) being 56 tonnes. Extremely costly to operate, the Mi-26, like most Soviet/Russian machines, was maintenance heavy. Consequently, the IAF flew it very conservatively and for tasks chosen with great care. A major restriction was that due to its large size, its manoeuvrability was restricted, thereby, limiting the valleys (especially in the east) where it could operate.

Enter the Chinook, which is equipped with an advanced radar for terrain flight-following, a Forward Looking Infra-Red (FLIR) system, two electronically controlled engines and other modern avionics in its full glass cockpit. With a basic empty weight of 10.2 tonnes and a maximum AUW of 22.7 tonnes, its rotor downwash is less than half that of the Mi-26 and that too distributed between two rotors. The absence of a tail rotor helps in quick and carefree entry and exit of personnel and equipment. It carries up to 55 fully equipped troops

or two jeeps and equivalent vehicles in the fuselage. The Chinook can transport around 10 tonnes internal cargo and has a three-hook undersling system, with the central hook capable of 12.5 tonnes and the other two hooks rated at 7.5 tonnes each; overall, a combined 11.34 tonnes in unison can be carried underslung. Thus, by rationalising external load carriage, underslung load can be carried to more than one destination in the same sortie.

Six of the 15 Chinooks which would arrive would most probably reequip the 126 Helicopter Flight at Chandigarh (with the phasing out of the Mi-26) while the others could be used to raise a new flight, most probably in the northeast. The operational capability that the Chinook would bring to the IAF is expanded upon below.

- Its good manoeuvrability and carefree handling due to excellent control response, electronically controlled engines and accurate navigation aids would enable narrower valleys to be penetrated; thus, access of BRO's road making activities into hitherto inaccessible areas would be supported.
- With three extra fuselage tanks and/or underslung fuel bladders (hopefully, we have contracted for them), the self-deployment capability range would be substantial. The underslung fuel bladders would also help in setting up Forward Arming and Refuelling Points (FARP) in quick time.
- Transportation of heavy equipment of the army like artillery guns can be done to areas close to the Tactical Battle Area (TBA), if not to within it. This was restricted with the Mi-26 due to its large size, the heavy downwash, and the lack of manoeuvrability. With its three cargo hook system, the loads are more stable and can be transported at speeds up to 260 km/h.[1]
- Troop deployment can be undertake in larger numbers with fewer helicopters, leading to greater unit cohesion of troops once they are disembarked.
- Air-sea operation of the special forces will get a boost as insertion and recovery of Gemini boats from the water can be done in certain conditions – many video films on this are available on the internet.[2]

1. "CH-47-D Chinook", http://www.military.com/equipment/ch-47d-chinook. Accessed on October 6, 2015.
2. For details, see "Navy Seals Extraction", *You Tube,* October 17, 2009, https://www.youtube.com/watch?v=JcxFqzNGtjY. Accessed on October 6, 2015.

- Quick role conversion using the Cargo On Off Load System (COOLS) of a Chinook can be done, wherein, by flipping floor panels even when the helicopter is in flight, the roller version cargo configuration can be converted to a troop carrying version in just fifteen minutes and vice versa.[3]
- One Chinook can be carried internally by a C-17, after removal of its rotor blades. Thus, long distance deployment would enable quick deployment for operational and Humanitarian Assistance and Disaster Relief (HADR) tasks. This combination is especially useful for relief missions in neighbouring and second tier countries where such movement would expedite, in no small measure, the availability of rotary wing capability on site for disaster relief. Similarly, even for the Andaman and Nicobar Islands, Chinooks can be airlifted by C-17s to Port Blair and Car Nicobar, cutting short the time required for the long ferry via Myanmar, as also saving a substantial number of precious flying hours.
- Longer availability on flight line would be possible due to the modular concept of construction and on-condition servicing for its major aggregates.
- Modern piloting devices would enable the crew to keep their 'eyes out,' that is so vital in low level flight, especially by night.

In a nutshell, the Chinooks will greatly facilitate induction of heavy logistics and personnel to remote areas, including into narrow valleys, enabling quick redeployment of men and material. Considering the increasing threat on our northern borders, this redeployment capability of the Chinook adds a nuanced strategic touch to moves that are inherently tactical—the realisation by adversaries that lateral as well as forward movement of a large body of men and material is possible in quick time through heli-lift (during day and night) would add a new paradigm to the deterrent value of India's military posture. The Mi-26 has done yeoman's service to the nation and some capability could be lost once it gets phased out – an example is the internal carriage of fuel bowsers without any

3. "Making a 'Cool' Chinook", *Boeing*, April 19, 2013, http://www.boeing.com/features/2013/08/bds-cool-chinook-08-19-13.page. Accessed on October 5, 2015.

dismantling, as was done in the Uttarakhand flood relief (which can be offset with fuel bladders and pumps). However, the induction of the Chinook would bring in operational capability that the IAF has been seeking for many decades—a fast, reliable, easy to service and operate heavy lift helicopter that can perform tactical tasks, bordering on the realm of the operational domain.

ATTACK HELICOPTER

The Apache AH-64E was selected after a fly-off with the Russian Mi-28. Some of the 22 machines coming in would equip a new squadron to support the strike corps of the Indian Army while the rest would most probably be replacements for the older Mi-25s that have reached obsolescence. Thus, the attack helicopter fleet of the IAF would have combinations of Apaches and Mi-35s manning its three AH Squadrons.

The Apache and major airframe associated equipment is a direct commercial sales deal with Boeing, while the armament, training package, platform certification, and components, including engines, sensors, and radar, are being procured through the US Foreign Military Sales (FMS) route. The following equipment is supposedly being contracted as part of the deal:[4]

- Twelve AN/APG-78 Longbow millimetric wave Fire Control Radars (FCR) which provide air crew with detection, location, classification and prioritisation of multiple moving and stationary targets on land, water and in the air in all weather conditions from stand-off ranges.[5]
- Fifty T700-GE-701D engines.
- Twelve AN/APR-48A Radar Frequency Interferometers (RFIs) for passive location and identification of radar-emitting threats.[6]
- 812 x AGM-114L-3 Hellfire missiles. The Longbow Hellfire, is a fire-and-forget weapon equipped with a Millimetre Wave (MMW) radar seeker. It also provides capability in adverse weather and

4. "Hunting Bows", *Strategic Affairs,* http://www.strategic-affairs.com/details.php?task=special&&id=38. Accessed on October 5, 2015.
5. "Saudi Arabia to Equip Apaches with Longbow Fire-Control Radars", http://www.army-technology.com/news/newssaudi-arabia-equip-apaches-longbow-fire-control-radars. Accessed on October 6, 2015.
6. "AH-64A/D Apache Attack Helicopter, United States of America", http://www.army-technology.com/projects/apache/apache8.html. Accessed on October 6, 2015.

against battlefield obscurants (obscurants such as smoke and fog being able to mask the position of the target or to prevent the designating laser from producing a detectable reflection). The Hellfire has a range of 8 km.

- 542 x AGM-114R-3 Hellfire II missiles. This missile uses a semi-active laser homing guidance system and an integrated blast fragmentation sleeve warhead to engage targets that previously needed multiple Hellfire variants. [7]
- 245 x Stinger Block I-92H missiles.
- 30 mm chain gun systems for each helicopter (plus a few spares) along with ammunition.
- Hydra 70 mm rockets.

The AH-64E is the most modern of the Apache series and has many technologies that would, perhaps, not be offered to India. For example, the Link 16 data link and the unmanned aerial systems tactical common data link assembly, via which live streaming of data from Unmanned Aerial Vehicles (UAVs) is done to the Apaches as also to the ground troops, if required.[8] Similarly, it would be of interest to know which generation of FLIR is being offered, as also the Night Vision Glasses (NVGs). The self-protection suite being bought would be of immense interest as on it would depend the survivability of the Apache in combat.

The capability enhancement that the Apache would bring with it to the IAF is discussed below.

Enhanced Battlefield Transparency: The mast mounted AN/APG millimetric wave radar will revolutionise how a force on force battle would be fought. The radar can sweep and track 128 targets and engage 16 at the same time and, using the data link, the battlefield picture can be transferred to the other aerial and ground-based assets. The RFI would also map the radar emitters in the area and form a composite picture of disposition of the enemy's assets. It would be

7. John Keller, "Army and Lockheed Martin Prepare for Production of Advanced Laser-Guided Hellfire Missile", *Military Aerospace,* April 10, 2012, http://www.militaryaerospace.com/articles/2012/04/hellfire-romeo-long-lead-items.html. Accessed on October 7, 2015.
8. "Longbow UTA", Lockheed Martin, http://www.lockheedmartin.co.in/content/dam/lockheed/data/mfc/pc/longbow-uta/mfc-longbow-uta-pc.pdf. Accessed on October 6, 2015.

noticed that while 22 Apaches are being bought, only 12 radars are being purchased, hinting at such connectivity being used to improve the situational awareness of non-radar equipped helicopters. As the IAF's Integrated Air Command and Control System (IACCS) gets more nodes and the Airborne Warning and Control System (AWACS) get integrated into it, the Intelligence, Surveillance and Reconnaissance (ISR) capability of the Apache would also be a big boon to fast jet strikes coming into the tactical battle area. The possibility of acquiring the Unmanned Tactical Aircraft (UTA) system would greatly enhance the situational awareness of the helicopter crew as also give them the advantage of being knowledgeable about what lies 'over the hill' with the help of live streaming of video from surrogate UAVs. The positioning of the radar on the mast permits the Apache to hide behind obstructions with the radar just above (the obstruction), scanning the area without giving away its position. In a nutshell, the heart of the Apache's prowess is its millimetric wave Longbow radar and it would be worth reproducing a small description of its capabilities from a renowned aviation website.

> The Longbow radar is a very weak power, millimetric band system, with extremely low sidelobes by virtue of a very large relative antenna size. The low emitted power, extremely narrow pencil beam mainlobe, and undisclosed LPI modulation features provide a system with a range of the order of 10 km in clear conditions, which is near to undetectable by established RWR technology. The choice of millimetric band means that atmospheric water vapour and oxygen resonance losses rapidly soak up the signal, which is also out of the frequency band coverage of most RWRs. The radar will track up to 128 targets and prioritise the top 16.[9]

The radar uses established decluttering techniques like use of the Moving Target Indicator (MTI) methodology and comparison with threat libraries utilising shapes and doppler signatures to track, isolate and identify ground-based as well as aerial targets like helicopters, armoured vehicles, artillery pieces and other such assets

9. Carlo Kopp, "AH-64D Apache Longbow Flight Report", *Air Power Australia,* April 1999, http://www.ausairpower.net/longbow-aa.html. Accessed on October 6, 2015.

of the adversary. Even camouflaged stationary targets can be picked up and real "beam video and synthetic imagery displayed." The functioning of the RFI is best described as *"….a multiple baseline, single panel wideband interferometer with 360 degree coverage and increased resolution forward coverage, using a cluster of cavity backed spiral antennas mounted beneath the radar package."*[10] With accuracy of "better than one degree of arc," the RFI works as an Electronic Support Measure (ESM) and paints an electronic picture of the TBA showing the distribution of all electronic emitters in the area of interest. The availability of this information helps in target prioritisation and subsequent engagement with appropriate weapons, which could be delivered by a designated helicopter, a UAV or a fast jet platform to which the picture has been transferred. The Hellfire AGM 114 L3 missile has a millimetric wave seeker and uses it to engage a designated threat. The designation can be done before launch, or the missile fired on an initial inertial guided course after which it acquires the target after launch.

OFFENSIVE PUNCH

- The Hellfire missile of the Apache is one of the most modern of all anti-armour missiles available in the world at present. Having a range of 8 km, it can be fired from forward flight as well as at hover. This is a great advantage over the Mi-35 whose Shtrum Anti-Tank Guided Missiles (ATGM) had to be invariably fired in forward flight due to the high power requirements to hover the Mi-35, which would be weighing around 10 tonnes in the TBA – the downwash on the substantially big stub wings added to the weight of the helicopter and the heavy rotor downwash created a virtual sandstorm, giving away its location. This is compared to the relatively lightly loaded Apache whose AUW in the TBA would be around 8 tonnes or less.
- The 70 mm rockets can be fired in forward flight as well as at hover. This enables the Apache to stay away from enemy frontlines but still maintain accurate rocket fire with a depressable launch mechanism and computer controlled designation, aiming and launch capability.
- The 30 mm chain gun installed between the front undercarriage,

10. Ibid.

is slaved to the aircrews' helmet mounted sight. With a carriage capacity of 1,200 rounds, the gun can fire armour piercing ammunition at 625 rounds per minute.

- The Apache would be equipped with a self-protection suite that comprises a passive radar warning receiver, Infra-Red (IR) and radar jammers, a laser warning receiver, missile warning receiver and chaff and flare dispensers and other modern counter-measures. Its self-protection, if 'bounced' by enemy aircraft/helicopters, is its potent Stinger air-to-air missile that homes on to the target with its IR/radar seeker.
- All weapon aiming is cued to the pilot's integrated helmet and sighting system. With all required cues and weapon aiming symbology projected on his monocle, the pilot can truly slave his sensors and weapons while looking out and engage the target effectively.

OPERATIONAL EMPLOYMENT

The government has gone ahead and given the IAF what it wanted; it is now up to the air force to exercise it to get the maximum operational capability from these two machines. For this to happen, doctrines may have to be modified and certainly the way they are operated cannot be a replica of the utilisation of earlier generation helicopters. The potent night capability, combined with ease of flying afforded by the onboard systems, has to be harnessed to ensure that the combined effect is greater than the sum of the operational capability of the two machines. Additionally, the phenomenal capability that the Longbow radar affords, should be utilised by IAF planners to dovetail Hindustan Aeronautics Limited's (HAL's) Light Combat Helicopter (LCH), that would be entering the IAF's inventory in a few years' time, into a composite operational mosaic. The LCH is a simple attack helicopter—a two-crew, light weight, weapon carrying machine with standard electro-optical and FLIR sensors (NVGs are a given). Data linking, at present, is absent and there is no way that a radar of the Longbow kind can be added on. At the same time, the major plus points of the LCH are its light weight (and, hence, low downwash), high manoeuvrability due to a rigid rotor system and its phenomenal high altitude capability that no other helicopter in the

world can boast of; the LCH has *landed* at 15,000 feet with sufficient load to justify substantial armament delivery against targets in India's mountainous border, a capability that was sorely lacking during the Kargil conflict. Ingenious minds must get to work to mix and match the capabilities of the two helicopters. This requirement would also be valid for the large number of advanced light helicopters (weapon systems integrated) that the IAF is acquiring and which would be under the armed helicopter category (the weapons and avionics/ optronics package are almost similar to those of the LCH).

The Apache is an ideal platform to act as escort in a Combat Search and Rescue (CSAR) package. With the Apache's ability to 'see' and navigate accurately at night, detect hostile assets and avoid/neutralise them with its Longbow-Hellfire configuration, the CSAR mission would have much greater chance of success than hitherto. However, the process and procedures require much deliberation and practice, as also creation of some select formations dedicated to the CSAR task.

The government on its part has a role to play too. While both the Chinook and Apache are majorly direct commercial sales, it is expected that with the warming Indo-US relationship, issues of ready availability of spares and timely major overhauls, which have been major irritants with the Russians, would be a thing of the past. This would be a true indicator of the proverbial 'turning of a new leaf' in Indo-US relations.

SUMMATION

The signing of the Chinook and Apache contracts is part of the rapprochement in Indo-US ties as a whole, and is not restricted to the defence sector only. The two machines represent the cutting edge in the heavy lift and attack helicopter segments of rotary wing aviation. They both cost a fortune but bring with them capabilities that can be game changers in any future conflict. For this to happen, it is necessary that their full potential be realised during peace-time training through an institutionalised process involving the best aviators and technical personnel present in the rotary wing stream of the IAF. Doctrinal changes would have to lead the way and flexibility of thought and a willingness to accept the 'new' and 'different' would be prerequisites to full utilisation of the capabilities of the Chinook and the Apache.

SPACE SECURITY POLICY: IMPERATIVES FOR INDIA

R RADHISH

INTRODUCTION

In October 2013, the then Chairman, Chiefs of Staff Committee and Chief of the Air Staff, Air Chief Marshal NAK Browne announced that "the Indian armed forces are submitting finalised proposals to the government for approval for setting up three Armed Forces Commands",[1] one of which was the Space Command, to be headed by an Air Marshal. The necessity for such an organisation to garner our strength in the field of space technology, which has been hitherto predominantly civilian in nature, and utilise it to enhance India's defence preparedness has been expressed by many Air Chiefs and defence analysts earlier. A step in that direction was initiated in June 2008 by the setting up of an Integrated Space Cell at Headquarters, Integrated Defence Staff (HQ IDS), to facilitate coordination and integration among the Indian armed forces, the Department of Space (DoS) and the Indian Space Research Organisation (ISRO).[2] Although India has a strong space technology background in the civilian

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1. Subhash Kapila, "India Setting up Three New Armed Forces Commands", *South Asia Analysis Group* Paper No. 5575, October 7, 2013, www.southasiaanalysis.org/node/1372. Accessed on October 2, 2015.
2. Rajeswari Rajagopalan Pillai, "Synergies in Space: The Case for an Indian Aerospace Command", *ORF Issue Brief # 59*, October 2013, www.observerindia.com. Accessed on October 2, 2015.

sector, the utilisation of space for military purposes has been very limited as a policy, probably to ensure that India's space research never suffered for want of cooperation with foreign space agencies or for want of technological knowhow that normally came from these organisations. Thus, India held the moral high ground in this respect and despite changes in our foreign relations, cooperation in space technology continued. The Anti-Satellite (ASAT) test by the Chinese in 2007 probably made the authorities take heed of what many strategic thinkers had been stating and gave the much needed impetus to utilisation of space technology and infrastructure for enhancing the defence posture of India.

As of now, India has not formally announced a space security policy. If the need for setting up of a command and control structure to facilitate utilisation of space infrastructure for military purposes has been tacitly, if not formally, recognised by the government, the next logical step is to enunciate a national space security policy that must percolate from India's foreign and defence policy. With our growing stature in the international community as a responsible nuclear and space power; as a growing economic power; as an aspirant for membership in the United Nations Security Council (UNSC); and as the largest democracy responsible for the well-being of its millions, it is incumbent on our part to formally articulate a policy for ithe utilisation of space for enhancing our comprehensive national power. Formally announcing our intent and holding ourselves accountable to the world will not only help demystify and eliminate speculations about our space programme but also facilitate better coordination and cooperation amongst various agencies within the country that are the stakeholders and benefactors of our space programme. This paper identifies certain policy imperatives which may merit consideration and which, it is felt, would make our national space security policy robust and relevant to our needs.

COLD WAR TABOO: ENHANCED SPACE SECURITY

All the initial development in the use of space as a medium for transit, and for sustained presence for exploration and exploitation was either for delivery of weapons or for improving its accuracy or for facilitating command and control of strategic weapons. The

effectiveness of the nuclear weapon as a weapon of mass effect and its capability to be the ultimate deterrent, fuelled thoughts of its enhanced usage. From conventional weapons like the V2, which was the first to use space as a medium of transit to its target, the USA and the erstwhile USSR, it graduated to Inter-Continental Ballistic Missiles (ICBMs) with multiple, independently targeted nuclear warheads that could target each other's country as the Cold War intensified. The Soviet Union even threatened to place nuclear weapons in orbit that could be de-orbited to strike mainland USA when required (the fractional orbital bombardment system) and co-orbital ASAT to attack the US satellites if the need ever arose. After the Outer Space Treaty (OST) of 1967 entered into force, prohibiting the placing of weapons in space, these nations started developing direct ascent attack missiles against satellites, ground-based lasers, beam weapons and other means to destroy or disable a satellite or disrupt its functioning without infringing on the provisions of the treaty. The launch of the experimental satellite, the Sputnik, in 1957, by the USSR, not only initiated uninhibited space exploration and exploitation, it also tacitly allowed over-flights of other countries in space, without permission, which was otherwise unthinkable in the air space below. This also allowed a certain degree of visibility to each other's strategic assets and activities which, in effect, brought in permissiveness and mutual confidence. During those days, assets in space were primarily meant for intelligence gathering about the enemy by overflying them and for command, control and communication to facilitate faster and more accurate delivery of weapons half way around the globe. The threat from nuclear weapons grew as both the US and USSR amassed huge piles of weapons and delivery platforms. Both blocs, however, soon realised that a nuclear war would be catastrophic. This led to a stand-off, with Mutually Assured Destruction (MAD) as the principle behind it. To an extent, space assets aided in sustaining this doctrine, in that both knew that their activities were being monitored. Although there were attempts at reducing weapons and warheads through treaty initiatives like the Strategic Arms Limitation Talks (SALT) and Anti-Ballistic Missile (ABM) Treaty, fluctuating geo-political situations during the Cold War like the Russian aggression into Afghanistan in 1979, continued to fuel tension that effectively

reduced mutual trust. Since there was a trust deficit between the superpowers, any attempt at targeting assets in space, which was the only mutually accepted form of keeping an eye on each other, was considered a taboo during the Cold War, lest it mistakenly be perceived as the other power initiating a confrontation. This, in effect, gave more sanctity to the Outer Space Treaty and prevented any attempts by the US or USSR to target assets in space.

Although former US President Ronald Reagan initiated the Strategic Defence Initiative (SDI) in 1983, to place weapons in space to target Russian missiles while in flight, it did not find favour in the US Congress and the press, as it was felt that it was prohibitively expensive and would unnecessarily initiate an arms race in space that both powers could ill afford. After the break-up of the USSR, when the threat of an arms race in space subsided, the SDI was revoked, which gave the initial impetus to the Ballistic Missile Defence Organisation (BMDO) and the Missile Defence Programme. Despite repeated protests from Russia and other countries, the development and employment of different forms of missile defence continued, making the rest of the world uneasy about the invincibility of the US. Assets for intelligence gathering, surveillance, reconnaissance, communication, command and control, detection and early warning, missile tracking, and precision guidance were the principal components of missile defence and they were placed in the most vulnerable environment of outer space. Although there was no arms race in space, the perceived invincibility fuelled missile and nuclear technology proliferation, because to defeat the missile defence, its most vulnerable and weak link had to be targeted, which was its orbital infrastructure. In the aftermath of the 9/11 terrorist attacks, the US, in the process of reassessing its homeland security against the background of widespread missile and nuclear proliferation, aided by some countries, decided to unilaterally withdraw from the ABM Treaty to pursue the National Missile Defence (NMD) programme in full earnest.

EMERGENCE OF CHINESE THREAT

The Cold War stand-off between the superpowers and the doctrine of MAD provided security to the space assets of the rest of the world, as space surveillance and situational awareness capability was not as

enhanced as it is today and, therefore, no country attempted to disturb the peace should it unwittingly initiate a confrontation. With the USA emerging from the Cold War as the sole surviving superpower, with no prospect of MAD and with no adversary to challenge its hegemony, the security of assets in space provided by the Cold War taboo has become non-existent. Aided by its strong economic growth since the Nineties, China has emerged as the strongest competitor to the US in all fields. Its economic growth has also helped China to modernise its armed forces rapidly and be more assertive in its dealings with competitors and adversaries. China has also realised that in order to be taken seriously, it needs to have proven deterrent capability. It has enhanced its ICBM delivery and accuracy capability, anti-satellite capability, nuclear and conventional forces' capability, and is in the process of research into advanced aerial and space vehicle technology to match the US as a world power. In addition, widespread missile, nuclear and space technology proliferation, aided by some countries, has made accurate ballistic missile delivery with nuclear weapons well within the reach of many aspiring regional powers and belligerents. China is also helping Pakistan with the latest technology in all fields and weapon systems to ensure that India has to deal with two fronts should there be a confrontation in the future. In such a scenario, what are India's options?

SPACE SECURITY POLICY IMPERATIVES

Deterrence: Deterrence aims to persuade an opponent not to initiate an action by stating or making obvious the consequences of that action and, thus, forcing the opponent to assess the cost of the action and weigh it against the benefits accrued, thereby aiming to maintain the status quo. Deterrence could be achieved through denial of success for an action, or by inflicting unacceptable costs through punishment, or by a combination of both. In order to achieve deterrence, there are two primary requirements and they are: whom to deter and how to deter. Since our primary concern in the near future is likely to be how to deter the rapidly modernising and assertive China, our actions should be directed against it.

Enhanced Space Situational Awareness (SSA): In order to ascertain who the potential attacker could be or who is the perpetrator,

there is a requirement for enhanced SSA. Objects in space need to be tracked and their characteristics monitored in order to build SSA. India is one of those few countries that has indigenously developed a Multiple Object Tracking Radar (MOTR), with the capability to track up to 10 objects up to a thousand kilometres, depending on the size of the target. Although it was reported that "with this radar, ISRO acquires the capacity to handle its future missions involving atmospheric reentry of space modules, having a protective eye on its space assets and track space debris,"[3] the present capability is grossly inadequate to provide defence to our critical assets in space, let alone deterrence against a determined belligerent. Enhanced SSA is a crucial capability that India needs to invest in. We must have the capability to keep our critical space assets under continued surveillance and also have the capability to detect any hostile or collisive approach,in order to take evasive or defensive action in time. In March 2014, Gen. William Shelton of the US Air Force (USAF), head of the US Air Force Space Command announced the planned launch of "a new space based surveillance programme that was meant to monitor satellites in the congested geo-synchronous orbit."[4] Geo-synchronous orbits have the US military's strategic assets like secure communication satellites and the space-based infra-red early warning satellites that are critical to their defensive capability.[5] According to *Spaceflight Now,* the "US military had acknowledged that the programme included a micro-satellite equipped with instrumentation to detect, track and identify other spacecraft in orbit called ANGELS (Automated Navigation and Guidance Experiment for Local Space), besides a pair of larger geo-synchronous space surveillance platforms".[6] Unless the characteristics of a satellite are mapped and kept track of, it would be impossible to protect one's assets from an attacker or to deter one. While we have invested in a space-based surveillance and tracking

3. "ISRO Makes Sophisticated Multi-Object Tracking Radar, *The Times of India,* May 15, 2015, http://timesofindia.indiatimes.com/home/science/Isro-makes-sophisticated-multi-object-tracking-radar/articleshow/47300242.cms. Accessed on September 25, 2015.
4. Stephen Clark, "Air Force General Reveals New Space Surveillance Program", *Spaceflight Now*, March 3, 2014, www.SpaceflightNow.com. Accessed on September 25, 2015.
5. Ibid.
6. Ibid.

system to enhance our anti-ballistic missile capability, there is a requirement to invest in capability to improve our SSA to enhance and project a credible deterrent posture in space. We could have this capability either by acquiring the required assets, or by obtaining the required information from strategic partners. Cooperation with other responsible space powers in this field is a must until we are in a position to provide for it ourselves.

Demonstrated Deterrent Capability: No threat is likely to be taken seriously if the targeted audience does not have reason to believe that the threat is real. Therefore, we need to demonstrate our deterrent capability in space if the threat is to be acknowledged as real and present. The fact that India is working on its own missile defence capability is known to the world. It is not considered alarming or threatening since any country is rightfully authorised to protect itself through defensive measures. It is also known that intercepting a missile in flight or intercepting a satellite in orbit are two versions of a similar capability. Therefore, it can easily be derived that BMD capability can easily be extended to an anti-satellite kinetic kill capability. The US demonstrated this variation when it used a modified interceptor from its ship-based Aegis Theatre Missile Defence (TMD) system to prove its direct ascent ASAT capability in 2008.[7] Deterrence in space by punishment requires either demonstrated anti-satellite capability, for physical destruction (irreversible) or disruption and/or denial of the satellite's critical capability (reversible). What the Chinese did by carrying out an ASAT test in 2007, and dazzling and disrupting US satellites was exactly this—proving a capability in order to deter. So our anti-satellite capability demonstration would definitely make the threat more real. It will not only demonstrate a capability but, more importantly, it will also imply our nation's resolve to act, when and if, required. Deterrence by punishment requires political will to execute the threat of retribution. Threat of punishment could be against conventional forces or terrestrial infrastructure. Since action against a satellite in space would be outside the glare of the media and the public, and no lives are likely to be lost as a direct consequence, in order to limit unintended consequences, punitive action in space

7. Victoria Samson, "India and Space Security", *The Space Review*, May 9, 2011, http://www.thespacereview.com/article/1838/1. Accessed on September 25, 2015.

would be preferable. Deterrence by denial in space can be achieved by passive measures like dispersion of assets and capabilities into different orbital planes; or by hardening or strengthening of satellites to mitigate/limit damage; or by providing redundancy by duplicating the capability in numbers and in the environment, i.e. assets in both space and on the ground. Denial can also be achieved using active measures to defeat an attack by manoeuvring, although the scope is very limited due to fuel and weight considerations; or by using active defence mechanisms like fitting short range kinetic weapons or directed-energy weapons to destroy or disable any satellite that comes close; or by deploying escort and decoy satellites.

Space Debris: Space debris is a major security concern for all space-faring entities, including India. Space debris consists of decommissioned or defunct satellites, used booster rockets, pieces of broken up rockets or satellites, or even flakes of paint or dust that are orbiting the earth. There are over 500,000 pieces of such debris of varying sizes orbiting the earth at about 17,500 miles/hr according to the National Aeronautics Space Administration (NASA). Because the debris has adequate velocity to remain in orbit, it would be a long time before its velocity decays adequately for it to come closer to the earth's atmosphere and subsequently burn out during reentry or finally crash into the earth. Depending on their size and the height of orbit they are in, it would take decades, if not centuries, for some of the debris pieces in higher orbits to re-enter the atmosphere. Because any impact would occur at over 10 km/s, any object above the size of 1 cm across could potentially cause major damage, if not a break-up, causing more debris. "In February 2009, the question of space security was again in the public eye with the collision of Iridium 33, an operational US communications satellite, and Cosmos 2251, a decommissioned Russian communications satellite, in Low Earth Orbit (LEO) over northern Siberia. The collision was the first to involve two intact satellites, and resulted in more than 700 new pieces of orbital debris".[8] Many new ideas to remove debris like

8. Marius Grinius, "Space Security 2009: Moving Towards A Safer Space Environment", *CONFERENCE ON DISARMAMENT CD/1876*, September 7, 2009, http://www.unog.ch/80256EDD006B8954/(httpAssets)/4034B40C3367B77BC12579CD0052CD18/$file/1876.pdf. Accessed on April 21, 2014.

using a laser from the ground to pulverise it[9], to collecting the debris in space, are being contemplated.[10] The Inter-Agency Space Debris Coordination Committee (IADC) provides the necessary oversight for new regulations that all states are to implement as debris mitigating measures to reduce further build-up of debris, to assure prolonged sustainable use of space.[11] While debris, that is, products of routine space exploitation, may be acceptable to an extent, the Chinese ASAT test and Cosmos-Iridium satellite collision caused global concern. The US effort to destroy the unusable satellite was purposefully carried out at LEO to allow the debris to fall to earth faster. More importantly, it is the tactical use of debris created either through an intentional collision or by an explosion in space to disable or destroy a satellite that is a serious security concern. Although nuclear explosions or tests in space or on celestial bodies are banned by the OST, Electromagnetic Pulse (EMP) from a nuclear explosion in space by an irrational actor that has the potential to disable a large number of satellites, is a plausible threat.

SPACE SECURITY POLICY

Nuclear Doctrine – A Parallel: Every security policy has some imperatives that emanate from the circumstances that dictate its need. For example, India's nuclear doctrine, enunciated on January 4, 2003, states that India will build and maintain a credible minimum deterrent; follow a no-first-use posture; and use nuclear weapons only "in retaliation against a nuclear attack on Indian territory or on Indian forces anywhere",[12] and so on. As per the draft report on India's nuclear tests submitted by the National Security Advisory Board (NSAB), "Our tests were primarily driven by the indefinite

9. "Take That, Space Junk! Australian Scientists to Zap Debris with Lasers", *The Guardian*, March 10, 2014, http://www.theguardian.com. Accessed on April 21, 2014.
10. Elizabeth Howell, "Europe Explores Ideas to Clean Up Space Junk", Space.com, March 4, 2014, http://www.space.com/24900-europe-space-junk-clean-up.html. Accessed on April 21, 2014.
11. "Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space", UNOOSA United Nations Treaties and Principles on Outer Space, Related General Assembly Resolutions and Other Documents, http://www.oosa.unvienna.org/pdf/publications/ST_SPACE_061Rev01E.pdf. Accessed on April 21, 2014.
12. "Press Release: Cabinet Committee on Security Reviews Progress in Operationalizing India's Nuclear Doctrine", Prime Minister's Office, January 4, 2003, http://pib.nic.in/archieve/lreleng/lyr2003/rjan2003/04012003/r040120033.html. Accessed on October 2, 2015.

extension of the Non-Proliferation Treaty (NPT) in 1995 that allowed the nuclear weapon states to maintain their nuclear weapons even with a stated first use policy, while attempting to prevent other nations from acquiring them. Having conducted the tests and proven our capability, we realised that our nation's interest as a responsible nuclear armed state lay in announcing our intent to the world by releasing a draft nuclear doctrine and permitting it to be discussed and debated in public before formally announcing a nuclear doctrine and associated National Command Authority."[13] 'No-first-use' was intended to provide Confidence Building Measures (CBMs) and prevent nuclear proliferation in the neighbourhood, and, ultimately, promote nuclear disarmament. Circumstances, especially after Pakistan's refusal to provide any form of CBM after its nuclear tests and declaration of the nuclear doctrine, coupled with China's covert help to Pakistan for all its needs to keep India at bay, demanded that we have a credible minimum deterrent, with the ability to absorb the first strike and retaliate massively to inflict unacceptable damage on the belligerent. A need was felt to develop a nuclear triad, with adequate warheads and delivery mechanisms that would deter any adversary from coercing India, using the nuclear arsenal. Today, with a more assertive and belligerent China that has refused to include India in its 'no-first-use' list; and a weak Pakistan that has developed tactical nuclear weapons to match our conventional superiority and which openly brandishes the nuclear threat at the drop of a hat, there are analysts and politicians who feel that India needs to rethink its stated nuclear doctrine. But, as of now, our doctrine stands, and it is serving its purpose, proof of which is the recent successful negotiation of the nuclear deal with the US.

Imperatives: Having argued that unless we demonstrate the capability and prove our resolve, it is unlikely that our position would be taken seriously, there is a requirement to first prove our anti-satellite kinetic kill capability. The necessary precautions need to be adopted to mitigate the debris, like intercepting the target at a lower orbit to allow the debris to de-orbit sooner to avoid an international uproar.

13. "Draft Report of the National Security Advisory Board on Indian Nuclear Doctrine", Ministry of External Affairs, Government of India, August 17, 1999, http://mea.gov.in/in-focus-article.htm?18916/Draft+Report+of+National+Security+Advisory+Board+on+Indian+Nuclear+Doctrine. Accessed on October 2, 2015.

As a technology demonstrator, we must also prove our passive and intrusive disruption/denial capability on our own satellite so that it is amply clear to our potential adversaries that we have the capability and the will to execute the threat. As China becomes more dependent on space assets for its economy and its armed forces, the threat would automatically become more relevant to it. Even if the conventional forces may remain out of reach for us, the space assets would always be within reach and, therefore, the threat would definitely be treated as clear and present. There is also a requirement to invest not only in space-based surveillance but also in space surveillance to improve our SSA at all relevant orbital planes. This is a crucial requirement as, without SSA, it would be impossible to execute the threat, and if a smart enemy knows that, the threat will not only be ignored but any inadvertent mishap may be turned against us to initiate either some punitive action or international condemnation. India also needs to take the initiative and participate in programmes that are meant to mitigate space debris. Since we do not have the technological capability to initiate any debris remediation programme on our own as of now, we need to cooperate with the European Space Agency and other responsible space-faring institutions in this field. India also needs to support and strengthen the provisions of existing treaties like Article VII of the Outer Space Treaty that "hold the state that launches the object into outer space and the state whose territory it is launched from, liable for damage to another state by any object or its parts in outer space",[14] and Article II of the Liability Convention that states, "a launching the state shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the earth or to aircraft in flight"[15] that are meant to prevent actions that increase insecurity in space by producing space debris that could damage satellites.

National Space Security Policy: If our nation is not to be misunderstood in the bargain, there is a requirement to put in place a national space security policy that clearly elucidates our national

14. "United Nations Treaties and Principles on Outer Space, Related General Assembly Resolutions and Other Documents", United Nations Office for Outer Space Affairs, p 5. http://www.oosa.unvienna.org/pdf/publications/ST_SPACE_061Rev01E.pdf. Accessed on April 21, 2014.
15. Ibid., p 11.

resolve. Our credibility as a space power is sustained by the fact that our space programme is fully under civilian control, and is predominantly for civilian use, with no dedicated military satellites or programmes. If we have that advantage, it is only prudent that we enunciate a coherent and comprehensive space security policy in a draft form, to be debated and discussed just like our nuclear doctrine, before it is implemented. If our nuclear doctrine, which was put together in the aftermath of our nuclear tests under the pressure of international condemnation and sanctions, could be opened up officially for discussion and debate before being approved by the Cabinet, there is no reason for a responsible space power like us to be wary of anything while drafting a space security policy for ourselves. This is especially important since so much is at stake in space and on the ground that depends on those assets. A national space security policy would not only provide the required higher direction to all those involved, including the newly contemplated Space Command, but also provide impetus for cooperation between the civilian space Research and Development (R&D) set-up and the armed forces so as to bridge the existing gap between the two.

CONCLUSION

During the Cold War, the doctrine of MAD provided security to assets in space against any belligerent because of the fear that it may trigger a confrontation between the superpowers. In the absence of that guarantee, and due to the unilateral and hegemonic behaviour of the sole surviving superpower, other aspiring and rising powers like China have upped their ante by rapidly modernising their forces, demonstrating deterrent capabilities and national resolve, making assets in space vulnerable. India has always been a responsible space power that has used its space technology only for civilian purposes. As we modernise our armed forces and ensure that they have global reach and effect, our dependence on the space infrastructure is also increasing. Under such circumstances, we need to ensure that our interests in space are not affected by any belligerent or adversary who may want to coerce us. In order to secure our assets in space, there is a requirement to demonstrate credible deterrent capability and through it, our national resolve. For that to be a reality, and to

improve our capability, we need to take measures to enhance our space situational awareness. We also need to actively participate in the global effort to mitigate and remediate space debris, using all means, including strengthening the treaties, so as to rein in countries that take advantage of the loopholes in the extant treaties. To continue to enjoy the moral high ground that we occupy when it comes to space capability, we need to elucidate a comprehensive national space security policy so that it helps us to maintain a credible deterrent posture in space, as well as coordinate the activities between various agencies on the ground to make it happen. In order to make it as comprehensive and coherent as possible, it needs to be drafted and thrown open for discussion and debate before implementation, just like our nuclear doctrine, so that our friends and adversaries are aware of our intent as a responsible space power.

CHINA'S CYBER SECURITY POLICY: AN ORGANISATIONAL ASSESSMENT

M K SHARMA

INTRODUCTION

China is today the second largest economic power of the world and is dependent on global cyber space for its industrial growth, government functioning, and national security. This makes cyber security a profoundly economic and political problem rather than merely a technical issue. Therefore, in order to understand China's cyber behaviour in the international arena, it is essential to appreciate its domestic economy and policy matters, ranging from its industrial regulations, law enforcement, and military strategy to civil rights concerns.

Contrary to general belief, China does not have a monolithic, coordinated policy approach to cyber security. Although political power is centralised in the Chinese Communist Party (CCP), Chinese governance is fragmented, regionally and functionally.[1] It is opined by many international observers that the burgeoning multi-dimensional development of China's Information and Communication Technology (ICT) networks might be diluting its economic and

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1. Jon Lindsay, "China and Cybersecurity: Political, Economic, and Strategic Dimensions", Report from Workshops held at the University of California, San Diego, April 2012.

political security posture, besides jeopardising its military security. There are widespread vulnerabilities in its financial security, critical information infrastructure networks, and military information security. Other civilian networks are infested with web-based fund-raising operations and scams. The situation is exacerbated due to the government-imposed information control, affecting the stability of public order. The vulnerabilities in the networks also make it easy for other countries to bounce their attacks through China.

This paper attempts to address some pressing questions such as: How do CCP leaders perceive cyber security? Who are the stakeholders in the formulation of the cyber security policy? What is the internal health of cyber security in China? How are current industrial and economic policies affecting Chinese cyber security. And, what are the cyber security policy faultlines and roadblocks?

CHINA'S PERSPECTIVE ON CYBER SECURITY: A CONCEPTUAL DEBATE

China has not faced a high intensity conflict since the Sino-Vietnam War in 1979, resulting in lack of own war experience. Also, new technologies and tenets of cyber warfare are rife with uncertainties. These two factors put China on the back foot while formulating its doctrine and training. In such circumstances, it is but natural for any country to fall back on the classic strategic literature of its past for guidance. This is where the conceptual difference in understanding cyber warfare may be seen between China and the rest of the world. Chinese wisdom puts information and intelligence at the centre of warfare and strategy to achieve a rapid victory at minimum cost, in contrast with canonical Western works such as *On War* by Clausewitz or Indian classical works such as *Arthashashtra* by Chanakya. Therefore, the concept of "warfare under informationized conditions" comprises characteristic Chinese thinking, inseparable from their kinetic and high intensity conflicts in the future.

What does cyber security mean to the Chinese? China does not have any official definition of cyber security from its authoritative sources such as the Ministry of Foreign Affairs and Ministry of Defence (MFA and MND) statements and briefings, and remarks by senior civilian and military officials appearing in the leading Chinese

Communist Party Central Committee (or CCP CC) and People's Liberation Army (PLA). However, a scan of non-authoritative sources reveals that they have similar concerns as other nations have about the crippling of national critical infrastructure through a cyber attack, misuse of the social media to create social disorder, industrial espionage, weakening of the nation's military capability through cyber disruptions, etc.[2] Thus, China believes that "cyber security is an international issue and a hacker attack is a common challenge facing the whole world."[3]

China's recently announced "national development strategy" is formally promulgated in Hu Jintao's "Scientific Development" dictum, which sets an objective goal for China to achieve the status of a mid-level developed country across its breadth and depth by the year 2050. Towards this, scientific development remains the key continuum for maintaining social stability by way of providing widely distributed economic growth; and for ensuring the country's diplomatic and military capacity to secure its expanding global presence and interests, necessary to achieve this growth.

Advancements in cyber space play a crucial role across the spectrum of the scientific development tenets, including information needs for economic, political, public security and military progress; and providing means for information dominance, in both domestic and international security arenas. China well understands that if its strategic mid-century objective to reemerge as Asia's preeminent actor is to be achieved, it requires capabilities to both secure China's cyber space capacity, and to hold at bay its external competitors or adversaries. Thus, quite unsurprisingly, Research and Development (R&D) in cyber espionage figure prominently in the 12th Five-Year Plan (2011-15) that is being drafted by both the Chinese central government and the People's Liberation Army (PLA).[4]

2. Zhong Sheng, "Joint Efforts Needed to Improve Cyber Space Rule," *People's Daily*, July 12, 2013, http://english.peopledaily.com.cn/202936/8323784.html. For the original Chinese version, see "填补网络空间 '规则空白'," 人民日报, July 9, 2013. Accessed on July 3, 2015.
3. "Foreign Ministry Spokesperson Hong Lei's Regular Press Conference on May 28, 2013," Ministry of Foreign Affairs of the People's Republic of China, May 29, 2013.
4. Willy Lam, "Beijing Bones up its Cyber-Warfare Capacity", *China Brief*, vol. 10, no. 3, 2010, pp. 2-4.

According to Gen Dai Qingmin, China has six forms of Information Warfare (IW), unlike Russia, that has only two sub-divisions and also unlike the United States Field Manual (USFM)-3.0[5] professing a total of 11 elements. Also, for China, IW occurs all the time, in peace and war. It is part of the ideological struggle, however, an Information Operation (IO) only occurs in war-time.[6] Over the past decade, out of the six forms i.e. operational security, deception, computer-network attack, electronic warfare, intelligence, and physical destruction, the two forms of 'electronic warfare' and 'computer network attack' have gained prominence in the Chinese concept of Integrated Network Electronic Warfare (INEW) aimed to seize battlefield information superiority.[7]

Another conceptual peculiarity, as observed in the past five years through open source information, is that the PLA is preparing itself to absorb a first cyber attack and then being able to launch a massive retaliatory counter cyber strike. This trend is evident in all training exercises: a Blue IW-based army is made to confront a red IW deficient army to test the reliability of its back-up systems and ability of counter-strike. The concept of the intention to defend China's cyber space, is echoed in the People's Republic of China's (PRC) Ministry of Defence "Defence White Paper 2012," stating that the goal of China's national defence efforts is (among other things) to protect its outer space, cyber space and national maritime interests. "We will not attack unless we are attacked; but we will surely counterattack if attacked."[8] It is, therefore, more interesting to understand whether such a stance is due to China's failure to develop a cyber early warning mechanism or due to its policy of non-aggressive posturing.

5. "US Army Field Manual" *FM 3–0 Operations (with included Change 1)*, Washington, DC., February 2008, https://fas.org/irp/doddir/army/fm3-0.pdf. Accessed on August 3, 2015.
6. Timothy L Thomas,"Comparing US, Russian, and Chinese Information Operations Concepts", *Foreign Military Studies Office*, p. 11.
7. Dai Qingmin, "Innovating and Developing Views on Information Operations", *China Military Science*, February 2002, pp. 112-117.
8. Ministry of National Defence, People's Republic of China, "New Situation, New Challenges and New Missions", April 16, 2013, http://eng.mod.gov.cn/Database/WhitePapers/2013-04/16/content_4442752.htm. Accessed on September 4, 2015.

STAKEHOLDERS IN CHINESE CYBER SECURITY POLICY MAKING

The stakeholders in the formulation of the Chinese cyber security policy include the Communist Party, the PLA, government agencies, critical infrastructure operators, academia, and ICT industrial suppliers. Within the Party and State Council, various leading small groups play an important role in tackling cyber issues. The State Informatisation Leading Small Group (SILG) for national IT development policy was formed in 1993 and reconstituted in 2001 under Zhu Rongji, but it received less emphasis under Hu Jintao. Its routine work was handled by the State Council Informatisation Office (SCITO), but this appears to have been disbanded in 2008, leading to a high degree of uncertainty for many players.[9]

Broadly, there are four key security agencies among others, responsible for managing information security.

- Protection of critical infrastructure and prevention of cyber crimes is the responsibility of the Ministry of Public Security which is executed through its nationwide network of cyber research laboratories.
- The State Encryption Bureau, also known as the CCP Central Office Confidential Bureau and Central Cryptography Commission, is mainly responsible for encryption management of the central Communist Party, military, and civilian cyber communications. However, the intelligence cryptology does not fall under this.
- The State Secrets Bureau, also known as the CCP Secretariat Secrets Protection Office, manages all classified networks and has been very active since the 2009 revision to the state secrets law.
- Strangely, the General Staff Departments (GSD) of the PLA namely; 3rd PLA GSD, 4th PLA GSD, PLA State Secrete Office, and PLA Encryption Bureau have a major say in matters of civilian cyber security. Further, a scan of the IW directed efforts of the PLA for the past decade, shows that it has had the full support of the Central Military Commission (CMC) and its chairman since Jiang Zemin's times.

9. Lindsay, n 1,p. 8.

For instance, on August 6, 2003, then Defence Minister Cao Gangchuan declared to the PLA General Staff and the Beijing Military Region (MR) that the defence build-up was aimed at gaining victory in IW.[10] In fact, Jiang Zemin's son Mianheng was reportedly nominated to serve as an adviser for the 38th Group Army's digitisation programme that included digitising the weapons and command systems of the units.

Another important ministry for cyber security policy formation is the Ministry of Industry and Information Technology (MIIT) that has an information security coordination department and is responsible for telecom and internet security. However, it has been relegated to a lower profile since the 2008 ministry reorganisation which disbanded SCITO. Also, the Ministry of State Security is understood to be the most technically capable, especially in the area of information assurance (the 13th Bureau, the Science and Technology Bureau, and CNITSEC). The Politburo Standing Committee for Propaganda is also important in this regard.

Furthermore, the National Network and Information Security Coordination Small Group (NNISCSG), chaired by Li Keqiang, was created in 2002 specially for cyber security, as a sub-group under SILG. This body drafted China's national civilian cyber security strategy ("Document 27") and approved major cyber security related policies and national strategies (e.g., the Multi-Level Protection Scheme, China Compulsory Certification, disaster recovery, incident management, e-government security, trusted networks, infosec standards, and infosec five-year plan). Surprisingly, NNISCSG was relegated in 2008 and was supposed to have been re-raised in 2009 but what is happening about the policies and activities it was involved is not known publicly any more.

CHINA'S CYBER SECURITY POLICY CHALLENGES

An economic outlook puts the cyber security challenges into better perspective than a purely technical approach. Thus, one should take into account China's domestic economy and politics to avoid misunderstanding its internal activities. It is specially significant to contextualise the domestic civilians and private sector to cyber

10. Thomas, n. 6.

security as most of the cyber insecurity is economically motivated and emanates from the private sector. While the private sector often lacks the incentive to mitigate risks, the public sector struggles to coordinate policy responses involving multiple government agencies. China's cyber security policy environment is faced with multifarious challenges including;

- **Dearth of Reliable Data:** In the cyber security domain, there is a dearth of relevant data needed to drive security investment. One reason why it is hard to come by good estimates of cyber security losses is that the victims (of both private and public sectors) often have an incentive to underreport incidents while security vendors overstate losses due to cyber crime to add to unreliability. Consequently, there are large scale vulnerabilities in the Chinese economic system. For instance, in an assessment report recently published by China's Software Test Centre, a sample of bank websites got only 31.98 points (out of 100 points) in an evaluation survey, which was the lowest score. In addition, another survey showed that 60 percent of 2,500 persons had their personal information stolen; more than 66 percent of them agreed that there should be intensified efforts to combat illegal behaviour.
- **Dealing with Domestic Cyber Crime:** While the rise in cyber crime is a global phenomenon, Chinese networks face some interesting and idiosyncratic risks in the form of ballooning levels of domestic cyber crime due to widespread dependence on Western software, and uneven legal regimes and enforcement. Furthermore, there is a large underground market targeting virtual goods such as video game accounts and currencies in which both the criminals and the victims are Chinese, unlike the trends in cyber crime wherein cyber criminals from Eastern Europe target victims in Western Europe and the United States, avoiding domestic predation.

  Software such as Dynapass, Ultrasurf, Freegate and Garden Networks are used by approximately 100,000 people in China to gain access to news and information that is blocked by the firewall. China perceives such developments as a threat to its cyber security. With the increasing interconnectivity of modern

times, China must actively defend against these internal threats or risk collateral damage to its military, soft power, economy, and political integrity.[11]

- **Challenge of Underground Economy:** Although a global issue, the underground economy of information security in China is unique in many aspects, because of the differences between the Chinese economy, laws, and culture and those of other countries. According to an estimate based on structural analysis and reports from security vendors and the government, the overall damage to the Chinese economy exceeded 5.36 billion RMB (US$ 0.852 billion), affecting 110.8 million Chinese users (~22 percent) and 1.1 million websites (20 percent) in 2011.[12]

  The overall underground economy includes four value chains: (a) real asset theft: stealing money from stolen bank accounts or credit cards; (b) network virtual asset theft: stealing virtual currency, equipment from stolen online game accounts, and selling them for real money; (c) internet resources and services abuse: taking advantage of the snatched internet resources, including compromised hosts, hacked servers, and infected smart phones, to abuse the internet services for profit; (d) black hat techniques, tools, and training: selling Trojan horses and attack tools employed to provide technical support for the cyber criminals, and providing training services to novices. In 2011 alone, there were at least 90,000 participants involved in the measured black markets, who posted more than 320,000 messages belonging to 80,000 threads, which reflects the booming situation of the underground economy in China.[13]
- **Distrust of Western Platforms and Fragmented R&D Efforts:** Chinese distrust of the security provisions of the "Wintel"[14] platform has motivated R&D efforts in both chip design and

11. "China Tightens Vice on Internet", http://cryptome.cn/china-vise.htm. Accessed on June 11, 2008.
12. Zhuge Jianwe and, Duan Haixin, "Investigating the Chinese Underground Economy of Information Security" Network Research Centre, Tsinghua University, and CCERT Team, CERNET Network Centre, IGCC Workshop Report on China and Cyber Security, April 2012, p.10.
13. Lindsay, n. 1, p. 11.
14. Wintel is a term describing any computer platform consisting of some version of Microsoft Windows running on an Intel processor or compatible, dictionary.reference.com/browse/wintel. Accessed on July 5, 2014.

development and software. China's Medium to Long-Term Plan (MLP) for scientific and technological development, with its mega projects, and the more recent Strategic Emerging Industries (SEI) initiative, have incentivised Chinese research establishments and industrial enterprises to develop their own Intellectual Property (IP), but this, in many cases, has resulted in many actors acquiring foreign technology that can be slightly customised in order to secure Chinese IP rights. The growth of cyber industrial espionage may be an outgrowth of these policies and the incentives they provide.

- **Technology Policy Driven by Commercial Interests:** The interaction of concerns for innovation and concerns for security are evident in the Chinese technology policy in a number of instances. In the case of the WAPI[15] wireless standard, for instance, the ostensible reason for developing the standard was the perceived security weaknesses of the widely used IEEE 802.11(WiFi). Clearly, however, the developers of the WAPI standard were also motivated by commercial interests. It can be argued that initiatives such as WAPI standards are also indicative of China's policy of raising technical hurdles to international trade, thus, raising doubts on its obligations towards the World Trade Organisation (WTO) based on consistent policy. Also in the case of the MLPS, the concerns regarding information security driving the promotion of the certification scheme are again mixed with commercial interests.
- **Cyber Policy Making: Professional Conundrum:** China's civilian cyber security elite is a professional, technically-versed group of individuals. The "first generation" of cyber security officials still holds power, with much representation from the Chinese Academy of Engineering (CAE) academicians and Chinese Academy of Science (CAS) fellows. Many current officials have been under the tutelage of these senior scholars/officials. Most cyber policy-makers have spent time doing technical research

15. WLAN Authentication and Privacy Infrastructure (*WAPI*) is a Chinese National Standard for Wireless LANs (GB 15629.11-2003). For details, see Zia K. Cromer, "China's WAPI Policy: Security Measures or Trade Protectionism?", no. 18, 2005, http://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=1138&context=dltra Accessed on July 19, 2014.

in academia, with little experience in economics or international affairs. Patriarchal relationships lead to difficult situations for junior officials.

- **Industrial Espionage: A Double-Edged Sword:** China may view things like industrial espionage differently. From the victim's perspective, losing trade secrets from infected computers is obviously a negative, whereas to the perpetrator, this is a benefit. It is believed that China has adopted an industrial policy that encourages or, at least, tolerates, conducting espionage on behalf of its own firms. Towards which, China also has clearly developed cyber space espionage and counter-intelligence tools to "shape the battlefield" at home and abroad. The organisations responsible for this task include the Ministries of Public Security, Industry and Information Technology, and State Security; Propaganda Department; Third and Fourth Departments of the PLA General Staff; PLA Technical Reconnaissance Bureaus; state-affiliated hackers; and a number of research institutes.

  The long-term cost-benefit analysis of such an approach must be weighed against the vulnerability of Chinese internet users whose computers may become infected and cause harm. For instance, between the years 2010 and 2011, there was 47 percent growth rate in computer attacks in China, accounting for about 8.531 million computers being infected every day.[16] The figures for the current year would be much more worrisome though they are not available in open sources. Therefore, it is not an easy task for China to decide whether the widespread vulnerability of its computers engaged in cyber espionage offers it net benefits or harms it.
- **Menace of Patriotic Hackers and PLA-Academia Nexus:** China is developing a private army of hackers, mainly civilian youths, who could be banked upon during crises to support regular PLA personnel.[17] While such non-military groups are not uncommon in other countries, in China, these nationalist hacker groups are slowly becoming a part of its foreign and security policy instrument.

16. Lindsay, n.1, p. 4.
17. Mac William Bishop, "China's Cyber Warriors", *Foreign Policy*, September/October 2006, http://www.foreignpolicy.com/story/cms.php?story_id=3553. Accessed on July 18, 2014.

The problem (and certainly a serious one) for the military and political leadership in encouraging this trend essentially is that of 'command and control'. The non-military hackers, motivated by their nationalistic fervour, would become beyond the control of the government. It may not be possible to exercise a strategic pause (during an ongoing cyber operation) as a part of the military-political coercive diplomacy (unlike traditional military instruments). And if intimidated by the Chinese government, these cyber experts may turn their cyber guns to destabilise internal security also.[18]

Furthermore, an indication of the formal and informal cooperation between the military and civilian parts is seen in the PLA's sponsorship of numerous universities and institutes supporting research and development in information warfare. "These include the Science and Engineering University in Hefei, the Information Engineering University in Zhengzhou, the National University of Defense Technology in Changsha, and the Communications Command Academy in Wuhan."

INTER-ORGANISATIONAL CHALLENGES

In the year 2003, China released "Document 27: Opinions for Strengthening Information Security Assurance Work," also known as its civilian national cyber security strategy. The document set the policy foundation for critical infrastructure protection, cryptography, dynamic monitoring, talent development, leadership, funding, and also laid down the principles of 'active defence'. However, this policy fell prey to an antagonistic system vigorously defended by the bureaucrats where no other agency was welcome. While SILG/SCITO took off well, its disbanding in 2008 has led to chaos and fragmentation in the policy space. Presently, there are multiple stand-alone and inconsistent policy initiatives launched by various government entities which have resulted in a state of chaos and confusion.[19] For instance,

- Product assurance comprises security testing for IT products. Each security agency runs its own certification schemes (CNITSEC/

18. M. K. Sharma, *Cyber Warfare: The Power of the Unseen* (New Delhi: Knowledge World, 2011), p.150.
19. Lindsay, n.1, p. 7.

TRIMPS/ISCCC/SSB/PLA), leading to the perverse result that some economic actors forego security assurances altogether. For example, there is widespread non-use of transport layer security "https" for Chinese internet applications. The Certification and Accreditation Administration (CNCA), a newcomer to the infosec space, tried from 2004 to 2008 to create a unified scheme but met opposition at home and abroad.

- The encryption policy predates "Document 27" to 1999 under the "State Encryption Management Commission" and included a number of regulatory schemes to promote domestic encryption for e-signatures, certificate authorities, etc., focussing primarily on government/CCP systems, while ignoring the whole economic and industrial space.
- Risk assessment is not a component of other existing policies but instead is implemented in isolation by the relatively underfunded National Development and Reform Commission's (NDRC's) State Information Centre (a former manifestation of SCITO).
- China's infosec standards are run by a committee co-chaired by representatives from the security agencies, known as the China National Information Security Standards Technical Committee (TC260). It is opaque and closed to foreign participants. It has turf issues with the China Communications Standards Association (CCSA).
- IT security research and development is managed through the Ministry of Science and Technology (MOST)/NDRC/ CAS programmes like projects 863/973, the Megaprojects, and the NDRC Industry Development Fund. There is a State Key Laboratory for Information Security under CAS.
- Following the 2008 disbandment of SCITO, there has been continued implementation of existing initiatives as well as a number of new initiatives that appear to be uncoordinated passive response policies (somewhat like the US' approach) for SCADA security, e-government systems compliance, trusted network connectivity, and botnet/telecoms security.
- Who Actually Attacks Whom? China's own network appears to be unprotected, and other countries can launch attacks through

China, which makes it appear the primary suspect. In fact, some experts like Steve Armstrong opine that some Western governments might already be bouncing their attacks through China as it is too easy to blame China.

- There is a serious lack of progress in the China Compulsory Certification for Information Security (CCCi)/Product Assurance where interagency cooperation is most needed. Classified systems information assurance is a new focus, with expanded activity from the State Security Bureau (SSB), which seeks to expand its power by keeping other agencies away from "classified systems". The SSB gained vice-ministerial ranking in 2009 and started opening university "state secrets institutes" in 2011, focussing on computer security.
- China has also proposed or enacted cyber-related policies that are over-regulatory. The 1999 encryption regulations restrict or ban outright the use of foreign encryption technology. Under the CCCi, 13 technology product categories must undergo stringent certification procedures for sale in China, albeit only for government procurement. In the MLPS, information security products sold into information systems ranked "3" or above must include Chinese indigenous IP.

CONCLUSION

Currently, China is facing a cyber policies conundrum partly due to preoccupation of the leadership with "more pressing matters" and partly also due to a fragmented constellation of bureaucrats aggressively protecting their turf. On the other hand, the civilian cyber security apparatus is dominated by technical professionals who lack deep economic or international relations expertise. As a result, the Chinese leadership is facing confusion and consequent stagnation in cyber security policy.

For civilian or industrial cyber security, China has to deal with a myriad issues related to conflicting policy directives under implementation by multiple regulatory organisations. Also, there seems to be inconsistency in the interest and aims of private and public sector agencies. Furthermore, all the agencies such as intelligence, military and other state entities responsible for domestic

and international security matters are uncomfortably integrated with each other and are at loss to arrive at the unified synergistic solutions to ever growing cyber security threats.

Inclusion of civilian individuals and organisations in cyber espionage, surveillance and well timed cyber attacks, unsanctioned by China, only bolsters the increased possibility and credibility of cyber threats in future, as long as attribution technologies do not become matured enough to pin-point the source of attacks. Therefore, while engaging with China on cyber security related matters, India should take into account China's fractured cyber security policy space and the strong presence of non-state actors in its cyber space. As there is no central one point agency in China to deal with cyber security matters, the dialogues/discussions would have to be accordingly calibrated and coordinated with the appropriate organisations.

CHINA'S RAPID LAUNCH/ LAUNCH ON DEMAND CAPABILITY

ARJUN SUBRAMANIAN P

Most modern armies have modernised their military capability centring on heavy dependence on connectivity of sensor nodes, information relay and data processing which in short is known as Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR). In this set-up, space-based elements have become an important and vital component of the network-centric warfare concept. Satellites are a key component which form the backbone of long distance data-relay and also act as sensors for earth observation, electronic intelligence, and geo-positioning. The geo-positioning satellites provide navigational data to platforms and weapons. This heavy dependence on network-centricity, particularly on space-based systems itself has become a major vulnerability in the present era. Any destruction or disruption in the information relay to key sensors would severely decapacitate the aimed forces in efficient conduct of operations.

This article studies China's military space programmes and the People's Republic of China's (PRC's) efforts in developing launch on demand capability. While the focus of the article remains on the

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custom made short launch cycle variants, the Long March 6, Long March 11 and the Kuaizhou rockets, an attempt has been made to discuss other aspects of military sigificance.

China itself has identified this vulnerability with the US forces and is building systems to interfere with network-centric operations of the US military. China is developing and testing both kinetic and passive Anti-Satellite (ASAT) weapons. It demonstrated its ASAT capability in 2007 when it kinetically destroyed a Fengyun-1C weather satellite at about 530 miles up in Low Earth Orbit (LEO).[1] China had also tested several rockets that could reach an altitude more than 20,000 km which is believed to be for ASAT purposes.[2] It is to be noted that some navigational or geo-positioning satellites orbit at this altitude (20,000 km and above). Apart from the testing of kinetic weapons, China is also believed to have the ground-based laser ASAT system which can blind or burn a satellite's lenses when it comes within its range. In 2006, there was a claim that China had dazzled a US satellite passing over Chinese territory with a laser weapon.[3] These passive systems could possibly be used to burn the lenses in the satellites, and in the low power mode, could be used to the blind it while it passes over one's territory or over any sensitive area.

However, China, despite knowing the disadvantage of overdependence on network-centricity, is itself modernising its armed forces centred on network-centricity. Network-centric warfare has become an unavoidable concept in the modern age despite its severe vulnerability. China's push towards network-centric operations was largely inspired by its study of the first Gulf War where network-centricity in battle was demonstrated on such a great scale.

CHINA'S MILITARY SPACE PROGRAMME

China has several earth observation satellites, particularly the Yaogan

1. Shirley Kan, "China's Anti-Satellite Weapons Test", *CRS Report for Congress*, April 23, 2007, https://www.fas.org/sgp/crs/row/RS22652.pdf. Accessed on November 1, 2015.
2. Brian Weeden, "Anti-Satellite Tests in Space:The Case of China", *Secure World Foundation,* August 16, 2013, http://swfound.org/media/115643/china_asat_testing_fact_sheet_aug_2013.pdf. Accesed on November 3, 2015.
3. "China's Asat Test Will Intensify U.S–Chinese Face-Off In Space", *Network 54,* January 23, 2007, http://www.network54.com/Forum/211833/message/1169524439/China''s+Asat+Test+Will+Intensify+U.S.-Chinese+Faceoff+in+Space. Accessed on November 3, 2015.

series. The Yaogan series consists of Earth Observation, Synthetic Aperture Radar, Electronic Intelligence (E/O, SAR and ELINT) satellites for ocean reconnaissance. Though China claims that these are for commercial purposes, it is strongly believed that these are mostly military satellites going by the orbital positioning. The PRC is also half-way through establishing a Global Positioning Satellite (GPS) navigation system, named the Beidou. The GPS satellite system is being implemented in three phases and, at present the second phase is under progress, and by 2020, the compass satellite system is expected to become fully operational.[4] The system would comprise 27 Medium Earth Orbit (MEO), 5 Geostationary Earth Orbit (GEO) and the existing 3 Inclined Geosynchronous Satellite Orbit (IGSOs) satellites of the regional system.[5]

The last few years have seen acceleration in satellite launch, particularly in navigation and reconnaissance satellites. On October 29, China released a national plan which says that by 2020, China will have very advanced and powerful space-based military assets comprising satellite systems for remote sensing, communications and navigation.[6] As per the plan, China is expected to build civil space infrastructure that uses cutting-edge technology, independent development and control, and reasonable distribution and global coverage, and the three systems must meet the demands of different industries and regions, and provide support for China's modernisation drive, as well as ensure national security and improve the people's lives.[7] Further, the plan prioritises land, ocean and atmospheric observation satellites with seven different satellite constellations,[8] which means that there will be seven constellations of remote sensing satellites which can be used as military satellites, depending on the resolution factor. The emphasis on ocean remote sensing satellites ought to be noted here—these satellite constellations, in coordination

4. Rui C. Barbosa, "Chinese Long March 3B Lofts Next Beidou-3 Satellite", *NASA Space Flight*, September 29, 2015, http://www.nasaspaceflight.com/2015/09/chinese-long-march-3b-lofts-next-beidou-3-satellite/. Accessed on November 4, 2015.
5. Ibid.
6. Manny Salvacion, "China's Civil Satellite System to be Finished Before 2020", *Yibada*, October 30, 2015, http://en.yibada.com/articles/79620/20151030/china-civil-satellite-systems-finished-2020.htm. Accessed on November 5, 2015.
7. Ibid.
8. Ibid.

with other satellites, could possibly be used for maritime surveillance and reconnaissance, particularly for anti-ship operations.

The number of orbital launches by China has increased over the years, with fifteen launches in 2013.[9] The number of Chinese satellites orbiting has also increased significantly, though it is much lower than that of the United States.[10] Very recently, China launched what is believed to be a Yaogan (reconnaissance), satellite using the Long March 4C launch vehicle from the Taiyuan launch centre.[11] The Yaogan satellites orbit in triple formation, separated by about 100 km. This satellite series has been launched by China ever since 2006, and, at present, several of these satellite constellations are orbiting the earth.

These military satellites are vulnerable to targeting by enemy forces and, if destroyed, can severely hamper Chinese military operations. Any significant degradation in the C4ISR would affect the operational capabilities in several ways from situational awareness, battlefield communication to weapon accuracy. Satellites are easy targets for a nation with moderate Ballistic Missile Defence (BMD) capability mainly because satellite orbits are a known trajectory which gives the location of the target at any given time. Moreover, satellites are large, with large Radar Cross-Section (RCS) and they emit electronic signals which make it easier for ground-based sensors to acquire them.

Despite China deploying a huge array of military satellites, it is also making efforts to mitigate this threat by developing rapid satellite launch capability (launch on demand). The Chinese have gained sufficient mastery in both solid and liquid rocket motor design as a result of decades of experience from their ballistic missile programme. China's first successful solid rocket motor was developed for the JL-1 Sea Launched Ballistic Missile (SLBM) which was adopted for the DF-21 ballistic missile series as well. In addition, China's civilian space programme has seen rapid strides in a very short time, progressing from advanced satellite launch capability to undertaking successful manned space flight.

9. Jonathan McDowell, "China's Satellite Update–2014", *Planet 4589*, 2014, p. 1, http://www.planet4589.org/space/papers/china2014.pdf. Accessed on November 5, 2015.
10. Ibid, p. 2.
11. For details, see "长征四号丙运载火箭成功将遥感27号卫星送入太空", *Sohu*, August 28, 2015, http://news.sohu.com/20150828/n419922828.shtml. Accessed on November 5 2015.

The workhorse of China's civilian space launch vehicle is the Long March rocket series. Several variants have been developed since the Seventies, according to the mission profile. The series evolved from the Long March 1 to 11—most of the older carriers are retired, with only new advanced versions in active service. These rockets are launched from three of China's space launch centres: Jiuquan, Taiyuan and Xichang.[12]

LAUNCH ON DEMAND/RAPID LAUNCH CAPABILITY

Recently, China successfully launched 20 micro-satellites into LEO in a single launch with a new Long March-6 rocket.[13] This was the first time such a feat was achieved. This rocket is a new variant in the expendable Long March series and is designed for small-load missions. These micro-satellites were mostly from research institutes like the Qinghua University and the Harbin Institute of Technology. The rocket is designed to carry a little above one tonne of payload and can place satellites in a 700 km sun-synchronous orbit. The rocket was launched from the Taiyuan space centre.[14]

Meanwhile, shortly after the launch of the Long March-6, another rocket which was a new and unique configuration, the Long March-11, was launched. The uniqueness of the LM-11 was that the first three stages of the rocket used solid rocket motors. The rocket falls in the same category of as the Kuaizhou launch vehicle. Not much information is available on the exact specification of this launch vehicle as the project was kept under tight wraps and only one photograph of the rocket is available. The booster technology is believed to be based on China's long range ballistic missile boosters. This launch placed four small satellites in orbit.[15] China had earlier used the Kuaizhou solid fuelled custom rocket to launch satellites into orbit.

12. "China's Satellite Launch Centres", September 9, 2006, http://www.china.org.cn/english/features/cslc/139838.htm. Accessed on November 8, 2015.
13. "中国新型运载火箭采用车载发射　类似东风-31导弹", September 28, 2015, http://military.people.com.cn/n/2015/0928/c1011-27640484.html. Accessed on November 7, 2015.
14. "专家：长征6号成功发射　中国已具备破美防御系统能力", October 7, 2015, http://news.ifeng.com/a/20151007/44790223_0.shtml. Accessed on November 8, 2015.
15. "中国为何要有快舟长征6/11号三种快速响应火箭", September 20, 2015, http://military.china.com/critical3/27/20150928/20481212_all.html. Accessed on November 8, 2015.

Long March-6: The Long March-6 rocket is a customised version to launch small payloads in a short time, meaning a quick launch. The other variants like the Long March-5 are designed to carry heavier payloads. This is a more strapped down version of the Long March 5 but with some design changes which would act as a carrier for small payloads and urgent launches, making it cost-effective. The new customised variant is using a new motor design which burns a non-toxic fuel which would be environment friendly while the other variants burn up the toxic hydrazine fuel. Further, this rocket was launched with the help of a Transporter Elector Launcher (TEL) to erect and launch much like a ballistic missile.[16]

The most significant aspect of this launch, apart from the use of environment friendly fuel, is that it proves China's strong space launch capabilities and signals the rapid launch capability that could be used to cater for frequent launches of satellites for international customers and make it commercially profitable, as a small launch vehicle with a shorter launch cycle would be very lucrative and cheap. The rocket would require only seven days' preparation.[17] The precise positioning of the 20 micro-satellites in their respective orbits shows the reliability and accuracy of the Long March motor systems. Certainly, this rocket could turn out to be the workhorse of China's commercial space launch arm.

However, there have been some stories going on in the Chinese news media on how this rocker booster launch relates to advancing China's ballistic missile capability. These stories appear to be an attempt to assuage the nationalistic pride of the domestic audience. The rocket booster and its quick launch cycle capability do not convert into advanced ballistic missile capability.

The first thing to be noted here is that the LM-6 launch vehicle is a liquid fuelled rocket and, hence, would not fit in for a modern ballistic missile. Liquid fuelled ballistic missiles comprise obsolete technology. Like any other country, China started with building and deploying liquid fuelled ballistic missiles. However, once China made a breakthrough in solid rocket motor technology for its JL-1

16. Ibid.
17. Ibid.

SLBM, it slowly started converting its entire ballistic missile arsenal to solid fuelled missiles.

At present, most of China's liquid fuelled ballistic missiles have been replaced with modern solid fuelled vehicles except for the DF-5B Inter-Continental Ballistic Missiles (ICBM) which is still operational. Even the largely liquid fuelled Short Range Ballistic Missiles (SRBMs) including the DF-11s and DF-15s, deployed across the Taiwan Strait, have been converted to solid fuelled missiles. Further, any ballistic missile developed for the future would be solid fuelled. There are several reasons for countries opting for solid fuelled missiles over the liquid fuelled ones. Firstly, liquid fuelled rocket motors are very difficult to maintain. Secondly, the mobility of a liquid fuelled missile gets severely restricted. For this reason, fuel is not permanently loaded into the missile except when it is prepared to be launched. Thirdly, there is only a certain number of times that the liquid fuel and the oxidiser can be loaded and emptied from the missile, after which the missile loses utility.

Further, fuelling requires considerable time which extends the launch preparation time. A missile is most vulnerable to being targeted on the ground during the launch preparation time. The use of solid fuel solves all these problems and gives the missile better mobility; fuel is always loaded into the missile; and it has a short launch preparation time. Because of these advantages which are militarily more desirable, modern ballistic missiles are solid fuelled missiles. Hence, any idea that the LM-6 boosters might be used for launching nuclear strikes is bizarre.

The only nuclear military signal that the LM-6 launch sends is related to the simultaneous deployment of multiple satellites into a precise orbit. The bus that is used to deploy the satellite in the orbit can also be used to shoot multiple nuclear weapons in orbit i.e. it points to Multiple Independently Retargetable Vehicle (MIRV) capability. The Chinese had long been thought to have the capability to MIRV their nuclear missiles. But it was only recently that they had MIRVed their DF-5B. Nevertheless, this capability of China had never been demonstrated until now. The LM-6 launch proves China's capability in deploying missiles with MIRV capability that can deliver more than 10 warheads.

This is a clear signal to the United States and Japan that have been building a network of ballistic missile defence around China. The high frequency (x-band) sensors can relay detailed target information to the ground-based mid-course defence system deployed in the US mainland to defend against incoming ICBMS. With the demonstration of MIRV capability via the LM-6, a clear signal has been sent to the adversaries regarding the capability of the DF-41 MIRV capable ballistic missile, in saturating the US missile defences.[18]

The Long March-11: This rocket which was launched after the successful launch of the LM-6 has some links to Chinese ballistic missile capability. It is believed that the booster of the rocket is based on the Chinese DF-31 ballistic missile[19] though reportedly with a bigger booster. The launch resembled a typical ballistic missile launch with the rocket booster placed in a canister for transporting and launching the rocket.[20] The rocket canister was erected by a TEL type vehicle before launch and was cold launched like a canisterised ballistic missile.[21]

The rocket is reportedly a solid fuel three stage vehicle, with a last small stage comprising liquid fuelled thrust motors for precision insertion of satellites. This rocket gives China the actual launch on demand capability as solid rocket boosters offer easy transportation, handling and shorter launch preparation. This is an ingenious way to attain such capability by just mounting a liquid control thruster's stage atop solid stages. The liquid stage is required because solid rocket motors cannot be cut off and reignited which is essential for placing a satellite in orbit. However, this has been performed earlier by Europe using the solid fuelled Vegas rocket.

The payload capacity of this rocket is not known, but it would most likely be used to place micro-satellites in orbit on demand. However, it does not appear that this rocket would be converted to augment

18. "長征6號首飛 專家：解放軍可挑戰美國彈道導彈防御系統", October 6, 2015, http://www.nanzao.com/tc/national/1503b51fb10db83/chang-zheng-6-hao-shou-fei-zhuan-jia-jie-fang-jun-ke-tiao-zhan-mei-guo-dan-dao-dao-dan-fang-yu-xi-tong. Accessed on November 8, 2015.
19. "长征11号首飞画面曝光发射方式酷似东风31", September 26, 2015, http://news.southcn.com/fu/content/2015-09/26/content_133649588.htm. Accessed on November 8, 2015.
20. "中国长征11号固体火箭以车载发射　方式像东风31", September 28, 2015, http://mil.news.sina.com.cn/2015-09-28/0828839989.html. Accessed on Novemebr 8, 2015.
21. "中国长征11号固体火箭以车载发射", September 28, 2015, http://www.dushi.ca/tor/news/bencandy.php/fid31/aid173619. Accessed on November 7, 2015.

China's ballistic missile capability. In fact, it appears to be the other way around where the solid missile booster technology is adapted to augment space launch capability. The reason is survivability; it is one of the primary components of a nuclear ballistic missile where road mobile capability and short launch preparation time are vital aspects to it. The LM-11, with a liquid fuelled final stage, would complicate the above mentioned requirements. The refuelling operation for the last stage will increase the launch preparation time, making the launch vehicle vulnerable to detection by enemy sensors.

This rocket too gives a boost to China's commercial space launch capability as the LM-11 configuration has a short launch cycle, claimed to be less than 24 hours, which is less than that of the US Minotaur.[22] Apart from this, the LM-11 version offers an important military advantage in terms of launching micro-satellites on demand during times of crisis, when there is a need to augment China's space surveillance capability or to replace any satellite that is disabled my enemy action. This launcher, minus the liquid stage, can also be used to launch the ASAT vehicle to destroy enemy military satellites.

Kuaizhou: Earlier, China had launched the Kuaizhou satellite launch vehicle on September 25, 2013 and again on November 21, 2014.[23] Both the launches took place from Jiuquan Satellite Launch Centre. The launch vehicle is a three stage solid fuelled rocket with a liquid fuelled fourth stage, with the payload forming the last stage. There is confusion regarding the booster's design. Speculations vary from the DF-21, DF-31 and even DF-26[24] booster design. A line diagram of the launch vehicle gives a diameter measurement close to the DF-21 booster diameter (1.4m); the second stage also, as per the line diagram, is the same as the DF-21 second stage. The third stage is of the same diameter but is longer, which is followed by the fourth liquid stage.[25] The same rocket, possibly upgraded, is the Feitan-1

22. n. 15.
23. Richard D. Fisher, "China Launches Second Kuaizhou Mobile SLV", *IHS Jane's 360,* November 26, 2014, 2014, http://www.janes.com/article/46360/china-launches-second-kuaizhou-mobile-slv. Accessed on November 6, 2015.
24. "Kuaizhou KZ-1, Feitan FT-1", September 25, 2015, http://www.b14643.de/Spacerockets_1/China/Kuaizhou/Description/Frame.htm. Accessed on November 6, 2015.
25. "Line Diagram of China's Launch Vehicle", *Sino Defence,* https://sinodefence.files.wordpress.com/2014/12/kt-1.jpg. Accessed on November 3, 2015.

(FT-1) which China marketed last year in the Zhuhai Air Show.[26] The payload capacity of these two rockets differs. This rocket too can be mobile launched like a ballistic missile, however, some time would be required after the TEL erects the missile to refuel the last liquid stage. Nevertheless, the launch cycle will be less than twenty four hours. The FT-1 model displayed during the Zhuhai Air Show showed a TEL modelled on a truck.

These short launch cycle rockets will be able to launch small satellites to replace damaged or destroyed satellite in a low earth orbit. This is a kind of redundancy China is trying to build as it is increasingly getting dependent on space-based military assets for efficient conduct of operations.

CONCLUSION

The customisation of proven boosters is aimed at two aspects. Firstly, the trimmed down launchers would offer launch on demand capability and a shorter launch cycle which would enable frequent launches for domestic requirements and for foreign customers. Secondly, these vehicles would help maintain operational readiness of their military satellite system by injecting satellites into orbit at short notice. The LM-11 might be used in addition to the Kuaizhou solid fuelled satellite launch vehicle, launched in November 2014.[27] This capability would enable China to have a reliable space-based system even when the systems are under attack. Particularly, in a Taiwan scenario, these systems might potentially be the first targets to degrade and delay China's offensive on Taiwan. The other military signal that the LM-6 launch conveys is nuclear MIRV capability. The bus developed for precise injection of 20 satellites points to the fact that the DF-41 ICBM is capable of delivering multiple MIRVed warheads as the bus can be employed for nuclear delivery as well.

26. Fisher, n. 23.
27. Ibid.

LAND POWER VS SEA POWER: HAS CHINA BEEN ABLE TO RESOLVE ITS DEBATE?

TEMJENMEREN AO

The 21st century has been witness to the emergence of a new multi-polarity in geo-politics. This was due to the developing nations taking advantage of globalisation, and by liberalising their economy, they were able to jump onto the bandwagon of progress and growth. The century also witnessed the emergence of China as a result of its continuous hyper economic growth throughout the 1990s and the possibility that it may pose a challenge to America's future global hegemony. President Xi's speech at the United Nations General Assembly in September 2015 clearly points out that there is an emerging multi-polarity in the international order and that the developed nations should look at the other nations as equals. As China continues with its military reforms, along with its ongoing maritime expansion, the question arises as to whether China has resolved the debate on its military strategy and begun to assert itself as a sea power, or is it just a change in the methods being adopted by China for fighting future warfare—where it sees a more high tech war which needs a limited number of forces—departing from Mao's concept of "people's war".

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THEORETICAL BASIS OF LAND AND SEA POWER

Mackinder saw history as a struggle between land-based and sea-based powers. He saw that the world had become a "close" system, with no new lands left for the European powers to discover, to conquer, and to fight over without affecting events elsewhere. Sea and land-based powers would then struggle for dominance of the world, and the victor would be in a position to set up a world empire. The heart of Mackinder's theory is contained in a famous and succinct dictum:

> *Who rules Eastern Europe, commands the Heartland;*
> *Who rules the Heartland, commands the World Island;*
> *Who rules the World Island, commands the world.*[1]

In the 1980s, Zbigniew Brzezinski, who was the national security adviser under the Carter Administration, echoed the words of Mackinder; "Whoever controls Eurasia, dominates the globe. If the Soviet Union captures the peripheries of the land mass… it would not only win control of vast human, economic and military resources, but also gain access to the geo-strategic approaches to the Western Hemisphere—the Atlantic and the Pacific…"[2]

Mackinder's "heartland theory" centres on the concept of a "pivot area/heartland", a sizeable region in Eurasia over which regional political control by a given country will, in turn, determine that country's supremacy over world politics. Figuratively, the theory presents a narrow and deterministic view of international politics as solely a function of geographical resources. Mackinder emphasised ruling Eastern Europe as a locus whereby geo-strategic access to the heartland is better facilitated and augmented. The "heartland theory" is essentially geographical in its outlook, thus, citing a critical geo-strategic link between land control and political power, that is, geo-political power.[3]

1. M R Ronald Hee, "World Conquest: The Heartland Theory of Halford J. Mackinder", http://www.mindef.gov.sg/safti/pointer/back/journals/1998/Vol 24_3/8.htm. Accessed on October 15, 2015.
2. Ibid.
3. Margaret Scott and Westenley Alcenat, "Revisiting the Pivot: The Influence of Heartland Theory in Great Power Politics", May 9, 2008, http://www.researchgate.net/publication/255010932_Revisiting_the_Pivot_The_Influence_of_Hearthland_Theory_in_Great_Power_Politics. Accessed on October 15, 2015.

Alfred T. Mahan wrote that the strategic value of any place depends upon three principal conditions: its position, or, more exactly, the situation; its military strength, offensive or defensive; and the resources of the place itself and the surrounding country. He wrote that it is "power plus position that constitutes an advantage over power without position or, more instructively, equations of force are composed of power and position in varying degrees, surplus in one tending to compensate for deficiency in the other". Mahan emphasised the inherent value of holding a central position, yet he did not go to the extreme and absolutise the value and importance of a central position in naval warfare. In his view, a central position is, "contributory, not the principal, one element of a situation but not the only one, nor even the chief". Mahan paid much attention to the importance of sea communications; in his view, communications dominate war, defining it as a line of movement by which a military body is kept in living connection with the national power. Sea lines of communication meant not geographical lines, like the roads an army has to follow, but those "necessaries, supplies of which the ships cannot carry in their own hulls beyond a limited amount". In order of priority, the most important logistical supplies are fuel, ammunition and food. Mahan consistently emphasised that navies must be used in offensive action, both tactically and strategically. This aspect of Mahan's teaching is largely responsible for the neglect of coastal defence by many blue-water navies; Mahan believes that coastal defence has minimal value, and he rejected the argument that the navy should serve for coastal defence. For Mahan, defence of the coast was a defensive factor while the navy is an offensive factor. However, another blue-water naval thinker, Sir Julian Stafford Corbett, differed on this by insisting that the object of naval warfare must always be to secure the command of the sea or to prevent the enemy from securing it, either directly or indirectly.[4] In his view, command of the sea means nothing but control of maritime communications, whether for commercial or military purposes.[5]

4. Julian Stafford Corbett, "Some Principles of Maritime Strategy", *SAASS Comps Prep Wiki*, http://saass.wikia.com/wiki/Corbett,_Some_Principles_of_Maritime_warfare. Accessed on November, 26, 2015.
5. Milan Vego, "Naval Classical Thinker and Operational Art", United States Naval War College, Joint Military Operations Department, 2009, http://www.usnwc.edu/getattachment/85c80b3a-5665-42cd-9ble-72c40d63153/NWC-1005-NAVAL-CLASSICAL-THINKERS-AND-OPERATIONAL-aspx. Accessed on September 30, 2015.

Corbett saw maritime strategy only suiting limited national purposes and he identified some fundamental differences between land warfare and sea warfare, proposing a balanced amphibious strategy. He advocated relative rather than absolute command of the sea. Therefore, Corbett believed that the prime object of naval warfare was to secure sea lines of communication. This was achieved by sea control, not command of the sea.[6] Alfred Thayer Mahan defined sea power as the product of international trade and commerce, overseas bases, and merchant and naval shipping. Mahan focusses much of his effort towards the "blue-water" navy, while Corbett, in contrast, focusses more intently on the connection between sea and land power, and the limitations therein. Despite differing views, the two theorists had a certain similarity and were complementary to each other with the aim of explaining the importance of sea power to land power, and how a "larger navy" is useful in that regard.[7]

CHINA'S NEED FOR SEA POWER

China never attempted to build itself into a sea power, apart from the impressive Zheng He's[8] voyages and the modern looking Beiyang fleet. Moreover, ancient China as a continental hegemon in East Asia saw little need for sea power. In the eyes of Chinese emperors, China was a power on the earth and they were "Sons of Heaven". However, from the outbreak of the opium war, China experienced a century long humiliation, which was mainly caused by foreign invasions from the sea. The founding of new China gave birth to the Chinese Navy, which has seized opportunities for rapid growth in the past two decades. Learning from history, China has realised the importance of a strong navy, the significance of maritime security and interests, and the implications of "command of the sea" or "sea control". China's

6. Xu Duo, "China's Cruise Towards Sea Power", April 17, 2012, http://www.E.IR.INFO/2012/04/17/CHINAS-CRUISE-TOWARDS-SEA-POWER/. Accessed on October 9, 2015.
7. Captain Adam Link, "On Sea Power and Land Power", *War Council,* http://www.warcouncil.org/blog/2015/3/17/on-seapower-and-landpower. Accessed on October 9, 2015.
8. Zheng He was an admiral of the imperial Ming Navy, commanding the Ming dynasty's fleet of immense trading vessels on expeditions ranging as far as Africa by 1431-1433—almost a century before the arrival of Christopher Columbus in the Americas and Vasco da Gama in India.

booming economy and increasing reliance on maritime trade make it more appealing for China to develop a powerful navy. Furthermore, with the maritime resources and sea lines of communication becoming an indispensable strategic issue for China's sustainable development, sea power has become an important strategic choice for China.[9]

Mahan's theory of sea power had a long historic impact on the Chinese maritime strategic thinking. Chinese Communist leaders, from Mao Zedong, Deng Xiaoping to Jiang Zemin and Hu Jintao, although not explicitly putting forward the ideas of sea power, always used "build a powerful navy" as an incentive slogan to officers and soldiers of the navy.[10] The historical glories of ancient Chinese sea-faring records demonstrated China's capacity to exert influence from, and at, sea upon other states. In the 21st century, with the increase of China's national strength and the rise of its international status, sea power theory is once again inspiring Chinese strategic thinkers, with a great debate on sea power taking place in China's academic and thinking circles. The increasing importance of contemporary China's maritime and security interests has aroused Chinese strategists' enthusiasm for sea power.

Some scholars conclude from history and the experience of other countries that the rise of China needs the development of sea power and the establishment of a strong navy.[11] Zhang Wenmu advocates these ideas, citing Mahan's dictum that economic prosperity hinges on the deployment of naval forces at strategic locations. He cautions that "it is extremely risky for a major power such as China to become overly dependent on foreign import without adequate protection and China needs to build up its Navy as quickly as possible, because sea battle was the ultimate way for major powers to resolve economic disputes". Ni Lexiong advocates that once an outward-leaning economy of a nation that relies on maritime trade comes into being, it must call for sea power. He contends that "we need our global military presence since we have commercial interests all over the world".[12]

9. Duo, n.6.
10. "Rethinking China's 'Sea Power' Strategy in Modern Times", *China US Focus,* February 14, 2011, http://www.chinausfocus.com/peace-security/%E2%80%9Csea-power%E2%80%9D-in-chinese-maritime-strategic-thinking/#sthas.JrImzYo1.dpuf. Accessed on October 15, 2015.
11. Ibid.
12. Duo, n.6.

The Chinese view of national security does not end with defence of its mainland against attack. China's definition of national sovereignty and territorial integrity is being applied more widely to include control of Taiwan. Since the earliest days of the People's Republic of China (PRC), the Chinese have seen the US and its sea power as the principal barrier to forcible reunification of Taiwan. In 1996, when US aircraft carriers entered the strait to prevent China's intimidation of Taiwan, the Chinese were reminded of their impotence to overcome this barrier. China still regards the US willingness to intervene in Taiwan's defence as a contradiction of one of its core interests. Apart from its assertion of sovereignty over Taiwan, China has numerous other territorial claims. It has settled or deferred most of its land border disputes, which may signify its interest in a stable neighbourhood as it reorients strategically towards the Pacific and its most formidable potential adversary, the US. While deferring its land territorial claims, China has become more adamant, impatient, and rowdy over its maritime territorial claims.[13]

HAS CHINA RESOLVED THE DEBATE?

Currently, China's military has been undergoing reform with the intent to equip its forces to fight and win modern wars. China's 2015 White Paper on military strategy is significant for two main reasons: firstly, it is the first White Paper exclusively on China's military strategy; and, secondly, it clearly lays out the expansion of China's naval power stating that "*the PLA Navy (PLAN) will gradually shift its focus from 'offshore waters defense' to the combination of 'offshore waters defense' with 'open seas protection,' and build a combined, multi-functional and efficient marine combat force structure*".[14] This change in China's military strategy can already be seen with China's President Xi, announcing on September 2, 2015, during the Victory Day parade, the scaling down of 300,000 soldiers from the People's Liberation Army (PLA) force and diverting China's military modernisation resources from land towards the air and sea. There has also been a report of five

13. David C. Gompert, *Sea Power and American Interests in the Western Pacific* (Santa Monica: RAND, 2013), pp. 98-99.
14. Ministry of National Defence, People's Republic of China, "White Paper: China's Military Strategy", May 2015, http://eng.mod.gov.cn/Database/WhitePaper/index.htm. Accessed on October 19, 2015.

Chinese Navy ships sailing in the international waters of the Bering Sea off the coast of Alaska. This incident occurred during the time when President Obama was in Alaska, as reported in the *Wall Street Journal* on September 2, 2015. Pentagon officials stated that this was the first such foray by Beijing. However, the Pentagon stated that the intent of China was unknown.[15]

Fig 1: China's Naval Global Expansion[16]

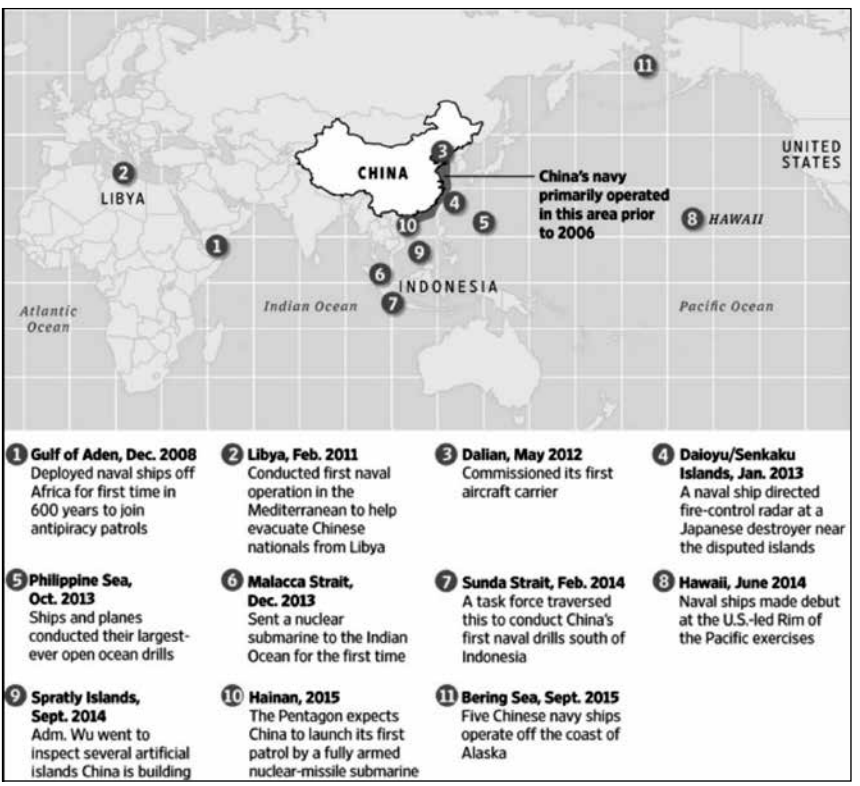


Fig 1 shows the global outreach undertaken by the PLA Navy since 2008. The figure helps in understanding the growth that is

15. Jeremy Page, "Five Chinese Navy Ships are Operating in Bering Sea off Alaska", *The Wall Street Journal*, September 2, 2015, http://www.wsj.com/articles/pentagon-watches-as-chinese-navy-ships-sail-in-bering-sea-1441216258. Accessed on October 16, 2015.
16. Ibid.

taking place in China's sea power through its navy's operational expansion across the globe. As can be seen in the figure, prior to 2006, China's navy operated primarily around its vicinity; however, there has been a sudden surge in the activities of the PLA Navy, by engaging in joint military exercises, anti-piracy patrols, and various other naval drills across the globe, particularly in the maritime regions that are of strategic significance to China. The question that emerges from these emerging trends is whether China has realised its growing naval power and stature—at least in Asia—and, hence, feels the inevitability of its emergence as a sea power and the need, therefore, to rewrite its maritime strategy.

The terms naval power and sea power are used interchangeably all too often. But naval power, properly understood, refers to a direct and indirect source of military power at sea. The main components of naval power are the navy, coast guard and marines/naval infantry and the shore establishment. The term sea power which was coined in 1849, originally referred to a nation having formidable naval strength. Today, this term's meaning is much broader; it now describes the entirety of the use of the sea by a nation. Specifically, sea or maritime power comprises the political, diplomatic, economic and military aspects of sea use.[17]

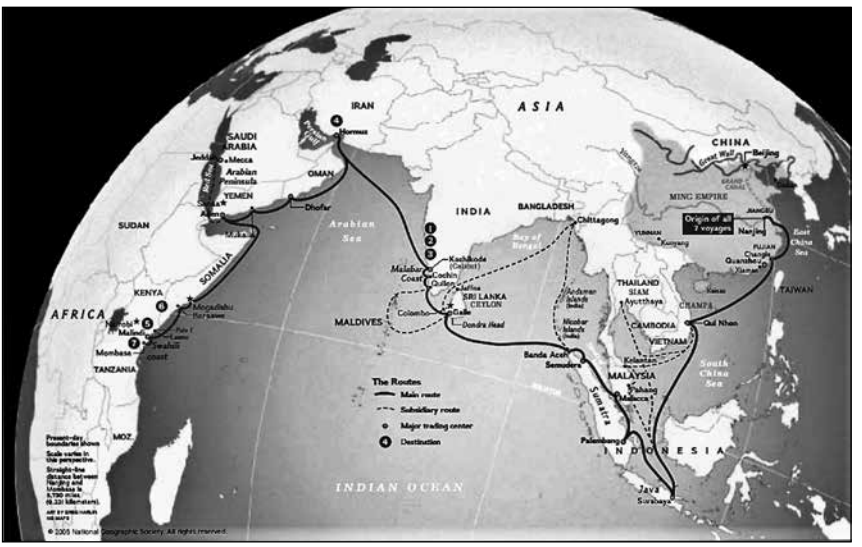
According to Julian Stafford Corbett, maritime strategy comprises the principles which govern a war in which the sea is a substantial factor. It must not be confused with naval strategy, which determines the movements of the fleet when maritime strategy has determined what part the fleet must play in relation to the action of the land forces. The paramount concern, then of maritime strategy is to determine the mutual relations of the army and the navy in a plan of war. Therefore, the object of naval warfare, according to Corbett, must always be directly or indirectly, either to secure command of the sea—which means nothing but control of maritime communications, whether for commercial or military purposes—or to prevent the enemy from securing it.[18] Hence, the object of naval warfare is the

17. Milan N. Vego, "On Naval Power", http://www.dtic.mil/dtic/tr/fulltext/u2/a517358.pdf. Accessed on October 15, 2015.
18. Juan J. Jimenez, "Maritime Power in Colombia, Analysis and Proposal of Strategy", June 1997, http://archive.org/stream/maritimepowerinc00jime/maritimepowerinc00jime_djvu.txt. Accessed on November, 26, 2015.

control of communications, and not, as in land warfare, the conquest of territory.[19]

Mahan's ideal model believed that the continental states had to defend their large land borders and, therefore, had to allocate the necessary resources for it. However, by looking at China's history and that of Zheng He's voyages, it becomes evident that even in ancient times, a continental China had the capability to exert powerful influence on both land and at sea. Fig 2 shows Zheng He's voyages from 1405-1433, which also marked China's golden age of exploration—travelling beyond India and across the Arabian Sea to reach Africa's Swahili coast by 1431-1433.

Fig 2: Voyages of Zheng He, 1405-1433[20]

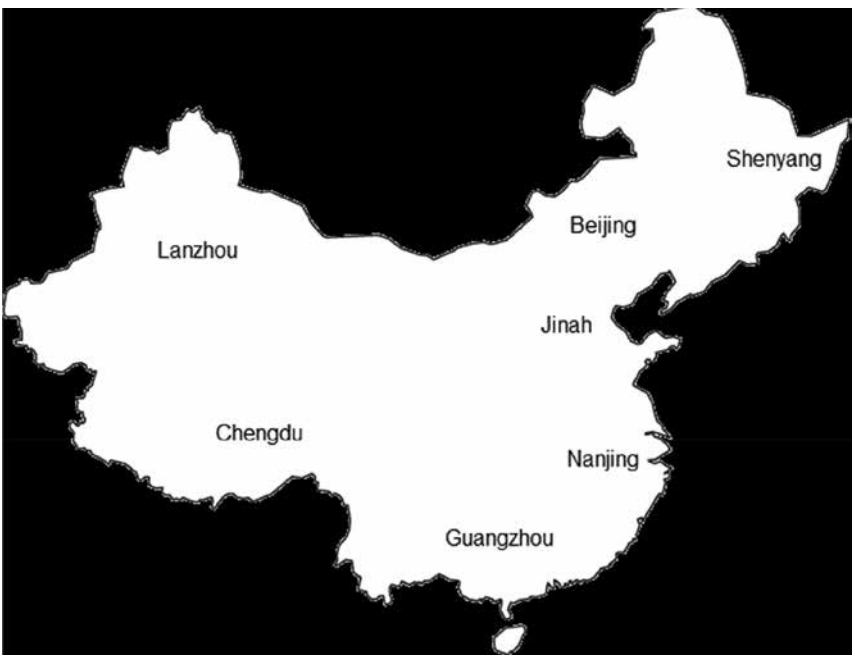


China fulfils all the six critical elements of sea power given by Mahan's theory: geographic position, physical conformation, extent of territory, number of population, national attitude and government's willingness. Currently, China's large land borders are relatively stable and it faces few threats in its east coast. Due to a stable environment in

19. Corbett, n.4.
20. http://ngm.nationalgeographic.com/ngm/0507/features2/map.html. Accessed on October 19, 2015.

its continental mass, there has been a shift in China's military reform shifting towards its maritime power. Fig 3 below shows the current seven Military Regions (MRs) of China. However, China is seriously considering reducing the current Military Regions to four, by merging Beijing with Shenyang in the northeast and the southeast could see the merger of three Military Regions—Guangzhou, Nanjing and Jinan—in order to make its military's command and control system more efficient and also due to the fall in China's threat perception from its northern and eastern coasts.

Fig 3: China's Current Military Regions



Therefore, due the existing stable environment in its landmass China has been focussing on its maritime strategy, since from a geo-strategic perspective, eight countries among China's nine neighbouring countries around its territorial waters have a marine territory dispute with China, hence, the need for maritime expansion

to secure its seas.[21] Maritime security has become a main part of China's national security, with the issue of Taiwan remaining one of the core issues to be resolved. There is also the issue of economic globalisation, since in today's highly economic interdependent environment, it draws countries closer than ever, moving away from the time when national maritime security relied on war and hegemony. China has also realised the importance of sea power as an important strategic choice, since maritime resources—to meet its energy needs for its economic growth—and the maintenance of its sea lines of communication for its free flow of trade, have turned out to be indispensable strategic issues for China's sustainable development.[22] Therefore, it has become pertinent for China to reform and develop its military capabilities in order to up the ante for its navy in a situation where it has to defend China's overseas energy, free trade and, more importantly, enforce its maritime strategy.

With the current expansion of its overseas interests, China's security boundary has already far exceeded its territorial boundary, which demands that China have a corresponding overseas military capability. However, many scholars are critical of sea power and raise doubts from the perspective of geo-political constraints, warning that China should avoid falling into the "sea power dilemma", since it is sea power that caters to any military strategy, rather than the strategy catering to sea power. According to Ye Zicheng, each country should trade off the development of land power and sea power according to its natural endowment, with the ultimate goal being the development of the nation. He further adds that, from the micro-historical point of view, the development of land power is more persistent, while the marine and space environments have the nature of liquidity, uncertainty and instability, and sea forces are unsustainable, converge fast and disappear fast. Therefore, only having military power at sea is not enough to be a sea power. The only way for China is to become a land power with a strong navy.[23] According to Zhang Wenmu, China's sea power is still, at best, limited, with the current pace of the development of its navy, not

21. n.10.
22. Duo, n.6.
23. Coebett, n.4.

going beyond the purpose of self-defence.[24] It must be realised that militarily China is a strong land power, and due to the surge in its global engagement, it is using its navy to project its military power beyond its continental landmass. Other issues such as its maritime disputes in the South and East China Seas, its need to maintain its sea lines of communication for its global trade and commerce, and its need for energy have further necessitated the need for China to project its military strength through its sea power. Furthermore, China has had the good fortune of having peaceful northern borders for more than three decades, enabling it to look at its east/southeast where it faces challenges that could be countered through its sea power projection.

CONCLUSION

Sea power as a symbol of greatness has been a dream for the Chinese for centuries, and the surge that China has witnessed—be it in its economic growth, global political stature or its military might—has enabled China to revive its past glory as a sea power. The major question that emerges for the US is whether to contain China as it continues to create an enabling navy that flexes its muscle in the disputed marine territories around its vicinity, or to let it grow. However, as history is witness, containing an emerging sea power has always been counter-productive, as shown by the US-Great Britain rivalry. It must also be made clear that as technology has advanced, it has made modern warfare evolve into five dimensions, i.e. in the spheres of land, air, water, space and cyber. There is no doubt that China is focussing on its military modernisation in order to counter these emerging trends, through reforms in its military command and control, operational concepts and its doctrines. In this new set of emerging trends, the significant question is: how much focus should there be on sea power? The current situation faced by China of a stable environment in its continental landmass has enabled it to concentrate more on developing its sea power. So the question that emerges is whether China has resolved the debate on land versus sea power, given the fact that it would be unwise to restrict modern warfare in the

24. Ibid.

current global scenario to only these two dimensions since there are other dimensions as well. However, in the case of China, it continues to surge ahead in the rapid development of its sea power to cater for its perceived global aspirations.

CHINA-BHUTAN: AN UNRESOLVED BOUNDARY DISPUTE

SANA HASHMI

INTRODUCTION

Bhutan is one of the two South Asian countries with an unresolved boundary dispute with China. The other, of course, is India. China shares a 470-km-long border with Bhutan that is in close proximity to India's Siliguri corridor, also known as the "Chicken's Neck". The Siliguri corridor connects India's northeastern region to neighbouring Nepal, Bangladesh and Bhutan. Therefore, the major problem between China and Bhutan lies in defining the tri-junction of the India-Bhutan-China border. With respect to the China-Bhutan common boundary, while the northwest part of the boundary constitutes Doklam, Sinchulung, Dramana and Shakhatoe in Samste, Haa and Paro districts, the central parts constitute Pasamlung and the Jakarlung valley in the Wangdue Phodrang district.[1] The disputed territory with Bhutan has strategic importance for China. First, the disputed territory shares a border with Tibet. Secondly, the Doklam plateau lies immediately east

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1. Medha Bisht, "Sino-Bhutan Boundary Negotiations: Complexities of 'Package Deal'", *IDSA Commentary*, January 19, 2010, http://www.idsa.in/idsacomments/Sino-BhutanBoundaryNegotiations_mbisht_190110.html. Accessed on September 3, 2013.

of Indian defences in Sikkim, which not only has a commanding view of the Chumbi valley but also overlooks the Silguri corridor further to the east.[2]

China and Bhutan are not only confronted with the unresolved boundary dispute, there are no diplomatic ties between the two countries. The absence of diplomatic relations has further delayed a resolution of the dispute. Bhutan's anxieties and fears vis-à-vis Chinese intentions have played a major role in the non-existence of the diplomatic relations and non-resolution of the boundary dispute. Throughout the 1950s and 1960s, Bhutan was consistently anxious about an underlying theme that emanated from Chinese propaganda, which implied, or stated outright, that Bhutan was a natural part of Tibet and that it would ultimately be reunited with China.[3] This was the same logic on the basis of which China has been claiming the entire Arunachal Pradesh since 2006. In August 1959, former Indian Prime Minister Jawaharlal Nehru announced that he had heard of Chinese reports claiming that the Bhutanese, Sikkimese and Ladakhis must once again be made a united family under China.[4] In 1959, the time when India-China boundary dispute began to gain prominence, the Chinese government sent a long document to the Indian side reiterating that apart from its dispute with India, it also contests approximately 700 km territory with Bhutan. Upon receiving this, the then Prime Minister of Bhutan, Jigme Dorji stated, "The Chinese claims are cartographical aggression and Bhutan does not recognise any Chinese claims on Bhutan territory".[5]

Bhutan has always been apprehensive of China's motives with respect to the boundary dispute. Road construction by the Chinese near the Bhutanese border has also been a cause of concern for the Bhutanese leadership. In addition to the infrastructure development, the confrontations at the border have further fuelled its anxieties.

2. Prakash Katoch, "Dealing with Doklam", *CLAWS,* March 16, 2013, http://www.claws.in/985/dealing-with-doklam-prakash-katoch.html. Accessed on September 25, 2013.
3. Paul J. Smith, "Bhutan-China Border Disputes and Their Geopolitical Implications" in Bruce A. Elleman, Stephen Kotkin and Clive Schofield, eds., *Beijing's Power and China's Borders: Twenty Neighbours in Asia* (New York: M. E. Sharpe, 2013), p. 26-27.
4. Ibid., p. 27.
5. *A New York Times'* article on Bhutan's reply to Chinese claims on Bhutan's territory is cited in Paul J. Smith, "Bhutan-China Border Disputes and Their Geopolitical Implications" et al., eds., Elleman. et. al., Ibid., p. 27.

For instance, on December 4, 2009, in response to the concerns of the Parliamentarians, the Secretary of International Boundaries, Dasho Pema Wangchuk gave a detailed briefing on the current status of Bhutan-China boundary negotiations:

> In 2008, the Chinese soldiers intruded deep into Bhutanese territory and came to the Bhutanese Army's outpost at Lharigang in the Charithang valley… In the year 2009, the Chinese intruded 17 times up to the RBA post… In 2004, the Chinese started road construction work from the Langmorpo stream towards the Zuri ridge. After several protests and discussions at the foreign minister level, the Chinese stopped the construction work… However, in August 2009, the Chinese have started the extension of the road construction work again between Zuri and Phuteogang ridge that overlooks the disputed Charithang valley. The Bhutanese government protested four times that year. The action of the Chinese was in violation of the 1998 agreement between China and Bhutan on the maintenance of peace and tranquillity and also of the mutual acceptance to maintain the status quo as agreed to in March 1959.[6]

NEGOTIATIONS BETWEEN CHINA AND BHUTAN

As of now, there have been 22 rounds of negotiations between China and Bhutan. The boundary dispute between the two countries came to the forefront in the 1950s when China began publishing maps depicting the ill-defined boundary with Bhutan. The boundary negotiations began in 1984 and, for the next four years, four rounds of negotiations took place. In 1986, during the third round of negotiations, former Chinese President, Jiang Zemin, assured the Bhutanese delegation leader, Yeshi Tobgyel, that the Chinese would not interfere in Bhutan's internal affairs and the two countries vowed to maintain a "peaceful and friendly border" while seeking an early settlement.[7] Both countries concurred on the four-point pattern of the guiding principles, which would govern their mutual relations and

6. Dr. S. Chandraseekharan, "Bhutan's Northern Border: China's Bullying and Teasing Tactics", Chennai Centre for China Studies, January 15, 2010, http://www.c3sindia.org/bhutan/1149. Accessed on October 24, 2013.
7. Mohan Ram, "Bhutan: Solution in Sight", *Far Eastern Economic Review*, July 10, 1986, p.28.

issued a joint statement to this effect. The guiding principles of the boundary talks are as follows:

- Observing the five principles of peaceful coexistence.
- Treating each other on an equal footing and entering into friendly consultations on the basis of mutual understanding and mutual accommodation with a view to reaching a just and reasonable settlement.
- Taking account of the relevant historical background based on traditions, custom, usage and administrative jurisdiction while accommodating the national sentiments of the people and the national interest of the two countries.
- Pending final settlement of the boundary question, maintaining tranquillity on the border and status quo of the boundary as before March 1959, and refraining from unilateral action or the use of force, to change the status quo of the boundary.[8]

The fifth round of negotiations took place in 1988 when both sides exchanged their respective perceptions on their common boundary. As a consequence of which, at the 68th session of the National Assembly, the Bhutanese leadership took an important decision to maintain its perceptions of the traditional boundary as the basis for conducting negotiations with China in the future.[9] The sixth round of negotiations was held in Beijing in October-November 1989 when both sides exchanged maps based on their respective perceptions once again. The seventh round of negotiations was held in 1990. The Chinese leadership attempted to give concessions to the Bhutanese side on the dispute in the Luling valley, which was located at the middle sector. However, the offer was not accepted by Bhutan, as it wanted more concessions in the western sector too, which was readily discussed in the eighth round of negotiations. In the tenth round of boundary talks held in 1996, China proposed to exchange 495 sq km of area of the Pasamlung and Jakarlung valleys in the northern borders

8. *The Times of India* (New Delhi), May 15, 1988, cited in "Bhutan's Relations with China", http://shodhganga.inflibnet.ac.in/bitstream/10603/17331/10/10_chapter%205.pdf. Accessed on November 4, 2013.
9. "Proceedings and Resolutions of the 69th Session of the National Assembly of Bhutan", National Assembly of Bhutan, Government of Bhutan, March 19-26, 1990, http://www.nab.gov.bt/assets/uploads/docs/resolution/2014/69th_Session.pdf. Accessed on October 8, 2013.

of Bhutan for Sinchulumpa, Dramana and Shakhtoe, with an area of 269 sq km, in northwest Bhutan, which shares borders with Sikkim, India, but no final decision was taken.[10] In the twelfth round of talks, both countries began to focus on improving the bilateral relationship, mainly the trade ties. Therefore, as a result of the twelfth round, the first formal agreement on the issue of the boundary was signed. In 1998, foreign ministers from both sides signed the "Agreement on the Maintenance of Peace and Tranquillity along the China-Bhutan Border". This agreement was on the lines of the India-China Agreement on the Maintenance of Peace and Tranquillity along the India-China border of 1993. In the agreement, it was agreed that:

> China and Bhutan, hereby, agree to maintain the status quo of the border as prior to March 1959 and ensure peace and stability of the border region before a final solution is reached, and oppose unilateral efforts by either side to change the status quo (Article 3 of the agreement)... As for the progress in the last 11 rounds of border talks, as both sides have made clear their stance, both hereby agree to resolve the issue through friendly negotiations (Article 4 of the agreement).[11]

In 1999, the thirteenth round was held when the Chinese side, for the first time, put forth its package deal for Bhutan. The deal explicitly talked about formally establishing diplomatic ties with Bhutan and also a diplomatic mission/consulate in Thimpu as a precondition for the final settlement of the boundary dispute. The problematic area was that while Bhutan was expecting still more concessions in the western sector from the Chinese side, the package deal had no mention of such concessions on that front. In the fourteenth round, in 2000, Bhutan asked for greater concessions and urged the Chinese side to initiate cartographic discussions as well as to accept the Bhutanese perception of the traditional boundary in the Doklam,

10. Govinda Rizal, "Bhutan-China Border Mismatch", *Bhutan News Service*, January 1, 2013, http://www.bhutannewsservice.com/column-opinion/commentry/bhutan-china-border-mismatch/. Accessed on December 2, 2013.
11. Cited in Kuei-hsiang Hsu, "A Preliminary Study of the Traingular Relationship between Bhutan, China and India", *Mongolian and Tibetan Special Affairs*, http://www.mtac.gov.tw/mtacbooke/upload/09403/0102/21.pdf. Accessed on January 5, 2014.

Sinchulumpa, Dramana and Shakhatoe region.[12] In the next three rounds in 2001, 2002 and 2004, discussions at the expert level groups continued to take place, with the main focus on the presentation and exchange of maps. No talks took place in 2003 and 2005. In 2006, the eighteenth round of negotiations took place and the discussion on the package deal took the centre-stage again, with Bhutan becoming even more adamant about not accepting the package deal without the concessions in the western sector. After a gap of four years, in 2010, the nineteenth round was held. It was significant due to its exclusive focus on the northwestern sector and both sides decided on a joint field survey, which would enable harmonising the reference points and names of the disputed areas. [13] The talks were noteworthy due to three developments:

- First, India and Bhutan revised their friendship treaty in 2007, and Article II, which stipulated that Bhutan should be advised by India in its foreign policy decisions, was symbolically dropped.
- Second, Bhutan witnessed the first stage of democratisation in 2008 by the holding of elections, thus, taking the maiden step towards domestic political reform. At the same time, the Oxford educated Khesar Jigme Namgyal Wangchuk was formally crowned the fifth king of Bhutan in November 2008.
- Third, China has been developing infrastructure along the China-Bhutan border, which has not been received well by the Bhutanese leadership. As of now, six roads have been built by China near Bhutan's north and northwest areas.[14]

In August 2013, the twenty-first round of negotiations was held in Thimpu and as per the joint statement:

> The two delegations expressed satisfaction with the talks and reaffirmed their commitment to resolve the boundary at the earliest through mutual consultation, understanding and accommodation on the basis of the Four Guiding Principles agreed to in 1988 and the 1998 Agreement on the Maintenance of Peace and Tranquillity

12. Chandrasekharan, n. 6.
13. Bisht, n. 1.
14. Ibid.

> in the Bhutan-China Border Areas. The meeting agreed to conduct a Joint Technical Field Survey in the first week of September in Pasamlung area in Bumthang.[15]

The twenty-second round of negotiations was held in Shaanxi, China, in July 2014.The meeting decided that the expert group on the boundary issue would work out the modalities for carrying out the joint technical field survey of the disputed areas in the western sector.[16] The joint statement stated:

> China-Bhutan relations retain good development momentum and the bilateral exchanges and cooperation in various fields advance steadily. The Chinese side stands ready to further enhance traditional good-neighborly and friendly relations with the Bhutanese side. The China-Bhutan Boundary Talks have achieved positive progress. The Chinese side is determined and sincere to make joint efforts with Bhutan to seek as soon as possible a just and reasonable solution to the boundary issue that both sides could accept. Before the final settlement, both sides should jointly safeguard the peace and tranquility of the China-Bhutan border region.[17]

Though there have been several rounds of negotiations till now and both sides have been showing political willingness to resolve the border issue, the final resolution will still take time. One of the major factors behind this has been Bhutan's proximity to India.

INDIA FACTOR

China-Bhutan boundary negotiations have never been solely about territory; they also reflect the larger geo-political dynamics of South Asia, which is ultimately driven by India-China relations.[18]

15. Press Release, Ministry of Foreign Affairs, Royal Government of Bhutan, http://www.mfa.gov.bt/wp-content/uploads/2013/08/press-release11.pdf. Accessed on September 7, 2013.
16. "An Affirmative Boundary Talk Between Bhutan and China", *BBS*, July 28, 2014, http://www.bbs.bt/news/?p=42282, Accessed on July 29, 2014.
17. "China and Bhutan Hold the 22nd Round of China-Bhutan Boundary Talks", Ministry of Foreign Affairs of the People's Republic of China, July 25, 2014, http://www.fmprc.gov.cn/mfa_eng/wjbxw/t1178884.shtml. Accessed on July 26, 2014.
18. Smith, n. 3, p. 33.

India's influence on Bhutan has been one of the major reasons behind the unresolved boundary dispute between China and Bhutan. On August 8, 1949, the Government of Bhutan signed a "Treaty of Perpetual Peace and Friendship" with India which allows India to guide Bhutan on external matters. Article II of the treaty states, "The Government of India undertakes to exercise no interference in the internal administration of Bhutan and on its part, the Government of Bhutan agrees to be guided by the advice of the Government of India in regard to its external relations".[19] By assuming responsibility for Bhutan's external relations, India demonstrated its intent to exclude the influence and intrigues of foreign powers, including China, from Bhutan.[20] This, apart from Bhutan's apprehensions, is one of the major reasons why China has, till now, failed to establish diplomatic ties with Bhutan. Initially, China tried to make several offers to Bhutan to lure it into the talks but Bhutan was not keen to talk to China without the involvement of India. In fact, in 1959, Zhou issued a letter to Nehru expressing China's wish to stage direct bilateral talks with Bhutan; the letter suggests Zhou's intention to separate the China-Bhutan boundary issue from the India-China boundary negotiations.[21] Hence, direct negotiations could begin only in 1984. Till 1988, the negotiations were carried out by the Bhutanese ambassador in New Delhi, while the Chinese delegation was headed by the vice foreign minister. It was only in 1989 that Bhutan elevated the level of the talks and assigned a senior vice foreign minister to take charge of the boundary negotiations with China. To put an end to the boundary dispute, establish diplomatic relations and counter India's influence in Bhutan, the Chinese leadership tried to offer a package deal consisting of several concessions to Bhutan.[22] China has been offering more land to Bhutan at a certain point of the China-Bhutan boundary in exchange for some adjustment at the

19. Ministry of External Affairs, "Treaty of Perpetual Peace and Friendship between the Government of India and Government of Bhutan", Government of India, August 8, 1949, http://mea.gov.in/bilateral-documents.htm?dtl/5242/Treaty+or+Perpetual+Peace+and+Friendship. Accessed on October 2, 2014.
20. T. T. Poulose, "Bhutan's External Relations and India", *The International and Comparative Law Quarterly*, vol. 20, no. 2, April 1971, p. 199.
21. Hsu, n. 11.
22. Smith, n. 3, p. 29.

tri-junction border of India, Bhutan and China.[23] However, the offer was politely turned down by the Bhutanese side stating that it is not yet prepared to accept the package offer and instead, it invoked the spirit of friendliness that had developed between the two countries to seek greater Chinese flexibility in accommodating Bhutan's territorial requests, particularly as it was a matter of national survival.[24] China has also been trying to fuel Bhutan's aspirations for greater autonomy in its external matters, without the intervention of India, of course. Since the 1950s, China has been trying to exclude India from the boundary negotiations with Bhutan. As the events are unfolding, it may be safely said that China has achieved noteworthy success in its efforts to exclude Indian officials from the talks.

THE WAY FORWARD

The trajectory of China's approach towards the boundary dispute with Bhutan suggests that China's willingness to resolve its boundary dispute with Bhutan is relatively higher in comparison to India's. Consequently, a survey of recent developments in the China-Bhutan boundary dispute also reveals that China has made remarkable progress in convincing Bhutan to opt for the final settlement. In June 2012, former Chinese Premier, Wen Jiabao held a meeting with Bhutanese Prime Minster Jigmey Thinely in Rio de Janeiro, Brazil, where he stated, "China is willing to complete boundary demarcation with Bhutan at an early date and strengthen exchanges in various fields so as to push bilateral ties to a higher level", while Thinley said, "Bhutan is willing to settle border issues with China in a cooperative manner, enhance bilateral economic and trade cooperation and people-to-people and cultural exchanges, and carry out close communication and coordination in international and regional affairs".[25] After 30 years and 22 rounds of negotiations, the

23. "Would India Disrupt China-Bhutan Boundary Negotiations"?, *Kuensel*, http://www.kuenselonline.com/forums/topic/would-india-disrupt-bhutan-china-border-negotiations/. Accessed on September 2, 2014.
24. Smith, n. 3, p. 29.
25. "China, Bhutan Ready to Forge Formal Diplomatic Ties", *Xinhua,* June 22, 2012, http://news.xinhuanet.com/english/china/2012-06/22/c_131669045.htm. Accessed on October 2, 2013.

boundary issue remain unresolved, however, the possibility of a final settlement is not altogether bleak or impractical. The progress is slow but there have been regular talks, which is indicative of the political will of the leadership of the two states. Nevertheless, India continues to be central to the China-Bhutan boundary question. Bhutan's treaty obligations with India do not allow it to agree to a comprehensive resolution without the consent and involvement of India. Clearly, China's interest lies in settling the dispute with Bhutan as soon as possible so that it can use it to leverage its position in the future negotiations between India and China.

NEUROTECHNOLOGY: AN EMERGING AND INSIDIOUS PARADIGM OF WARFARE

ASHISH GUPTA

Since the evolution of mankind, recourse to war has been viewed as a rational alternative for the preservation, or furtherance, of a state's interest. The justification or condemnation of war and its characterisation as just or unjust depends on the success or failure of achievement of anticipated objectives. Waging a war requires *aggrandisement of resources* and power. The warring parties leave no stone unturned in their efforts to secure favourable outcomes concomitant with anticipated gains in terms of territory, resources, power, glory, and so forth, in spite of expected damage to property and life. With such high stakes involved, the combatant parties commit all resources in all domains in the support of the war efforts, relegating the issues of morality and ethics to the background. As noted by Frederick Salalgar, "What characterizes an all-out, or total, war is that it is fought for such high stakes that the belligerents are willing, or compelled, to employ, not all the weapons they possess but any weapons they consider appropriate and advantageous to them".[1]

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1. Isidor Wallimann, Michael N. Dobkowski and Richard L. Rubenstein, *Genocide and the Modern Age: Etiology and Case Studies of Mass Death* (Syracuse: Syracuse University Press, 1987), p.102.

The breakthroughs in technology may come from unexpected fields, largely disconnected from traditional warfare domains. However, depending on its potential *in furtherance of* existential and aspirational military capabilities, the new technology and its spin-offs are adopted, assimilated and integrated in some domain or the other of warfare. In the face of profound and powerful breakthroughs, capabilities are developed, refined and used in creating a domain which is entirely unknown, unfathomable and incomprehensible to the adversary. The evolution of at least three domains—air, space and information—is attributable to advances and breakthroughs in the respective fields. The ''domain approach" is a logical evolution of military thinking and rationale to accrue strategic, operational and tactical advantages over potential adversaries. The ground-breaking research in neuroscience and related cognitive sciences, and the great strides made in the field of 'neurotechnology' have opened up a vista of new possibilities for military exploitation.

Research in neuroscience and neurotechnology has reached a point of inflection, fuelled by advances in technology, methods and tools. The understanding of the functioning, interactional relationship with other entities, and responses *to stimuli* of the brain, nervous system and nerve pathways is no longer considered an esoteric discipline with subjective interpretations only. Advances made in neuroimaging, neurogenetics, neurophysiology and neuropharmacology have paved the way for new understanding, diagnosis and management of neurological disorders, injuries and neuropsychiatric disorders and have expanded the realm of neurological care and neurorehabilitation for people with congenital or acquired neurological conditions. These techniques are being used far beyond the treatment of conventional neurological disorders: they are increasingly being used to gain new insights into techniques and strategies for improving human performance by predicting, modifying and controlling cognitive schemas, emotional responses and behavioural traits.

The research in the field of neuroscience and neurotechnology is adding to the repertoire of knowledge beyond the perfunctory functioning of the brain and making deep inroads into our collective understanding of cognitional, emotional, behavioural,

motivational and attitudinal functions in determining the human response to various known and unknown stimuli. Today, implantable neural interfaces are being used for neural recording and stimulation. Brain-Machine Interfaces (BMIs) or brain-computer interfaces offer a ray of hope for those with severe motor impairment and a host of other neurological disorders. Algorithms have been designed to decode/ simulate neurons and synapses. The understanding of the anatomical structure and 'physiological function' of the brain by 'brain mapping' through imaging, molecular and cellular biology molecular, stem-cell manifestations, electrical and biomedical technologies, neurophysiology and nanotechnology, is deepening and expanding. These developments have rekindled the hope, and reaffirmed the belief, that modern medical and scientific endeavours are collaborative efforts, being put forth for the benefit of mankind as a whole. The design and development of neuroprosthetic devices capable of interfacing between the brain and a prosthetic limb will convey sensation to its wearer. Parkinson's and Alzheimer's brain diseases will not be as degenerative and debilitating as they are today. The definitive and ameliorating treatments for a variety of psychiatric disorders would be available for bringing in quantifiable improvements in the quality of life of patients. The possibilities and spin-offs of mapping and decoding the brain are virtually endless and constantly evolving. However, neurotechnology is a dual-use technology fraught with the existential danger of being misused.

In the military field, the cutting edge technology from other fields is modified outside its original intent and adopted to fulfill a military objective. Advances in the field of neurotechnology and their adoption in the military realm would redefine and revolutionise the potential battlespace.[2] The combatants' brains will become potential targets and neuroweapons will be used to control their thoughts, behaviour and responses. By steering human thought, shaping decisions, influencing behaviour, altering perceptions, and penetrating the subconscious,[3] it would be possible to bring a conflict to a favourable end without firing a single shot.

2. James Giordano, *Neurotechnology in National Security and Defense : Practical Considerations, Neuroethical Concerns* (Boca Raton: CRC Press, 2015), p.117.
3. Ibid.

The hidden sinister facets of neuroweaponry include not only the manipulation of brain activity and *psychological/behavioural functions but also to render human targets unresponsive, perplexed, incoherent and afraid. When used to target the political leadership, top military echelons and decision-makers, the political and military ramifications would be wide-ranging and severe*. The perfidious dual-use technology for nefarious and destructive purposes always finds enthusiastic and willing support from war-mongers. The field of neuroscience is no exception. In spite of the larger and noble aim of advancing the neuroscience research in an effort to rid mankind of the scourge of debilitating and incapacitating brain related disorders, the possibility of its nefarious usage is not lost on sabre-rattlers everywhere.

The human brain is a complex organ, capable of generating higher consciousness: an inextricable part of human ingenuity and capability, equipping us with the unique ability to make intelligent and cognitive decisions, optimise sensory-motor functions, undertake higher cerebral endeavours and help in elicitation of *behaviour* consistent with conditioning. Yet the complexities of neuroanatomy overwhelm the specialists and dilettantes alike. Like many other organs of the human body, the brain cells are activated when a potential difference produces local current flows. The brain's electrical current consists mostly of Na+, K+, Ca++, and Cl- ions that are pumped through channels in neuron membranes in the direction governed by the membrane potential.[4] These iconic currents result in generation of electric and magnetic fields which can be measured by using Electroencephalography (EEG) and Magnetoencephalography (MEG). The measurements recorded by the EEG and MEG provide functional imaging of the human brain and are directly and instantaneously tied to neuronal currents, the brain's information processing mechanism.[5] In addition, techniques like functional Magnetic Resonance Imaging (fMRI), positron emission tomography and single-photon emission tomography are used to undertake quantitative measurements of regional physiological and biochemical processes to be made *in vivo* in humans. From the anatomical

4. M. Teplan , " Fundamentals of EEG Measurement", *Measurement Science Review*, vol. 2, Section 2, 2002, p.1.
5. *Encyclopedia of Neuroscience* , 2004 ed., s.v., "Electroencephalography (EEG) and Magnetoencephalography (MEG)"

perspective, the brain can be divided into three major sections: cerebrum, cerebellum, and brain stem. The cerebrum consists of cerebral cortex which is a dominant part of the central nervous system. The cerebrum contains the amygdala and hippocampus, which are involved in various emotional responses and memory functions, including initiation of perceptual-motor skills, conscious awareness of sensations and complex analytical functions. The highest influence to the EEG comes from the electric activity of the cerebral cortex due to its surface position.[6] Brain waves have been categorised into four basic groups: Delta δ below 3.5 Hz, Theta θ below 4–7.5 Hz, Alpha α between 8–13 Hz, Beta β above 13 Hz and the Gamma γ which are often used for frequencies above 30–35 Hz.

The use of brain control technologies as weapons to gain control over a person's brain and nervous system and to alter, modify or wrest control of an individual's rational thinking, behavioural responses to stimuli, emotional reactions or coherent decision-making processes, have been experimented with, and used, since World War II. The research in this field, which began by testing the efficacy of neuropharmacological drugs, turned more sinister when experimentations with new means such as use of electronic microchip implants, nanotechnologies, microwaves and electromagnetic waves commenced with unremitting enthusiasm.

NAZI EFFORTS TO HARNESS BRAIN POWER

During World War II, Nazi Germany saw enormous potential in the use of a new cocaine-based "wonder drug" for enhancing the performance of German troops. Nazi researchers experimenting with the so-called D-IX pills used the inmates of the Sachsenhausen concentration camp a*s human guinea pigs*.[7] After administration of the drug, the prisoners at Sachsenhausen were forced to march in circles carrying 20 kg packs, to check its effectiveness. The results of these tests were encouraging, which prompted the plans of supplying the D-IX drug to the entire Nazi Army. However, the successive allied victories on many fronts thwarted the mass production efforts of the

6. Teplan, n.4, p.1.
7. Jeevan Vasagar, "Nazis Tested Cocaine on Camp Inmates", *The Guardian,* November 19, 2002, http://www.theguardian.com/world/2002/nov/19/research.germany. Accessed on November 1, 2015.

substance. The pills contained a mix of cocaine, the amphetamine pervitin and a morphine-related painkiller. As per Hamburg-based criminologist Wolf Kemper, these D-IX pills were the last of Hitler's efforts to secretly develop weapons and other means to bolster his already diminishing war-waging capability.[8]

PROJECT MK ULTRA: CIA'S MIND CONTROL PROGRAMME

The United States' Central Intelligence Agency (CIA) embarked on an ambitious but insidious mind control programme code named **Project MKUltra** and undertook experiments on humans in an effort to identify and develop drugs and procedures, which would destabilise or weaken the mental resolve and toughness of individuals. Once under the induced effect of the drug, the victim could be easily forced to confess during interrogation or torture. The programme, which began in the early 1950s, after officially being sanctioned in 1953, continued till 1973, when it was officially halted. The scope and extent of Project MKUltra was vast and the associated research was being undertaken at 80 institutions, including 44 colleges and universities, as well as hospitals, prisons, and pharmaceutical companies.[9] The CIA unabashedly experimented with "chemical, biological and radiological" means for the purpose of mind control. In December 1974, *The New York Times* reported that the CIA, during the 1960s, had indulged in illegal activities, including experiments on US citizens. In the summer of 1975, Congressional Church Committee reports and the Presidential Rockefeller Commission report revealed to the public for the first time that the CIA and Department of Defence had conducted experiments on both unwitting and cognisant human subjects as part of an extensive programme to influence and control human behaviour through the use of psychoactive drugs such as LSD and mescaline and other chemical, biological, and psychological means.[10]

8. Ibid.
9. Nicholas M. Horrok, "80 Institutions Used in CIA Mind Studies: Admiral Turner Tells Senators of Behavior Control Research: Bars Drug Testing Now", *The New York Times*, August 4, 1977, http://query.nytimes.com/gst/abstract.html?res=9D07E4D7113FE334BC4C53DFBE66838C669EDE. Accessed on November 1, 2015.
10. Project MKULTRA, the CIA's Program of Research in Behavioural Modification, joint hearing before the select Committee on Intelligence, 95th Cong (1977). (Statement of Senator Kennedy).

BRAIN STIMULATION USING IMPLANTABLE DEVICES

The experimentation with Deep Brain Stimulation (DBS) in humans began in the 1950s and 1960s. The electrical stimulation of the brain was used to treat movement disorders, psychiatric disorders, epilepsy, cerebral palsy, and pain. With new insights about the functioning of the brain, the targeted application of electrical current to specific brain regions or structures by placing electrodes is being increasingly used to improve neurological functions.

The latent potential of this new and revolutionary technique was immediately realised and a number of countries started research on implantable devices into an individual's brain for performance enhancement, elicitation of favourable and conditioned response and trauma mitigation treatments, as part of post war recovery. It has been reported that DARPA (Defence Advanced Research Projects Agency) of the US, under its classified brain programme, is already testing "implantable wireless 'neuroprosthetics'" to help soldiers with brain injuries. "[S]oldiers allow the tiny machines, or chips, to be implanted in their brain," With its programmes like RAM (Restoring Active Memory) and REMIND (Restorative Encoding Memory Integration Neural Device), DARPA is trying to help soldiers recover from traumatic brain injuries impacting memory and abnormal behavioural patterns.[11] It will be simply a matter of time and imagination to use the spin-offs from DARPA's research into using these implants as a mainstream weapon in the US arsenal.

BRAIN-COMPUTER INTERFACES

Greater knowledge of the functioning of the brain and the easy availability of powerful processors, capable of matching the complexity and real time analysis of brain activities, has led the quest to develop a brain-computer interface, capable of exchange of information from the brain to a computer and vice versa. While the brain's normal communication and control capabilities depend on nerves and muscles, the existence of easily recordable brain signals, such as the EEG, gave impetus to the possibility of establishing non-muscular communication and control based on Brain-Computer

11. "Mind Meld, DARPA is Testing Implanting Chips in Soldiers' Brains", *Fusion*, September 27, 2015, http://fusion.net/story/204316/darpa-is-implanting-chips-in-soldiers-brains/. Accessed on November 1, 2015.

Interfaces (BCIs).[12] In one of the most poignant and powerful demonstrations of BCIs, 29-year-old Juliano Pinto, with complete paralysis of the lower trunk, donning a mind-controlled robotic exoskeleton, performed the symbolic first kick-off of the 2014 World Cup in São Paulo in Brazil. His robotic exoskeleton was created by a team of more than 150 researchers led by Brazilian neuroscientist Dr. Miguel Nicolelis. Dr. Nicolelis, who is based at Duke University, is a leading figure in the field of brain-machine interfaces. The exoskeleton used a cap placed on the patient's head, picked up brain signals and relayed them to a computer in the exoskeleton's backpack. The signal was then decoded and transmitted to the exoskeleton to execute the action.[13] It has been reported that under a DARPA project in the US, a paralysed woman was successfully able use her thoughts to control an F-35 and a single-engine Cessna in a flight simulator.[14]

The BCI-controlled weapons in a battlefield would provide a higher degree of situational awareness to soldiers, enhancing threat detection and identification as well as substantially reducing response times. DARPA is developing the "Cognitive Technology Threat Warning System" (CT2WS) that uses an EEG cap that monitors and records the operator's brain signals and by using cognitive visual processing algorithms, running on a computer, detects brain responses even when the operator may not be consciously aware of a subtle movement or of unexpected appearance. [15]

BIOCHEMICAL NEUROWEAPONS

The potentiality of offensive neuroweapons can be actualised for behavioural modification and/or incapacitation of an adversary. A number of research projects are underway to develop biochemicals

12. n. 5.
13. Alejandra Martins and Paul Rincon, "Paraplegic in Robotic Suit Kicks off World Cup", *BBC News*, June 12, 2014, http://www.bbc.com/news/science-environment-27812218. Accessed on November 1, 2015.
14. Abby Phillip, "A Paralyzed Woman Flew an F-35 Fighter Jet in a Simulator— Using Only her Mind", *The Washington Post*, March 3, 2015, https://www.washingtonpost.com/news/speaking-of-science/wp/2015/03/03/a-paralyzed-woman-flew-a-f-35-fighter-jet-in-a-simulator-using-only-her-mind/. Accessed on August 3, 2015.
15. Bruce Sterling, "Augmented Reality: DARPA Cognitive Technology Threat Warning System", *WIRED*, SEPTEMBER 19, 2012, http://www.wired.com/2012/09/augmented-reality-darpa-cognitive-technology-threat-warning-system/. Accessed on November 1, 2015.

and neuropharmaceuticals, which once administered, can elicit a predictable and favourable behavioural response. The psychological and behavioural manifestations in humans are related to a complex *interplay and influence of hormones* on the brain. For example, the neurohormone oxytocin which is naturally produced by the brain's hypothalamus is often responsible for such behaviour as empathy, trust and bonding. Oxytocin could be used as a manipulator to give a false sense of trust, clouding and altering rational reasoning. Some of the newly discovered parasites can even alter the *instinctive and natural behaviour* of their hosts by turning their genes on and off. One such single-celled organism called 'Toxoplasma gondii' can only reproduce inside of a cat. In order to enter the cat's body from the soil, it first infects rats and alters their response to cat smell. Many infected rodents lose their natural fear of the scent and some even seem to be attracted to it and become easy prey for cats. Once inside the cat's body, the parasites complete their life cycle, pass out with cat's faeces and infect rats to again enter a cat's body.[16] With current advances in microbiology, the possibility of developing a mutation of such parasites to influence the natural behaviour of human beings does not appear to be *a far-fetched and outrageous* inference.

EFFECTS OF MICROWAVES ON BRAIN FUNCTIONALITY

During the Cold War period from 1953 to 1976, the US Embassy building in Moscow and its inmates were subjected to microwave radiation, directed from a building in close vicinity. A detailed study of the health conditions and manifestations in comparison to the US population brought out that the exposure had led to some increase in the cases of heart diseases and cancers, but a significant increase in the cases of brain tumour.[17] In 2006, a former KGB officer, Gen Boris Ratnikov divulged the secrets about special mind control techniques used during and after the Cold War. The general went as far as claiming that in 1992, his team detected efforts focussed to 'program' the mind of then President Boris Yeltsin to make him give the Kuril

16. Carl Zimmer, "Parasites Practising Mind Control", *The New York Times*, August 28, 2014, http://www.nytimes.com /2014/08/28/science/parasites-practicing-mind-control.html?_r=0. Accessed on November 1, 2015.
17. J Mark Elwood, *Microwaves In The Cold War: The Moscow Embassy Study And Its Interpretation. Review of a Retrospective Cohort Study* (Bethesda MD: National Library of Medicine, 2012), p.1.

Islands back to Japan, which would have led to demands from China to have Russia hand over its disputed territories as well. Yeltsin was persuaded to give up his plans.[18] The microwave auditory effect or the Frey effect induces audible clicks directly inside the human head by the use of pulsed/modulated microwave frequencies without the use of any kind of receiving device. To use this effect for incapacitating personnel remotely, the US Navy awarded a contract to WaveBand Corp. for the design of a system called MEDUSA (Mob Excess Deterrent Using Silent Audio). [19]

The neurotechnological breakthroughs and their willing and enthusiastic adoption, as a tool to bolster overall military capabilities, have the potential to alter and reshape the tactical, strategic and doctrinal contours of warfare as well as bring to the fore the various moral, ethical and legal dilemmas. The assimilation and adoption of new technology for military purposes requires new thinking and perspectives for governing its use within the moral and legal precincts. In the absence of enforceable international standards and their adoption by consenting states, the unbounded ramifications of the use of a powerful, potent and insidious technology for military purposes will be calamitous. The testing, policy and organisational issues which need to be tackled in the wake of development, acquisition and use of neurotechnological capabilities have profound legal ramifications. These include the legal duties, the extent of moral righteousness and accountability of those authorising missions/ operations applying neurotechnologies and the developers and manufacturers of neurotechnology. Subjecting humans to a condition, either through consent, connivance, incognisance or victimisation, as part of experimentation for testing, refining and consolidating neurotechnological capabilities, may cause cognitive impairment, behavioural modifications, sensory-motor failure or permanent disablement.

18. "Ex Agent Reveals KGB Mind Control Techniques Paper", *Sputnik International*, December 22, 2006, http://sputniknews.com/russia/20061222/57596889.html#ixzz3pN5HzZwe. Accessed on November 1, 2015.
19. Scott Freeman, *Just the FACTS101 e-Study Guide for: Biological Science*, Vol 1 (Vancouver: Contents Technologies, 2015), p. 45.

EMERGENCE OF NEW THREAT ENVIRONMENT

The use of neurotechnology in the medical field will create new opportunities, leading to more effective treatment breakthroughs as well as ameliorating or mitigating the effects of debilitating and life threatening diseases. On the flip side, such technology will fuel the emergence of a new threat environment for exploitation and abuse. According to Marie Chevrier, a professor of public policy at Rutgers University, the "neuroweapon is not biological, not chemical but electronic." This critical observation points to the possibility of unbridled misuse and abuse of neurotechnologies, as provisions in the two existing UN treaties i.e. the Biological Weapons Convention (BWC) and Chemical Weapons Convention (CWC) do not cover brain technologies. Under current international jurisprudence, the development and use of neuroweapons most likely does not violate international criminal law.[20] The abuse and misuse of certain types of weapons may be arrested or curtailed if either *consensually* based *customs* or mutually consented treaties proscribe their use. Unfortunately, neuroweapons do not figure in the weapons or means of warfare prohibited under the provisions of single issue treaties or more comprehensive conventions.[21]

Neuroweapons will escalate the proliferation of new threats and will enchance the severity of traditional threats. The monitoring of the mental state and processes of leaders and trying to remotely alter these processes using neurotechnology to elicit a favourable response or decision may be used by an adversary. By mapping their brains and neural networks, it may be possible to predict their behavioural pattern and likely decisions. Personnel could be forced to reveal secrets under the influence of neuropharmacological agents or the secrets may be unravelled by scanning their brains. By using brain implants, the mental state, emotional make-up, rationality of thoughts and memories of people can be altered or modified.

20. Stephen E. White, "Brave New World: Neurowarfare and the Limits of International Humanitarian Law," *Cornell International Law Journal*, vol. 41, no. 9, 2008, p.31.
21. Robert Kolb and Richard Hyde, *An Introduction to the International Law of Armed Conflicts* (Oxford: Hart Publishing, 2008), p. 157.

CONCLUSION

Neuroscience and technology will alter the broad contours of today's warfare as well as profoundly affect its nature and character. Dominance in the neurospace will pave the way for achieving dominance in other domains with relative ease by controlling an adversary's collective cognitive processes and activities. The deep insights gained from exploration of the brain and its functioning, and the enormous breakthroughs made in the field of neuroscience have raised a spate of challenges unprecedented and unmatched in modern times.

The issues which need to be tackled in the wake of acquisition and use of neurotechnological capabilities have strong and integrated linkages across a wide range of m*oral, ethical and legal* concerns. The usage of such capabilities in warfare can *manifest in complex and unpredictable ways, having far-reaching and irreversible consequences*. *The calamitous consequences* and dangerous complications to which the use of such technology may lead can only be arrested by proscribing the efforts of developers and users under the provisions of some mutually consented treaties or universally accepted conventions.

APACHE AND CHINOOK DEAL: A PERSPECTIVE

R K NARANG

The Cabinet Committee on Security, headed by Indian Prime Minister Narendra Modi, cleared the purchase of 22 AH-64 Apache attack helicopters and 15 Chinook heavy lift helicopters on September 22, 2015.[1] The AH-64 Apache and Chinook were preferred over the Russian Mi-28 Havoc attack helicopters and Mi-26 heavy lift helicopters after extensive field trials. The deal for the procurement of the Apache and Chinook, amounting to $3.1 billion was signed in the US on September 28, 2015, taking the total cost of procurement from the US to $13 billion since 2007.[2] The deal will help the US consolidate its position as the frontline supplier of defence equipment to India. It includes the supply of 812 AGM-114L-3 Hellfire Longbow missiles, 542 AGM-114R-3 Hellfire-II missiles, 245 Stinger Block I-92H missiles and 12 AN/APG-78 fire-control radars.[3] The delivery is expected to commence within 36-48 months of the signing of the deal. There is an option

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1. "India to Buy Boeing Apache and Chinook Helicopters", *BBC*, September 22, 2015, http://www.bbc.com/news/world-asia-34328801. Accessed on September 25, 2015
2. Rajat Pandit, "India Inks $3.1 Billion Deals for Apache and Chinook Helicopters", *The Times of India*, September 28, 2015, http://timesofindia.indiatimes.com/india/India-inks-3-1-billion-deals-for-Apache-and-Chinook-helicopters/ articleshow/49141174.cms. Accessed on September 29, 2015
3. Ibid.

clause for procurement of an additional eleven Apache and seven Chinook helicopters.[4] Budget constraints had delayed the signing of the deal, which was finalised in 2012, by three years. The deal involves a contract with Boeing for the supply of helicopters through Direct Commercial Sales (DCS) and another contract with the US government for weapons, radars and Electronic Warfare (EW) suites through Foreign Military Sales (FMS). The Apache and Chinook are meant to replace the ageing Mi-35 attack helicopters and Mi-26 heavy lift helicopters respectively of Soviet origin. The Indian Army is simultaneously moving a separate case for 39 Apache helicopters for its aviation wing.[5]

UNDERSTANDING THE ADVANTAGES

The Apache is an attack helicopter in the true sense and would replace the Mi-35 helicopter, which is meant for assault missions with combat troops. Its advanced night vision capability, secure communications equipment and EW suites would help undertake Suppression of Enemy Air Defence (SEAD) and strike missions in the Tactical Battle Area (TBA). It is likely to perform better at higher altitude due to the greater reserve of power.[6] The Apache's air-to-air missiles and night fighting capabilities would enable it to undertake anti-helicopter and anti-UAV (Unmanned Aerial Vehicle) missions.[7]

The Mi-26 lost to the Chinook in the selection for the heavy lift helicopters requirement of the Indian Air Force. The Mi-26 and Chinook CH-47F actually have no comparison when we compare

4. Atul Chandra, "India Proceeds with Apache and Chinook Acquisition", *Flight Global*, September 23, 2015, https://www.flightglobal.com/news/articles/india-proceeds-with-apache-and-chinook-acquisition-417076/. Accessed on September 25, 2015.
5. Manu Pubby, "Here is why Apache and Chinook Helicopters are Game Changers for India", *The Economic Times*, September 23, 2015, http://economictimes.indiatimes.com/news/defence/here-is-why-apache-and-chinook-helicopters-are-game-changers-for-india/articleshow/49067786.cms. Accessed on September 25, 2015
6. Vivek Ahuja, "Why the Apache is a Brute and LCH is Elegant", *Bharat Rakshak*, March 17, 2015, http://forums.bharat-rakshak.com/viewtopic.php?t=6995. Accessed on September 25, 2015
7. "India's $2.5 Billion Purchase: All You Need to Know about the IAF's Shiny New Apache Helicopters", *Firstpost*, September 23, 2015, http://www.firstpost.com/world/indias-2-5-billion-purchase-all-you-need-to-know-about-the-iafs-shiny-new-apache-helicopters-2442874.html. Accessed on September 25, 2015

their Airframe Unit Weight (AUW), being 56,000 kg and 22,668 kg[8] respectively. The Mi-26, with 20 tons payload and ability to carry heavy and bulky equipment like the Bofors guns, Dozer, etc to high altitude regions, has a strategic airlift capability.[9] The Chinook can carry 55 combat troops for assault missions or 11,100 kg of payload and has air-to-air refuelling capability.[10] However, the Chinook has a few capabilities which made it the preferred contender, while outperforming the legendry Mi-26. The lower cost of acquisition and maintenance, envisaged higher serviceability and assured spares supplies have gone in its favour.[11] However, Boeing, the manufacturer of the Apache and Chinook, has also been in the news for the wrong reasons. Boeing was criticised for deliberately overlooking the Full Authority Digital Engine Control (FADEC) malfunction in its inquiry and blaming the pilot for the fatal crash of a Chinook in the UK on June 2, 1994.[12] It has also been accused of inflating prices to exorbitant levels for the supply of spares to the US Army.[13]

LCH VERSUS APACHE

The Hindustan Aeronautics Limited's **(**HAL's) indigenous 5.8 ton class twin engine Light Combat Helicopter (LCH) completed hot and high trials on September 3, 2015 as part of its Initial Operational Clearance (IOC).[14] The landing of the LCH at an altitude varying from 13,600 ft to 15,800 ft, with ambient temperatures varying between 13

8. "US-made Chinook Outshines Russian Mi-26 as Lowest Bidder for IAF's Heavy Lift Chopper Deal", *Defence Now,* http://www.defencenow.com/news/991/us-made-chinook-outshines-russian-mi-26-as-lowest-bidder-for-iafs-heavy-lift-chopper-deal.html. Accessed on September 29, 2015
9. "Mi-26 Halo", http://fas.org/man/dod-101/sys/ac/row/mi-26.htm. Accessed on October 1, 2015
10. n. 8.
11. "India Confirms that Chinook Wins Helicopter Tender", *Russia and India Report,* December 6, 2012, http://in.rbth.com/articles/2012/12/06/india_confirms_that_chinook_wins_helicopter_tender_19589. Accessed on September 29, 2015.
12. Simon Rogerson, "The Chinook Helicopter Disaster", http://www.ccsr.cse.dmu.ac.uk/resources/general/ethicol/Ecv12no2.html. Accessed on September 28, 2015.
13. Nick Schwellenback, "Leaked Audit: Boeing Overcharged Army up to 177, 000 Percent on Helicopter Spare Parts", P*roject on Government Oversight,* June 28, 2011, http://www.pogo.org/our-work/articles/2011/ns-sp-20110623-2.html?referrer=https://www.google.co.in/. Accessed on September 28, 2015.
14. "LCH Becomes First Attack Helicopter to Land at Siachen", *One India,* September 9, 2015, http://www.oneindia.com/india/lch-becomes-first-attack-helicopter-to-land-at-siachen-1857693.html. Accessed on September 29, 2015.

to 27 degree Celsius, is an outstanding achievement for an attack helicopter. Its Shakti engine, which has been jointly developed with the assistance of Turbomeca, France, is optimised for operations at high altitudes with a service ceiling of 6,000-6,500 metres (m). The LCH's Technology Demonstrator-4 model is being prepared for weapon trials scheduled in mid-2016.[15] The LCH would be equipped with the French Giat-Nexter turret gun, four Belgium made 70 mm anti-tank missiles, the indigenous Helina anti-tank missile and the MBDA Mistral-2 air-to-air missiles and EW suits provided by South Africa, and, could prove to be a lean and mean machine in the time to come.[16]

The Apache's greater armour protection would give it greater survivability compared to the LCH, which may have to depend on its manoeuvrability to survive. The LCH, with an empty weight of less than 3,000 kg, is much lighter than the AH-64 helicopter's empty weight of 5,165 kg. The AH-64 with 2,980 KW engine power against 1,700 KW of the LCH engine is able to match the LCH's performance in weight carriage and rate of climb at sea level to medium altitudes.[17] However, the LCH could prove to be more effective in mountainous terrain due to it light weight, greater reserve of power, high rate of climb, and could complement the Apache helicopters, especially in the anti-helicopter and anti-UAV role missions.[18] The LCH could become the first Indian world class combat helicopter and has a large export potential in the decades to come.

PREVIOUS ACQUISITIONS AND FUTURE REQUIREMENTS

India had earlier signed contracts for ten C-17 Globe Master-III, six C-130J Super Hercules and eight P-8i maritime reconnaissance aircraft worth $10 billion from US firms.[19] India had also signed a

15. Smriti Jain, "HAL's LCH: Made in India Combat Helicopter Eyes Weapon Firing Trials", *The Economic Times,* September 18, 2015, http://economictimes.indiatimes.com/news/defence/hals-lch-made-in-india-combat-helicopter-eyes-weapon-firing-trials/articleshow/49010728.cms. Accessed on September 29, 2015
16. Franz-Stefan Gady, "What's the Status of India's Light Combat Helicopter?", *Diplomat,* September 8, 2015, http://thediplomat.com/2015/09/whats-the-status-of-indias-light-combat-helicopter/. Accessed on September 29, 2015.
17. Ahuja, n. 6.
18. B. S. Pawar, "Indian Light Combat Helicopter vs Chinese Z-10Attack Helicopter" *Scholar Warrior,* Autumn 2015, pp. 129-134.
19. n. 7

$640 million deal to procure 75 Pilatus PC-7, Mk-II, single engine turboprop basic trainer aircraft (Rs 2,900 crore) from the Swiss company Pilatus Aircraft Limited in May 2012.[20] The Defence Acquisition Council of India has also cleared a deal for 48 Mi-17 V-5 worth $ 1.1 billion (Rs6,996 crore).[21] Similarly, the Rafale deal[22] and an agreement to co-produce the Ka-226 helicopter in India would fulfil the needs of the Indian armed forces.[23] The offset clause in the case of the Ka-226 would be met with limited transfer of technology. The production of the coaxial Ka-226 would be a useful experience for the Indian industry.

The answer to whether we could have done without the deal may not be easy in view of depleting fleets and emerging security challenges. The proactive approach followed by the government is a welcome change in meeting the immediate requirements of the armed forces rather than making them wait for decades. However, this beginning needs to be followed up by formulating and executing a long-term approach to achieve indigenisation, and the reasons for the need for such an approach are covered subsequently in this paper.

The import bill has already touched 70 percent of total procurements and may go up with these deals. These deals, though necessary, have not helped in the "Make in India" campaign. There has been no worthwhile transfer of technology or offsets in all these deals. The risk of withdrawal of technical support during a conflict is always a possibility, in view of the changing dynamics in

20. "India Signs $640-mn deal for 75 Pilatus Trainers", *India Strategic,* May 2012, http://www.indiastrategic.in/topstories1552_India_signs_$640_mn_deal.htm. Accessed on September 26, 2015.
21. "India Goes Ahead with Purchase of 48 Russian Mi17-V5 Choppers", *Russia and India Report,* September 02, 2015, http://in.rbth.com/economics/defence/2015/09/02/india-goes-ahead-with-purchase-of-48-rusian-mi17-v5-choppers_394039. Accessed on September 27, 2015
22. "Rafale Deal: France Says No to Offset Clause, Yes To Make In India", *The Economic Times,* August 16, 2015, http://economictimes.indiatimes.com/news/defence/rafale-deal-france-says-no-to-offset-clause-yes-to-make-in-india/articleshow/48500832.cms, accessed on September 27, 2015.
23. Aman Sharma, "Make In India: Russia Wants Co-Production of KA-226 Choppers to Start as Soon as Possible",*The Economic Times,* August 28, 2015, http://economictimes.indiatimes.com/news/defence/make-in-india-russia-wants-co-production-of-ka-226-choppers-to-start-as-soon-as-possible/articleshow/48713931.cms. Accessed on September 25, 2015.

international relations.[24] The provision of the maintenance support package gives Boeing and the US government complete control over critical spares, which could become a major vulnerability in the case of hostilities. The aspiration for the best would only keep us dependent on foreign vendors forever, which is never a desired condition, especially in the field of defence equipment. Defence equipment is never cheap and the cost of spares, maintenance and future upgrades would continue to cost the taxpayers' money. All these issues do raise questions on our approach to indigenisation. India has shown that in the space arena, it can achieve indigenisation in critical advanced technologies. India was facing sanctions after the nuclear bomb test in 1998 and Indian Space Research Organisation (ISRO) was denied access to cryogenic engines for its Global Satellite Launch Vehicle (GSLV) programme. However, our scientists overcame these challenges and undertook successful missions to the Moon and Mars at much less cost.[25] Similarly, there is a need make a blueprint for achieving indigenisation in the defence sector.

CONTRASTING INDIGENISATION

Indigenisation is the key to India achieving the dream of becoming a regional power. Many countries have tried different ways to achieve this. The approaches of the US, China and Pakistan are worth mentioning and are discussed subsequently.

The Berry Amendment,[26] the Bayh Amendment, the Buy American Act 1933,[27] and the National Defence Authorisation Act 2006 of the US require that defence procurement is to come from

24. "Sudan Foreign Military Assistance", http://www.photius.com/countries/sudan/national_security/sudan_national_security_foreign_military_ass~1815.html. Accessed on October 05, 2015.
25. Sudha Ramachandran, "India's Impressive Space Program", *The Diplomat*, October 13, 2014, http://thediplomat.com/2014/10/indias-impressive-space-program/. Accessed on November 10, 2015.
26. Valerie Bailey Grasso, "The Berry Amendment: Requiring Defense Procurement to Come from Domestic Sources", *FAS*, February 24, 2014,https://www.fas.org/sgp/crs/natsec/RL31236.pdf. Accessed on September 25, 2015.
27. Alan W.H. Gourley, John E. McCarthy, Jr. and Adelicia R. Cliffe, "Federal Restrictions on Participation by Foreign Investors in Defense and Other Government Contracts", *Manual of Foreign Investment in the US*, 2009, https://www.crowell.com/documents/2009-Federal-Restrictions-on-Participation-by-Foreign-Investors-in-Defense-and-Other-Government-Contracts.pdf. Accessed on September 25, 2015.

domestic sources and have put restrictions on the US armed forces importing defence equipment.

The Chinese had realised this as early as in the 1950s when they started modifying aircraft, and commenced indigenisation. They established aeronautics universities, modified imported aircraft, and produced less capable indigenous aircraft. Their aircraft were often brushed aside being of low technology, and less capable. However, despite all this, the Chinese have been able to build a military aviation industry that others would be envious of. They are still not the best but good enough to meet their defence needs. Their way of acquisition of technology may not be ethical, but they have built the capability and have become major exporters of defence equipment, surpassing even the major suppliers in some areas. The US has been forced to take note of the progress made by China in the development of defence equipment, including military aircraft. The US National Defence Authorisation Act 2000, stipulates that the US Department of Defence (DoD) should submit an annual report on the military and security developments in China.

Pakistan too realised the importance of indigenisation early enough and signed a deal for the basic trainer, Mushak, with transfer of technology, with the Swedish company, in 1974. The imposition of sanctions by the US due to the Pressler Amendments in the 1990s, forced Pakistan to take the task of indigenisation seriously and expedite the process. Pakistan has also received transfer of technology for the Falco UAV from the Selex Company of Italy and given impetus to "Make in Pakistan". The upgraded Super Mushak trainer aircraft has been exported to Saudi Arabia and Iraq. Pakistan has succeeded in developing small to medium UAVs, and Integrated Dynamics of Pakistan is exporting UAVs to Australia, Spain, South Korea and Libya and the United States.[28]

CHALLENGES OF INDIGENISATION

Security needs and indigenisation are contradictory requirements The procurement plan based on security needs would involve

28. Riaz Haq, "Pakistan's Defense Private Sector Emerges with Indigenous UAV Technology", *Dinar Standard,* February 12, 2009, http://www.dinarstandard.com/pakistans-defense-private-sector-emerges-with-indigenous-uav-technology/. Accessed on October 05, 2015.

procurement of equipment based on the most stringent Qualitative Requirements (QRs), whereas indigenisation may require some relaxation of QRs to support and promote indigenous industry. Indigenisation of defence equipment in India has not got the impetus, it needs. These contracts often result in cancellation of indigenous projects, resulting in further dependence on foreign vendors. The R&D agencies, despite huge investment, sometimes work on new designs, either without the involvement of its key stakeholders (armed forces) in the critical design phase or they have a limited role. The armed forces come into the picture only at the time of trials and testing of prototypes. Hindustan Aeronautics Limited (HAL)[29] and the R&D agencies have come up with many designs like the Krishak, Pushpak, HT-2 trainer, HF-24, HF-24 Mk-II (a.k.a. HF-73), HJT-16 Kiran, HTT-34, IJT, LCA, ALH, armed ALH, LCH, Cheetal, LUH, etc. but have either failed to cross the threshold or ended up in limited production. Aviation assets have a very long life, if persisted with, and improvised on. The Apache and Chinook are upgraded versions of 40-50-year-old designs and are likely to stay another 40-50 years in the IAF's inventory.

The technical difficulties being faced by our indigenous manufacturers are not uncommon in aviation history. Many leading arms manufactures have faced similar difficulties and failures, however, they do not expose their failures. The Lockheed Martin F-104 was called the "flying coffin" as 50 percent of aircraft in Canada were lost in crashes.[30] Boeing, the contractor for the AH-64 Apache, had designed the Boeing-787, which has been grounded time and again the world over for various problems, which include the engine, fuel leaks, hydraulic, heating of batteries and other design defects and has run into huge cost overruns.[31] The famous F-22 fighter programme was described as a "broken system" by the former Lockheed F-22

29. "Our History", *Hal India,* http://www.hal-india.com/Our%20History/M__111. Accessed on September 28, 2015.
30. Robert Farley, "The Five Worst Fighter Aircraft of All Time", *National Interest,* October 12, 2014, http://nationalinterest.org/commentary/the-five-worst-fighter-aircraft-all-time-9695?page=2. Accessed on September 27, 2015.
31. Christopher Harress ,"Boeing 787: A Complete Timeline of the Dreamliner's Legacy of Failure, After Cracks Discovered in Wings", *International Business Times,* March 10 2014, http://www.ibtimes.com/boeing-787-complete-timeline-dreamliners-legacy-failure-after-cracks-discovered-wings-1560491. Accessed on September 27, 2015.

programme chief himself and has seen exorbitant cost escalation, technical glitches and undue delays.[32] The F-22 report brings out how the design team worked in isolation and ignored the users, and the result is apparent.

The participation of the private sector is being incorrectly associated with the increased investment in the R&D and innovations in the aviation field. The expectation from the private players that they would invest huge amounts of money for the design and development of critical defence technologies, especially in the backdrop of limited and unsure orders, is rather unrealistic. The recent collaborations by Indian private sector companies with the world's leading arms manufacturers indicate that these collaborations are limited to production and assembly of products. The participation of the private sector is likely to be useful for production, or speeding up production. Therefore, the Public Sector Undertakings (PSUs) would continue to be key players in design and development of critical technologies. However, the expertise of private sector companies in manufacturing and supply of ancillary equipment could help in increasing productivity.

The Apache and Chinook deal was indeed a necessity to meet the operational requirements of the IAF. However, the procurement of the large number of defence aircraft from foreign vendors is an indicator of our failure to indigenise military aircraft, despite such a long history of indigenisation, elaborate R&D set-ups and government support. These defence contracts do not show India being in the league of the major world powers. We may be almost there, but there is something missing, which is preventing us from becoming a major aviation power. Smaller nations, with less ambitious goals, have done much better. China, despite being viewed as a copycat, has slowly established itself as a major world power through indigenisation.

The development of a large number of aircraft by HAL and other agencies and then shelving them appears to be work without a definite goal. There is a tendency in India to view military aircraft development projects as projects of the respective R&D organisation, and not as

32. Ralph Vartabedian and W.J. Hennigan, "F-22 Program Produces Few Planes, Soaring Costs", *Los Angeles Times,* June 16, 2013, HTTP://WWW.LATIMES.COM/BUSINESS/LA-FI-ADVANCED-FIGHTER-WOES-20130616-DTO-HTMLSTORY.HTML. Accessed on September 27, 2015.

national projects. The lack of long-term goals, involvement of key stakeholders, taking ownership, transparency in the functioning of the R&D agencies and coordination among various stakeholders are some of the key areas needing immediate attention. Aviation designs take decades to mature and once they are perfected, may stay in the Service for decades, and could result in disproportionate dividends. There is a need to design aircraft indigenously and thereafter persist with successful designs.

As a whole, imports will always be expensive, while indigenous equipment would always be a better option. The Indian armed forces' equipment deficiencies would be best met though indigenisation. Also, "Buy Indian" would mean that the money would go to Indian workers and companies. The profits would remain in India and our government would be more willing to fund indigenous projects. Finally, if India has to emerge as a global power, it would have to indigenise, and purchase advanced technologies only as an exception.

CONCLUSION

The deal for the procurement of the Chinook and AH-64 Apache helicopters was a much needed and timely decision to meet the operational needs of the IAF. The decisions by the government in the last one and half years may appear to have increased the import bill, however, they also indicate the long standing neglect to meet the requirements of critical equipment and defence preparedness. The above decision should, in a way, be applauded. However, I have viewed it from a different perspective, of our long-term goals and factors impacting our preparedness as a country and these include the indigenisation process, impact of defence deals on indigenisation and possible ways of making indigenisation a success to bring down the import bill. History shows that although we have been working on "Make in India", however, most indigenously designed aircraft designs have not survived. All the stakeholders involved in the indigenisation process i.e. the government, R&D agencies, armed forces and private sector have to ensure that the country edges towards this goal in a progressive manner. The government may have to carry out a detailed audit and bring all these stakeholders on one platform to make "Design and Make in India" a success. The indigenous

designs should be developed and nurtured simultaneously if we are to succeed in developing indigenous military flying machines. The indigenous flying machines would not only meet our defence needs but also have the potential to become a source of revenue for the country.

Imports consume a huge percentage of our defence budget. The procurement of indigenous defence equipment could help in creating jobs through the Indian defence manufacturing industry. This could help in meeting our defence needs at a lower cost and give us greater political and diplomatic independence to conduct our affairs. Imports should be resorted to only till such time that capability is created through indigenous R&D. "Design and Make in India" is the only way, India can reduce its import bills, meet the operational needs of its armed forces and become a truly global power.

CRUISE MISSILES IN FUTURE WARS: INDIA'S PROSPECTS

VIVEK KAPUR

INTRODUCTION

Cruise missiles have been present in the military space for decades. In fact, the first rudimentary cruise missiles were developed as early as during the period of World War I. The world has been witness to the use of long range cruise missiles by the US on several occasions when it wanted to strike targets located at difficult to access areas, when the direct approach of its manned military elements was constrained by geography and/ or political considerations, and when it wanted to keep its own military personnel out of harm's way. Thus, the Gulf Wars of 1991 and 2003 saw extensive use of American Tomahawk long range subsonic cruise missiles; as also in the US strikes at suspected Al Qaeda locations in Taliban ruled Afghanistan after the 9/11 event in the US. US military action in erstwhile Yugoslavia also saw extensive strikes by cruise missiles. In fact, most US military interventions have involved BGM-109 "Tomahawk" Land Attack Cruise Missiles (LACMs) being used for strikes at targets within the conflict zone. Most recently, Russia, in its ongoing military engagement in Syria, used a strike by 26 long range cruise missiles, launched from Russian naval vessels operating in the Caspian

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Sea, against 'terrorist' targets in Syria.[1] These missiles, fired from a distance of 1,500 km from the targets, highlight the maturity of Russian military technology to levels of capability hitherfore held by the US alone. The obvious military utility of such weapons calls for a more detailed examination of the technology and its application in the force structure of modern military forces.

BACKGROUND AND CRUISE MISSILE DEVELOPMENT

The first attempt at developing an unmanned vehicle to fly through the air and impact on enemy targets was developed as early as during World War I by Orville Wright and Charles F. Kettering. Given the rudimentary technology then available, this craft called the "Kettering Bug" used a simple gyroscope-based system for maintaining directed flight.[2] It was to be launched in the direction required to reach the target. The range to target was used to determine the number of engine revolutions needed to reach the target. At this point, through a simple mechanism, its wings were made to fall off, resulting in the explosives laden fuselage falling onto the target to cause damage. While precision accuracy was not achievable, this experiment is often claimed to be the development of the first cruise missile. The "Kettering Bug" was not used in actual combat and remained a curiosity and technology demonstrator.

During World War II, the Germans deployed their Fi-103 / V-1 "Buzz Bomb".[3] This weapon was ready by 1943 and was first used operationally in June 1944. The weapon was a simple design. It utilised a streamlined winged fuselage packed with explosive charge and simple stabilisation and direction maintenance devices based on the use of gyroscopes. It had a simple pulse jet engine, positioned above the rear fuselage on a strut, for propulsion. For range determination, a simple rotating counter was powered by a small airscrew mounted

1. Brendan McGarry, "Strike Highlights Russia's Advances in Cruise Missile Technology", *Defence Tech,* October 8, 2015, http://defensetech.org/2015/10/08/strike-highlights-russias-advances-in-cruise-missile-technology/. Accessed on October 10, 2015.
2. Jimmy Stamp, "Unmanned Drones Have Been Around Since World War I", *Smithsonian,* February 12, 2013, http://www.smithsonianmag.com/arts-culture/unmanned-drones-have-been-around-since-world-war-i-16055939/?no-ist. Accessed on October 9, 2015.
3. "Fi-103/V-1 Buzz Bomb", *Warbird Resource Group*, http://www.warbirdsresourcegroup.org/LRG/v1.html. Accessed on October 9, 2015.

on the nose.[4] This gave the weapon area bombing ability sufficient to engage targets such as large cities. The weapon was used to mount area attacks on London, commencing June 1944. The weapon flew in a fixed height band and was slower than most contemporary fighters which enabled several successful intercepts of V-1 missiles in flight by aircraft of the British Royal Air Force's (RAF's) fighter command. The thought towards utilisation of unmanned weapons to fly into enemy territory and destroy targets was not restricted to Germany. In 1941, the US Navy (USN) initiated a project to develop unmanned flying craft that could be used to directly impact on targets or alternatively drop bombs on the target as part of its "assault drone" project.[5] The project saw some success though it could not be scaled up in numbers. The result was the TDR-1 twin-engined drones that were controlled by means of radio controls on escorting TBM-1 "Avenger" aircraft.[6] A TV screen, coupled to a radio remote control system in the rear cockpit of the "Avenger" was used for terminal guidance to direct the drone at its target. These were used operationally on September 27, 1944, when the US Navy used TDR-1 drones to destroy a Japanese anti-aircraft battery.[7]

Interest in the unmanned attack weapon only increased after the end of World War II. The ability to destroy enemy targets with no friendly personnel being exposed to danger in the process is an attractive concept with universal appeal. The US saw several projects aimed at developing long range unmanned attack systems. One branch of this effort was directed towards ballistic missiles, which by their nature were unguided weapons with very long range. A parallel effort was directed towards development of air breathing unmanned missiles that flew like aircraft but without any crew on board. Early American development was focussed on trials of captured German V-1 missiles. These V-1s were copied and experimented with to fully understand and internalise their technology. Then, the erstwhile manned aircraft were modified through the addition of stabilisation and guidance systems to "jury rig" cruise missiles. The next step was to develop dedicated cruise missiles *ab initio*. An early example was

4. Ibid.
5. Lawrence Spinetta, "The Rise of Unmanned Aircraft", October 11, 2010, http://www.historynet.com/the-rise-of-unmanned-aircraft.htm. Accessed on October 9, 2015.
6. Ibid.
7. Ibid.

the subsonic Regulus-I cruise missile used from naval vessels.[8]Another notable example of this effort was the US SM-62 "Snark" cruise missile which had intercontinental range, and was able to fly out to over 9,600 km, achieving a speed of Mach 0.94 with its turbojet engine.[9] This weapon carried a nuclear warhead. The SM-62 used an Inertial Navigation System (INS) with celestial navigation inputs for updates but its terminal accuracy was at best between 40 km and 7 km, making it usable only as a nuclear weapon delivery system, with no tactical / conventional utilisation.[10] This missile was made obsolete by ballistic missiles and saw very limited deployment.[11] Later developments of cruise missiles in the US led to the very capable McDonnell Douglas, later Raytheon BGM-109 "Tomahawk" cruise missile. Developments in new technologies, especially computing technology, made this weapon possible and delivered terminal accuracies that made its operational use feasible for the first time in the 1970s. The Tomahawk cruise missile is made in versions for specialised tasks from anti-ship strikes to the much more demanding land attack variants. The effort to develop cruise missiles was evident in the Soviet Union as well. However, as the Soviets lacked the capability in electronics and computing that was possessed by the US, most of the Soviet cruise missiles were developed for the relatively easier target system of anti-ship attacks and to deliver nuclear payloads. In the case of ship attacks, it was easier to detect, track, and home onto large metal objects operating in the relatively uncluttered environment of the sea background. For attacks on land, a nuclear payload made precision guidance and the attendant need for advanced electronics technology redundant. Thus, several Soviet era cruise missiles were developed and put into operation for the anti-ship role and to deliver nuclear weapons.

IMPORTANT COMPONENTS AND TECHNOLOGIES

Cruise missiles are, as has been seen, fairly old weapons that incorporate the most cutting edge technologies as well. This apparent paradox is easier to unravel by examining the component parts of a

8. "Fast Attacks and Boomers", *American History,* http://www.americanhistory.si.edu/subs/weapons/armament/missiles/index.html. Accessed on October 10, 2015.
9. Encyclopedia Astronautica, "Snark", http://www.astronautix.com/lvs/snark.htm. Accessed on October 10, 2015.
10. Ibid.
11. Ibid.

typical cruise missile. The major components of a cruise missile are described below:

Airframe

The airframe of a cruise missile is very similar to that of an aircraft. A few cruise missiles have been built to sizes almost as large as contemporary fighter aircraft. An example of this type is the American Regulus which was similar in size to an early model American jet fighter like the P-80 "Shooting Star" or the F-86 "SabreJet". Soviet equivalents were the KSR-2 / AS-5 "Kelt".[12] The airframe of cruise missiles requires technology similar to that for building regular manned aircraft in terms of materials as well as aerodynamics, etc. as the cruise missile utilises aerodynamic lift during flight like an aircraft. With time, the trend became to reduce the size of the cruise missiles in order to enable more to be carried on a greater number of platforms and to reduce their detectability by the opposing forces. This trend towards reduced detectability also saw the introduction of non-metallic structures such as carbon composite materials for the airframes of cruise missiles in order to reduce the Radar Cross-Section (RCS) and, hence, detectability of the missile by defensive radar systems. Here again, the technology mimicked that which was available for regular aircraft. Any country able to build even light aircraft, possesses the technology to construct cruise missile airframes. Initially, a large number of short range cruise missiles came to be designed and built. At shorter ranges, the issues of target detection, tracking and guidance were less problematic. At these ranges, rocket motors and a boost glide powered flight profile also sufficed. Long range cruise missiles required propulsion systems similar to those on aircraft as rocket motors proved inadequate in delivering long cruise ranges. In addition, these needed effective and accurate navigation systems to bring them close enough to their targets for the terminal guidance system to be effective. Long range cruise missiles also needed greater aerodynamic lift than short-range missiles due to lower overall speeds.

Propulsion System

The very first experiment with unmanned missiles, the "Kettering

12. Carlo Kopp, "Soviet / Russian Cruise Missiles", August 2009, http://www.ausairpower.net/APA-Rus-Cruise-Missiles.html#mozTocId478484. Accessed on October 11, 2015.

Bug" used the then state-of-the-art in power plants, a piston engine. Later, the American TDR-1, which was essentially a remote controlled version of a regular manned aircraft, flew with standard aviation piston engines. The Germans were the first to utilise a new technology in terms of the Fi-103's pulse jet engine. In the post World War II years, as jet engines became the standard power plant for military applications, most utilised jet engines, though, at times, a few incorporated rocket boosters for the initial launch phase, especially for launch from the ground. These rocket boosters could be jettisoned after launch of the vehicle. Early cruise missiles were quite large and so their power plants were similar to those in use on fighter aircraft. In later years, as the size of cruise missiles reduced, and the use of rocket motors became more prevalent. Rocket motors had been used on earlier cruise missiles as well. The Soviet KSR-2 / AS-5 "Kelt" used a rocket motor to power it to very high supersonic speeds.[13] The shorter range cruise missiles such as the British Sea Eagle, French Exocet, Soviet P-15 Termit / SS-N-2 Styx, etc. adopted the mature and relatively easily available solid fuel rocket motor as the power plant of choice. For longer range applications, the rocket motor, despite the two-stage configuration of the booster for initial launch and a sustainer rocket motor for long range cruise, proved inadequate. Hence, small jet engines were developed for use on long range cruise missiles. These small jet engines became a crucial enabling technology for the development of long range cruise missiles and, hence, were closely controlled by the more advanced nations.

The range performance of jet powered cruise missiles depends upon the fuel carried and the fuel consumption characteristics of the engine. This latter point has driven the adoption of more fuel efficient turbofan engines over the earlier pure turbojet engines. There are no current examples of propeller [piston engine or turbo-propeller (turboprop)] engined cruise missiles. However, these are possible technologically.

Navigation System, Target Detection and Guidance System

The flight of the weapon towards the desired target is a major problem that increases appreciably once the range to target is increased. Here, the anti-ship weapon faced a much less difficult situation.

Most typically, a radar seeker in the nose of the anti-ship cruise

13. Ibid.

missile was able to detect and lock on to the radar return from metallic ships against the background of water to help guide the weapon towards its target with adequate accuracy. This active radar was extensively used for anti-ship cruise missiles. These could be launched in the known direction of the target ship, using inertial guidance, based on a gyro stabilised platform onboard. Once within the onboard radar's range capabilities, the weapon could detect the target on its own on its radar and guide itself till impact. A small computer able to generate commands for the flight control system, based on the missile's flight path and the exact relative location of the target, was incorporated into the control system. Such a guidance system proved adequate for use at sea, though even in this relatively benign environment, heavy sea conditions did influence the efficacy of the guidance system.

Over land, most targets did not provide the level of radar contrast found at sea and so problems were encountered. For relatively short ranges of about a few tens of kilometres, the use of the Inertial Guidance System (INS) was incorporated to take the missile till the vicinity of the target. Thereafter, for some targets, Infra-Red (IR) detection and tracing could be used, while at other times, radio link with optical tracking of targets was resorted to. For long range cruise missiles, the problems of navigation remained. One solution was to utilise very accurate, hence, also expensive, INS. Even the best INS, however, suffers from gyro drift and attendant inaccuracies. Therefore, means of updating the INS were sought. One solution was to update the position of the inertial platform over waypoints, easy to clearly distinguish pinpoints whose exact coordinates were known, on the track of the missile. The updating could be done by the use of optical / TV or other means. In later years, once the US Navstar Global Positioning System (GPS) satellite navigation system became operationally available, its signals were used to update the errors of the INS, thus, increasing navigational accuracy. GPS signals can be jammed, and so several missile designers opted to stay away from using GPS as the only device to guide the missile and instead retained the INS with a method of constantly comparing the position information from both the INS and GPS, and following the more accurate one, while constantly using each to update the other, a method called "Kalman Filtering".

Advances in computing technologies of high power computers,

along with the products of space technology, allowed the US to accurately map large areas of the planet with high accuracy and to retain this information in digital form. This led to a technique called Terrain Contour Mapping (TERCOM). In this technique, accurate digital maps of the route to be flown were stored onboard a computer in the missile. Onboard electronics scanned the terrain in the vicinity of the missile while it was in flight and compared terrain features with the stored data to determine the position of the missile. This data could now be used to update the missile's INS, alternatively, it could also be utilised to execute the navigation on its own. The latter was rare as the missile anyway required to be stabilised in flight and so usually had an INS onboard. Once in the vicinity of the target, the missile could impact on pre-fed geographical reference coordinates or could open up a terminal seeker using IR, TV [comparing the viewed image with target images stored in the memory of the missile's computer, a technique called Digital Scene Matching Area Correlation (DSMAC)].

These new techniques relied upon very high computing and digital data storage capabilities. These new niche capabilities were developed first in the US which gained a leadership position in the field of computing and aviation electronics (avionics). Hence, the first country to field these high performance and very accurate long range cruise missiles was the US, the most widely known and used cruise missile being the BGM-109 "Tomahawk" Land Attack Cruise Missiles (LACM). This missile was developed into versions that could be launched from land-based launchers, from surface ships, submarines and also from aircraft. This made the Tomahawk a very potent weapon. The missile showed that it could fly out to ranges of more than 2,000 km and strike targets with remarkable accuracy. This technology was not initially available with other countries and came to symbolise US military power, and was a unique US capability unmatched elsewhere in the world.

Payload

Early long range cruise missiles, due to their inherent accuracy, carried nuclear payloads till such time as these were replaced by ballistic missiles in the nuclear attack role. However, even today, some

cruise missiles, despite much greater accuracy, do have a nuclear attack tasking. Once navigation and target engagement accuracies improved through application of the technologies discussed in the previous section, the payload on cruise missiles changed to include high explosive either in monolithic general explosive configuration or specialised blast, penetrator or cluster configurations based upon the targets envisaged to be engaged. The payload of most cruise missiles lies between 300 kg and 1,000 kg.

THE OPERATIONAL ADVANTAGE OF CRUISE MISSILES

Long range cruise missiles retain great relevance for modern armed forces. Other means of striking targets located at large distances are fighter-bomber / bomber aircraft and ballistic missiles.

Ballistic missiles, especially long range ballistic missiles, have been associated with nuclear payloads apart from issues with their accuracy which is in most cases inadequate to engage targets through the use of conventional explosives. There are also fears that detection of launch of long range ballistic missiles may trigger a precautionary nuclear response from the adversary. Hence, ballistic missiles are not counted as a viable means of hitting distant targets with conventional weapons. An exception to this could be the Chinese DF-21D which is touted to be an aircraft carrier killer through the addition of a terminal seeker to the ballistic missile.

Manned aircraft, whether fighter-bombers or bombers require penetrating what in all likelihood is contested air space to approach close enough to engage their targets. In the process, it is expected that the attacking force is likely to suffer some attrition due to enemy interceptors as well as ground-based defensive systems. Even after negotiating these defences, the manned aircraft could fail to accurately hit the target. Moreover, the military and political implications of aircraft being shot down in enemy territory could dictate that such missions not be undertaken at all.

Cruise missiles, in the first two decades after World War II, were configured primarily for the nuclear attack role. The more recent widespread use of conventionally armed cruise missiles in many scenarios the world over has helped fix cruise missiles in the general consciousness and in the military mind, as conventional weapons

the use of which, should not automatically trigger a nuclear fear or response. This stands in sharp contrast to ballistic missiles which are seen as nuclear armed weapons. In addition, the fact that friendly lives are not put at risk during execution of cruise missile attacks opens up the military strike options for the military possessing these weapons.

In view of these aspects, cruise missiles are likely to proliferate more and become an essential part of the structure of most modern military forces.

Russia's cruise missile strikes against terrorist targets in Syria launched from its naval vessels in the Caspian Sea have demonstrated that the US monopoly over the long-range precision strike is over. Russia has showcased its ability to reach out and hit targets at large ranges very accurately in this strike.

DEVELOPMENT OF CRUISE MISSILES IN INDIA: FUTURE PROSPECTS

India has used imported anti-ship cruise missiles that entered service aboard imported warships from the erstwhile Soviet Union and also imported British Sea Eagle anti-ship cruise missiles to equip its maritime strike squadrons. Now, India is in the process of importing American Harpoon anti-ship cruise missiles as part of the modernisation of its armed forces. Alongside this process, India has also co-developed the BrahMos supersonic cruise missile with Russia. This weapon is a variant of the Soviet era supersonic cruise missile with upgraded guidance systems to give it precision land attack capability that the Soviet era weapon lacked. The Russian contribution to the BrahMos project has been the airframe and power plant, while India has contributed substantially to the missile guidance and target engagement system aboard the Brahmos.

India first developed a small unmanned flying craft in the form of the Lakshya Pilotless Target Aircraft (PTA) designed by India's Defence Research and Development Organisation (DRDO) and built by Hindustan Aeronautics Limited (HAL).[14] This small vehicle is powered by a small jet engine, the PTAE-7, built by HAL itself.[15] The

14. "HAL Delivers Pilotless Target Aircraft Lakshya", *Defence Security India,* July 27, 2013, http://defencesecurityindia.com/hal-delivers-pilotless-target-aircraft-lakshya/. Accessed on October 10, 2015.
15. Ibid.

Lakshya uses a small rocket booster to assist its launch. HAL is now reported to be developing the Lakshya Mk-II which has been designed by the Aeronautical Development Establishment (ADE).[16] DRDO is also developing the Nirbhay subsonic long range cruise missile.[17] This missile is launched by a rocket booster and then powered by a small turbojet engine in cruising flight.[18] There are also plans to develop a small turbofan for this weapon system in the future.[19] The Nirbhay has undergone at least two test flights. In the first test, the Nirbhay strayed from its pre-planned path after 250 km of flight and was intentionally destroyed as a precautionary measure.[20] The second test flight saw it achieving a distance of 1,000 km at Mach 0.7 with a claimed terminal accuracy of 10 metres.[21] India is reported to have imported from Russia 200 NPO Saturn TRDD-50MT small turbojet engines,[22] which could form a back-up to the new turbofan engine being developed for the Nirbhay.

With the BrahMos programme, including the avionics for its navigation and accurate guidance to hit land targets, in addition to avionics such as the Direction Attack and Ranging Inertial Navigation (DARIN) series of accurate navigation systems, access to the GPS, Russian Global Navigation Satellite System (GLONASS) and the new under development Indian Regional Navigation Satellite System (IRNSS), India has all the building blocks required to develop cutting edge cruise missiles. The Lakshya programme and the Nirbhay test flights have shown the ability to design and build small effective airframes. With the experience of the Lakshya, its PTAE-7 engine and the HAL small turbofan engine HTFE-25, the power plant issues should be within reach for the cruise missile programme. India appears well on its way to develop advanced long range cruise missiles with accurate guidance and precision strike capability. Such

16. Ibid.
17. "India's Nirbhay Cruise Missile to Have Turbo Fan Engine", *Defense World*, January 13, 2015, http://www.defenseworld.net/news/11896/India___s_Nirbhay_Cruise_Missile_To_Have_Turbo_Fan_Engine#.Vhzc9CuxUxs. Accessed on October 12, 2015.
18. Ibid.
19. Ibid.
20. James Hardy, "India Successfully Tests Nirbhay Cruise Missile", *IHS Janes Defence Weekly*, October 16, 2014, http://www.janes.com/article/44688/india-successfully-tests-nirbhay-cruise-missile. Accessed on October 12, 2015.
21. Ibid.
22. Ibid.

indigenous cruise missiles would be an important complement to the Indian Air Force's (IAF's) long range strike capability and should open up more military options for the nation's leadership.

CONCLUSION

The first cruise missiles or unmanned guided aerial weapons were developed in the very first decade of modern aviation, when the Dayton Wright / Kettering "Liberty Eagle / ("Bug") was successfully tested in November 1917, with orders placed by the US government in 1918.[23] However, these came to a level of maturity that allowed their operational utilisation only in the later years of World War II. The most widely known such weapon was the German Fi-103 / V-1 "Buzz Bomb" though the American TDR-1 guided drones also saw operational utilisation in the Pacific theatre of operations. The years after World War II saw further development of increasingly more accurate cruise missiles. While short range cruise missiles were the first to see widespread deployment advances in technology, the information processing technology saw the US introducing long range accurate cruise missiles.

Proliferation of information technology and an understanding of the crucial sub-components that go to make an effective long range cruise missile have led to more countries obtaining long range cruise missile capability. The recent cruise missile precision strikes in Syria by Russian ships operating in the Caspian Sea demonstrated that Russia too has precision strike capability with long range cruise missiles to match capability hitherfore available only with the US. Other countries that have the technological building blocks for long range cruise missiles are in the process of developing these weapons due to their immense operational utility. China is developing long range cruise missiles such as the DH-10 and India is in the process of developing the Nirbhay cruise missile. With time, even greater proliferation of this crucial technology can be expected, while existing producers could be expected to incorporate more features and lethality in existing designs.

23. Andreas Parsch, "Dayton Wright/Kettering Liberty Eagle ("Bug")", http://www.designation-systems.net/dusrm/app4/bug.html. Accessed on December 4, 2015.

NUCLEAR SECURITY AND CIVIL SOCIETY ORGANISATIONS

MANISHA CHAURASIYA

States are responsible for nuclear security, but that doesn't mean that civil society has no role to play. On the contrary, we need civil society to put the right questions to government and politics and make them focus their attention to nuclear security.

– Mr. Kees Nederlof [1]

The exploitation of nuclear technology by man rightly deserves exceptional and infallible security procedures and arrangements. The eight decades of coexistence with 'nuclear' reinforces this belief. Its extraordinary nature is due to the element of contrasting 'duality' of nuclear technology. On the one hand, nuclear technology has apocalyptic consequences when used as a weapon, and, on the other, it is a thriving source of clean energy when used for power generation purposes. The demonstration of the former potential was witnessed in Hiroshima and Nagasaki at the dusk of the Cold War, which marks the first and only use of nuclear weapons in history. The

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1. Mr. Kees Nederlof, who was the sherpa for the Nuclear Security Summit, belongs to the Dutch Ministry of Foreign Affairs. He spoke at a seminar, "'Nuclear Security Process and the Role of Civil Society" in 2013. For details, see Mr. Kees Nederlof, "Nuclear Security Process and the Role of Civil Society ", *Stimson,* http://www.stimson.org/images/uploads/research-pdfs/13_Kees_Nederlof_Reception.pdf. Accessed on June 29, 2015.

latter potential of civilian usage however, is popular and happens to be economical, clean and qualitatively superior to all the former ways of energy generation in the history of mankind. The widespread nuclear technology and materials all over the world cause concerns regarding their security. This paper touches upon the various actors involved in the process of nuclear security and evaluates the role of civil society groups in the same. An analysis from the past to the present trends and the growing upsurge in their contemporary activities and advocacies are central to the paper.

Nuclear security is important as there is a probability of the technology turning from boon to bane. The following are some threats that haunt mankind and call for immediacy of attention on plural and plausible efforts on nuclear safety and security:

- **Intentional Use of Nuclear Weapon Technology by a State:** The intentional use of nuclear weapon technology or to put it simply, a nuclear weapon first use, by any state as a threat to mankind has the least possibility in comparison to the other three probabilities. The logic of nuclear deterrence has been successful so far and optimists expect it to be so in the future. Nuclear deterrence had diminished the probabilities of nuclear weapon use post-1949, owing to the 'plurality of possession'[2] of the coveted technology. The threat of consequences and unacceptable costs of counter-attack forced states to keep their nuclear weapon option deep in their pockets. This is undoubtedly why nuclear weapons have not been used as war-fighting instruments after their sole usage in 1945.
- **Unintentional Use or Accidental Launch of Nuclear Weapons by a State:** An unintentional or accidental use of a nuclear weapon by a state is a serious matter as it could initiate an unforgiving nuclear exchange. The overall strengthening of the command and control systems, the security of the nuclear establishments beyond any scope for careless fatal mistakes would decrease the probability of accidental usage. The impracticality of demating

2. 'Plurality of possession' prompts the acquisition of nuclear weapon technology, initiated by the Soviet Union in 1950, which was followed by the UK in 1952, China in 1964, France in 1960 and others. This chain reaction marked an end to the singular possession of the ultimate weapon technology by the USA. Intentions of weapon usage by state actors since then were largely tied down through nuclear deterrence which threatened the 'unacceptable' consequences of weapon use.

nuclear weapons at the sea level of the 'nuclear triad'[3] and the first use doctrine of some states make the threat of accidental launch even more grave.

- **Nuclear Accidents:** As the probability of accidents can never be completely ruled out, this needs to be taken with the utmost seriousness, more so when the consequences are simply unacceptable. The lucrative option of clean power generation through nuclear technology has resulted in thousands of nuclear reactors all over the world. Accidents in the nuclear realm have created gigantic problems in the past at both military and civilian nuclear energy generation plants. The Chernobyl disaster and the Fukushima nuclear meltdown are regarded as two major nuclear accidents. Lessons were learnt from the Fukushima nuclear meltdown, as the 2012 report[4] suggested that the Japanese accident was the result of human, organisational and technical factors. Thus, the necessary lessons need to be learnt by the "governments, regulators and nuclear power plant operators throughout the world."[5]As Yukiya Amano, the director general of the International Atomic Energy Agency (IAEA) puts it, "There can be no grounds for complacency about nuclear safety in any country."[6] The subject deserves the highest priority.
- **Intentional Malicious Use of Nuclear Weapons, Materials and Related Technology by Non-State Actors:** The present decade has seen an upsurge in the audacity and scale of non-state actors' attempts to spread terror throughout the world. The case of intentional malicious use of nuclear weapons, materials and related technology by non-state actors is high on the chart of possibilities. President Obama, in the Prague speech asserted, "In a strange turn of history, the threat of global

3. Nuclear triad here refers to the three components of nuclear weapons delivery by a state. Commonly known as the land, air and sea based capability of retaliation, through strategic bombers, ICBMs and SLBMs. Apart from providing a second strike capability, the triad also fulfills the purpose of increasing a state's nuclear deterrence.
4. For details, see "Executive Summary of the Final Report of the "Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power Company", Cabinet Secretariat (Japan), July 23, 2012, http://www.cas.go.jp/jp/seisaku/icanps/eng/finalgaiyou.pdf. Accessed on August 17, 2015.
5. Ibid.
6. Ibid.

nuclear war has gone down, but the risk of a nuclear attack has gone up."[7] The non-state actors have threatened to attack major population centres of the world. Incidents of theft of nuclear materials reported to the IAEA have witnessed a rise in the past few years, certifying the gravity of the problem. An act of nuclear terrorism would certainly have a lasting impact in time and space. Nuclear terrorism has the potential to surface in multiple *avataars*—dispersion of highly radioactive material by conventional explosives as a dirty bomb, malicious transfers of technology and goods from nuclear facilities for a nuclear bomb, seizure of nuclear weapons and civilian nuclear facilities, etc. The presence of nuclear 'black markets' which incentivises theft and illegal sale of fissile material is a known secret. Thus, nuclear terrorism becomes certainly one of the most urgent threats to mankind which rightly deserves intensive counter-nuclear terrorism collective efforts.

Though the negative consequences of any of all the four above catastrophes on the environment, the human population and on world peace are equally dreadful, the probability of the latter two occurring is greater. Many civil society organisations have expressed their support for nuclear disarmament on the grounds of the disastrous consequences of both nuclear accidents and accidental nuclear exchange. In a well-acclaimed article by the 'four hosemen,'[8] they have talked about the practicality and urgency of providing the highest possible standards of security for all stocks of nuclear weapons, weapons-usable plutonium, and highly enriched uranium everywhere in the world.

CIVIL SOCIETY'S ACQUAINTANCE WITH 'NUCLEAR'

The relationship between 'nuclear' and 'civil society' transcended simple 'acquaintance' long ago and has matured to much higher levels of mutual involvement. A complex network of organisations

7. "Barack Obama, President of the United States of America, Speech at Hradcany Square, Prague", *Acronym Institute for Disarmament Diplomacy*, April 5, 2009, http://www.acronym.org.uk/dd/dd90/90us.htm#obama. Accessed on June 29, 2015.
8. George P. Shultz, William J. Perry, Henry A. Kissinger And Sam Nunn, "A World Free of Nuclear Weapons", *The Wall Street Journal,* January 4, 2007, http//www.wsj.com/articles/SB116787515251566636. Accessed on August 7, 2015.

on both the international and national levels has been working on nuclear issues. Civil society's broad canvas includes "physicists, seismologists, and other scientists; physicians and lawyers; women's organisations; research institutes and disarmament NGOs; mayors and parliamentarians; 'downwinders' exposed to radioactive contaminants resulting from atmospheric testing and the 'hibakusha', the survivors of the atomic bombings of Hiroshima and Nagasaki; and the wider public."[9] It may be recalled that civil society forums began to strongly support the noble cause of nuclear disarmament since the first display of the fanatic power of nuclear weapons in 1945. The devastation of the twin Japanese cities of Hiroshima and Nagasaki had a massive impact on both society and the environment. For both political and security reasons, nuclear disarmament did not turn into a reality during the Cold War. Expectations for the same remained equally unfulfilled even after the evaporation of bipolar rivalry with the end of the Cold War. From the post-Cold War till the present time, civil society groups have provided mass support in the form of "quantifiable public backing"[10] for a nuclear-weapon free world. Though the anticipated result—nuclear disarmament—remains unachieved even after 70 years of advocacy, nevertheless steady and quantifiable progress, due to pressure by civil society groups has been witnessed in two related fields.

- ***Nuclear Testing***
  Civil society groups have contributed as a powerful pressure group in plugging the rampant nuclear testing which was being recklessly pursued by 'the powerful' states all through the Cold War years. They opposed and mounted public pressure, both domestically and internationally, against nuclear testing

9. "Civil Society", United Nations, http://www.un.org/en/events/againstnucleartestsday/civilsociety.shtml. Accessed on June 22, 2015.
10. 'Quantifiable' as a number of surveys and opinion polls have been conducted over time in nuclear weapon states, to know the mass opinion on the viability, possession and future path for both their state's and the global nuclear arsenal. A majority of these, over the years, have come out in 'the negative'. For instance, in 2007, the Simons Foundation commissioned a Global Public Opinion Poll to measure the public attitudes towards the possession, proliferation and possible use of nuclear weapons. The results revealed that 79 percent of respondents agreed that nuclear weapons make the world a more dangerous place and overwhelmingly supported the worldwide elimination of nuclear weapons or a reduction of arsenals.

and played a decisive role in creating awareness regarding the implications of the same on human health, the ecosystem and global peace and security. The ill-effects of nuclear radioactive fallout became known largely due to the effects of the efforts of civil society Non-Governmental Organisations (NGOs). With every test, states were improving their nuclear technological capabilities and inciting a further nuclear arms race. The Partial Test Ban Treaty (PTBT)[11] was largely the result of the untiring efforts of a nuclear civil society group called the Parliamentarians for Global Action. The Comprehensive Test Ban Treaty (CTBT) too was the result of vigorous advocacy. "In 1985, several of the NGOs lobbied in the Nuclear Non-Proliferation Treaty (NPT) review process for a commitment to achieve the CTBT."[12] At the inaugural of the CTBT, UN Secretary-General Boutros Boutros-Ghali praised the civil society for bringing "constant and passionate flow of petitions, appeals, and support from the peoples of the world."[13]

- ***Arms Control Measures***

  For furthering arms control measures, the civil society organisations have fought a long battle during the Cold War as well as in the post-Cold War era. Checking the unnecessary stockpiling of nuclear warheads by states, especially in the dusk of the Cold War, was indeed crucial, keeping in mind the unnecessary deployed warheads and huge stockpiles of Highly Enriched Uranium (HEU). Civil society undertook the challenging task. This became more important as unnecessary nuclear stockpiling presented inherent and fresh threats, especially post 9/11, an attack that demonstrated the audacity and reach of terror groups worldwide. Apart from security concerns, many groups saw nuclear arms control as the way to further nuclear disarmament through a step-by-step approach. During the Cold War too, several substantive anti-nuclear weapons movements came to the

11. The Partial Test Ban Treaty (PTBT) was signed in 1963. It prohibited nuclear testing in the atmosphere, outer space and underwater.
12. n. 9.
13. Rebecca Johnson, "Unfinished Business: The Negotiation of the CTBT and the End of Nuclear Testing" ,*UNIDIR*, 2009, http://www.unidir.org/files/publications/pdfs/unfinished-business-the-negotiation-of-the-ctbt-and-the-end-of-nuclear-testing-346.pdf. Accessed on July 30, 2015

fore. In 1961, the Women Strike for Peace led to a peaceful march in 60 cities in the US, with more than 50,000 participants for arms control and the PTBT. The Nuclear Weapons Freeze Campaign, launched in 1980 in the USA, also unprecedentedly swept the country with the support of nearly all the peace groups.

Apart from the abovementioned role of civil society nuclear groups in matters of nuclear testing and arms controls, their role in nuclear security, especially in the contemporary times, adds to their credentials.

THE EMERGING SCOPE OF CIVIL SOCIETY IN NUCLEAR SECURITY

The subject of nuclear security has gained currency in contemporary times owing to the unholy desire of terrorists, criminals and other unauthorised actors to acquire nuclear materials and blackmail humanity by the threat of their use. The risk of nuclear terrorism demands serious nuclear security initiatives as an imperative. On the duty of states for the task, the IAEA has asserted that they "must set up an appropriate legislative and regulatory framework (domestically) to ensure control of nuclear power plants, as well as of the transport and uses of nuclear material that present a radiological risk and, thus, require safety and security provisions."[14] The vast horizontal spread of nuclear material all over the globe in varying quantities and forms make nuclear security a gigantic task. Thus, collaborative efforts in this direction from not just individual states but from a variety of actors are a requisite.

Actors Involved in Nuclear Security

Traditionally, three actors have been actively engaged in this exercise: national governments, multi-national coalitions and international organisations. However, the energetic participation of the civil society as the fourth participant ought not to be discounted. It has assumed recognisable shape and importance in contemporary times. Plurality and coordination of all these actors is the need of the hour, given the complexity and urgency of nuclear security. Much has been

14. "The Interface between Safety and Security at Nuclear Power Plants", *International Nuclear Safety Group*, *IAEA*, http://www-pub.iaea.org/MTCD/publications/PDF/Pub1472_web.pdf. Accessed on July 29, 2015.

written and researched on the contributions of the other three actors to nuclear security, but not much on the civil society organisations.

Though pinning down the exact scope and meaning of the term 'civil society' is difficult, it can be understood as "the aggregate of non-governmental organisations and institutions that manifest the interests and will of citizens."[15] In the case of nuclear security, the civil society refers to the organisations and NGOs, that advocate, promote and work for further securitisation of the nuclear materials and technologies against any mishap like theft, sabotage, etc. The civil society organisations in nuclear security are known for expressing the societal perspective and highlighting loopholes in the legislations and deliberations of multinational and national actors. Their means are meetings, parallel conferences, working papers, reports, surveys, and protests. Policy inputs and publications form a large chunk of their contribution. Often, the international organisations and forums help by providing the civil society organisations with the platform they need to be distinctly visible. They keep a close watch, and a critical focus, on the government agencies, international organisations and their efforts on nuclear security issues. This work is even more desirable as a mishap in the nuclear domain is synonymous with an unforgiving impact on human civilisation and, thus, the voices of the masses ought to be heard. In this context, the participation of civil society organisations has become critical, though much further efforts are needed to realise their true potential as equivalent partners in the cause of nuclear security.

Why Nuclear Security has Become a Niche Area of Civil Society

Civil society organisations in the past were not regarded as decisive actors suitable for the 'high table' nuclear issues which traditionally have been the realm of either powerful state actors or international organisations. But contemporarily, the civil society groups have appeared as suitable actors to contribute to nuclear security due to a variety of reasons. Firstly, they are immune from domestic scrutiny and electoral compulsions. Before proposing some fresh idea or

15. "Definition of Civil Society", Wikipedia, https://en.wikipedia.org/wiki/Civil_society. Accessed on June 22, 2015.

deciding on something at multi-state forums, they do not have to prepare for answers to be given at home. They are not limited the peculiar problems encountered by state actors. Secondly, some of these civil society organisations are huge in the sense that they have a variety of funds providers to rely upon, unlike states that are most of the times constrained by budgetary issues. For instance, Warren Buffet's $50 million contribution to further the idea of an international fuel bank into reality happened to be a crucial stepping stone for the foundation of the bank. Thirdly, the politics of power and international relations happens to be the daily bread and butter of states. Even the multi-national coalitions and international organisations have fallen prey to power politics. The civil society, however, appears to be comparatively vocal and open in expressing what they believe in, though political loyalties cannot be denied with certainty. Fourthly, the civil society groups often maintain a low profile in their work; their research usually surfaces after some salient meets or decisions, etc which, in turn, help them to concentrate on their work. Lastly, nuclear security has also emerged as a field that is a niche area of civil society organisations because these organisations are the hubs of new ideas. One can observe that from the dawn of the nuclear age till today, the civil society groups have come up with several fresh and out of the box ideas. For instance, the Doomsday Clock[16] which was established by the Bulletin of the Scientists (BAS) and the publication of the Country Profiles and the Nuclear Threat Initiative (NTI) Index were some of the brand new initiatives.

The Contribution of Civil Society: Post-2010

The participation of civil society in nuclear security has been visible in the contemporary times. In 2013, when Vienna hosted the "UNSCR 1540 Civil Society Forum", the IAEA's conference, called the "International Conference on Nuclear Security: Enhancing

16. The 'Doomsday Clock' is a symbolic clock that was established by the Manhattan Project scientists in 1947. It uses the imagery of apocalypse (midnight) and the contemporary idiom of nuclear explosion (countdown to zero). The clock has since then become a universally recognised indicator of the world's vulnerability to catastrophe from nuclear weapons, climate change, and new technologies emerging in other domains. Presently, the Doomsday Clock minute hand is three minutes to midnight. The whole initiative creates a visual impact that civilisation is moving closer to Armageddon, thus, attracting mass attention on the counter-productiveness of nuclear weapons.

Global Efforts" was convened. The latter accepted the need for plurality of actors in the task, with participation by "government ministers; senior officials and policy-makers responsible for nuclear security; specialist organisations that contribute to nuclear security; representatives of intergovernmental and non-governmental organisations with relevant competencies."[17] The participation of some 21 organisations was seen as a sign of them overall complementing and strengthening the nuclear security subject. The Nuclear Security Summit (NSS) process which emerged as a multinational initiative on the call of the United States in 2010, also saw enthusiastic participation of civil society groups. There has been dedicated attention in recent times on the security of nuclear materials. Civil society has taken the aspect of "security of materials" seriously. It works to minimise the vulnerable weapons-usable fissile materials all over the world. The Nuclear Threat Initiative[18] (NTI) can be counted as one of the noteworthy efforts of civil society in this direction.

CONCLUSION

> *We recognise that neither we, nor Government officials, have the monopoly of wisdom in dealing with nuclear security (thus) we have a regular dialogue with civil society through think-tanks and similar organisations engaged in nuclear security.*
>
> – Mr. Tim Andrews[19]

17. "The International Conference on Nuclear Security: Enhancing Global Efforts", *IAEA*, July 1-5. 2013 https://www.iaea.org/About/Policy/GC/GC57/GC57InfDocuments/English/gc57inf-6_en.pdf. Accessed on July, 21, 2015.
18. The Nuclear Threat Initiative (NTI) is an organisation directed by Sam Nunn and President Joan Rohlfing. It has contributed in the direction of nuclear security by its initiatives which include mapping a state's nuclear threats by evaluating its nuclear safety procedures, participation in relevant non-proliferation treaties and regimes, preparedness in securing of nuclear installations, etc. The NTI then comes up with annual country-wise profiles on the basis of data collected. Overall, the organisation has contributed in making states aware of, and keeping a check on, nuclear material security.
19. Tim Andrews, "International and Regional Organisations: Partnership with Civil Society"- *UNSCR 1540 Civil Society Forum - Opportunities for Engagement, Stimson*, January 8-10, 20i3, www.stimson.org/images/uploads/research-pdfs/01_Tim_Andrews_Partnerships.pdf. Accessed on October 9, 2015.

The civil society organisations are no longer nominal representatives at any nuclear meet. Their participation and overall plurality of expertise and efforts indicate a rejuvenated concern on nuclear security and related issues.[20] The "Nuclear Fuel Bank," for instance, has been one such endeavour that has turned into reality in the recent times by the contributions from civil society organisations as well as private actors. The predicted pack-up of the widely acknowledged NSS process in 2016 puts further responsibility on the civil society groups. Post-2016, they are expected to fulfill the vacuum and be the constant check on governments, to remind them about the needed efforts and then formulating and implementing laws in the direction of nuclear security. The civil society groups have initiated playing the much needed role of highlighting the pros of nuclear security and the cons of not taking them seriously, but the scope for enhancement in their efforts remains. Prevalent mass ignorance about nuclear issues, in general, ought to be done away with, and civil society groups and their activities are, indeed, a good platform for the same. Finally, it must be acknowledged that strengthening of international cooperation and coordination among all the four actors involved in the task of nuclear security—national governments, multi-national coalitions, international organisations and civil society groups—holds the key to an anticipated future framework on nuclear security that can reflect the needed synergy in this direction.

20. A brief snapshot of the numbers of civil society organisations, their plurality of expertise and efforts in the direction of nuclear security in particular and nuclear issues in general would include the International Campaign to Abolish Nuclear Weapons (ICAN) which presently has the backing of more than 200 organisations in 60 countries. The International Physicians to Prevent Nuclear War (IPPNW), International Association of Lawyers Against Nuclear Arms(IALANA), International Network of Scientists and Engineers for Global Responsibility, Mayors for Peace, Pax Christi International, Women's International League for Peace and Freedom (WILPF), International Trade Union Confederation (ITUC) and the World Federation of United Nations Associations (WFUNA). Other large national organisations include, the Japan Council against Atomic and Hydrogen Bombs and Japan Congress against A- and H-Bombs, as well as France's Mouvement de la Paix (Movement for Peace).The Women's International League for Peace and Freedom (WILPF) has also been particularly active in the anti-nuclear campaign.

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