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ues to be responsible for the air defence of the national airspace while the Airports Authority of India carries the responsibility for managing civil air traffic. Increase in civil (and military) air traffic would require much deeper synergy between the two agencies to ensure efficiency and safety, argues Atul.

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The air force in the future would be influenced by changing technologies, weapon systems and operational requirements. This necessitates close attention to the future imperatives of the Indian Air Force (IAF), argues Air Marshal **Vinod Patney** SUYSM PVSM AVSM VrC (Retd), former AOC-in-C Western Air Command. The IAF is only one of the contributors towards “military power,” but it is the specialist Service to exploit the vertical dimension. Also implicit in the definition is the conviction that even though a single Service operation is a valid operation of war, it will be beneficial if it is the result of joint planning. Unquestionably, the major military requirement is to achieve the maximum possible degree of air dominance, because the effectiveness of air power in war will be governed by the degree of air dominance that can be achieved. An important mission for the air force must also be attacking targets and target systems deep into enemy country in order to definitely carry the war to the enemy as well as to expand the battle space to advantage, particularly if we are the stronger air force. The enemy should feel our presence throughout their territory if possible. Expansion of the battle space will put the enemy increasingly on the defensive.

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In his article, Brigadier **P.K. Mallick** argues that while 4th Generation Warfare would remain a serious challenge, the risk

of conventional war would require a significant reorientation of force structures and deployments. He questions the efficacy of a couple of large sized strike corps going deep into the heartland of Pakistan and believes that the utility of currently structured holdings and strike corps is minimal. The question whether the existing organisation of the field army into corps, divisions and brigades should be retained, or a more flexible organisation of “task forces” directly controlled by a divisional or corps headquarters should be introduced, he believes, requires to be considered.

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Dr. (Ms) **Ranjana Kaul** believes that that national security is symbiotically linked to the rapid changes taking place in the global space industry, bringing new challenges every day. The development of space security doctrines embedded in national security goals, of new space weapons systems; threat of deionisation of outer space; new arms race; obscuring boundary between air space and outer space; incalculable commercial gains from space related activities; shrinking natural resources in outer space; non-state and hostile entities with resources at command all demand that India's national security policy is empowered with an appropriate space policy together with attendant procedures and legislation to support it.

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Noting the shifts in Pakistan's nuclear posture since the early days after the nuclear tests in 1998, Professor **Peter R. Lavoy** identifies five main features of Pakistan's strategic deterrence policy and these are described in some detail. A set of new long-term Pakistani strategic concerns stimulated by the expanding US-India partnership is identified and analysed. The basic point is that, in the perception of Pakistan, projected developments in India's nuclear and conventional military capabilities eventually could threaten the survivability of Pakistan's strategic deterrent, which has always been a major concern for the country's defence planners.



EDITOR'S NOTE

Indian naval air power is heading toward a potential crisis: the former Soviet aircraft carrier *Gorshkov* being refurbished in Russia (future INS *Vikramaditya*) is likely to be delayed by 4-5 years, creating a serious situation since the solitary carrier INS *Viraat* would have come up for retirement after an extended service. This was quite a blow on the eve of the Navy Week. On top of this development, the Russians have sought to increase the price to nearly double the original figure. The figures being cited would reflect amounts far beyond the contracted escalation provisions inevitable in such contracts. For a country that had built up an enormous military industrial complex and was always seen in India as a reliable partner in the sale of weapons and equipment, this has undoubtedly come as a major shock. In view of the extensive Russian experience in the military industry, especially in managing a programme on one of their own designed products, it would be naïve to believe that Russian shipyards and industry had failed to calculate the cost and time required for refurbishment correctly.

What appears to have been the reality is that the Russians diverted manpower, material and effort from the *Gorshkov* refurbishment to other projects. Either way, the development reflects very poorly on Russian reliability in arms supplies. Unfortunately, the *Gorshkov* episode seems to be part of a new trend in the Russian arms industry and supplies, even to India, its preferred customer for decades. We have been witness to the MiG-21 upgrade programme being delayed enormously, with major weaknesses in performance and reliability of the systems (especially the engine). There have also been reports of the Russians demanding a much higher price for the additional two squadrons of the Su-30 that New Delhi has ordered. This stands out in stark contrast to the way two squadrons of the MiG-23MF were supplied at short notice in the early 1980s. Our problem of spares for Soviet origin equipment after 1991 also stands out, espe-

cially during the years when the Russian defence industry was in serious difficulties due to the economic crisis, and needed infusion of funds which the supply of spares would have provided. There is also the issue of the recent failure to sign a bilateral agreement for nuclear reactors where the Russians are believed to have baulked on the irrevocability clause.

The major lesson from the recent developments is that we must strengthen our self-reliance in weapons and military equipment. No country can expect to play any significant role in international affairs if it remains dependent on — and more crucially, vulnerable to — the processes of arms acquisition from abroad. Strengthening self-reliance would call for much more than speeding up our indigenisation processes. There are two fundamental policy issues that South Block must seriously consider. One is the issue of increasing diversification of sources of weapons and military technology; and the second is the issue of leveraging opportunities to build interdependence with countries from which we expect to acquire arms and military technology.

With 75-80 per cent of our weapons and military equipment of Soviet/Russian origin, this dependency would always leave us with an intrinsic vulnerability for a long time to come. Given that modern weapon systems have a design life of 30-40 years, any further acquisition from Russia would only extend this vulnerability into the future decades. And what we tend to forget is that Russia is not the Soviet Union; and, unlike the Soviet Union, the Russian Federation has few (if any) areas of dependence on India. The obvious answer is to diversify the sources of supply. The odds are building up further against us with Russian military technology and state-of-the-art weapon systems being freely transferred to the Chinese, bestowing the latter with the confidence that they plan to win the next war through “command of the sea and command of the air!” In addition to this new strategic “partnership” between the two erstwhile military allies, there is a clear strategic nexus between China and Pakistan which has provided the latter even with nuclear weapons and missile designs, technology and materials.

This is also linked to the issue of leveraging our own strengths to energise our aerospace industry. The new procurement procedure lays down minimum

offsets to the extent of 30 per cent of the value of contract for acquisition from abroad. Boeing has already taken the lead in planning and investing \$1 billion over the next ten years in production of sub-systems for aircraft not in service in India. The offsets parameter must, of course, be applicable to acquisitions from Russia. But the offsets route holds out the opportunity to infuse our aerospace industry with modern technology and the ability to meet the bulk of the needs of spares and future product support. In fact, we need to adopt a policy that offsets should provide the capability to design, develop and incorporate most of the upgrades that every new weapon system would require 10-15 years after induction. The OEMs (original equipment manufacturers) would obviously be partners in this process. But this should help us move more firmly toward the capacity to design and develop future weapon systems with greater self-reliance since this approach would necessitate setting up research and development (R&D) facilities in systems and sub-system design and development.

At the same time, regardless of how the *Gorshkov* issue is resolved, we must expedite the construction and commissioning of the indigenous aircraft carrier already under construction while planning for follow-on carriers. The advent of anti-ship sea-skimming missiles now constitutes the major threat to surface fleets. Defence of (surface) fleets against such threats requires the platform (aerial, surface ship and/or submarines) to be engaged before weapon launch. And this makes integral air power a vital requirement for the defence of a surface fleet, not to talk of its strike roles against hostile vessels and many other contingencies. The challenge multiplies when faced with supersonic cruise missiles that China possesses (believed to be of Russian designs) and which Pakistan claims to have acquired. As it is, Pakistan is acquiring what would be the region's largest aerial maritime strike force supported by AWACS/AEW&C (airborne warning and control aircraft/ airborne early warning and control aircraft).

The assets of the Indian Air Force, especially the Su-30 MKI would obviously be available for naval tasks out at sea. But in order to meet long-term needs, we would have to bring up infrastructure south of the Vindhyas. As it is, the changes taking place in the air force, expanding its reach, demand a shift in the strategic deployment posture of the air force deeper into the country; and this

would help to complement the needs of the navy for air power cover, especially during the next 15 years or so when naval air power may find itself tied to land rather than be out at sea.

FINANCING FORCE MODERNISATION

VINOD K. MISRA

Air Chief Marshal O.P. Mehra, Director, Centre for Air Power Studies, Air Commodore Jasjit Singh, AVM Kapil Kak, distinguished guests, seminar participants, ladies and gentlemen.

I am deeply honoured and happy to have this opportunity to share my thoughts on the critical theme of modernisation of our defence forces with such an accomplished array of defence practitioners and analysts.

Notwithstanding the crucial role of modern equipment and weapon platforms to the success of defence missions, it should be recognised that modernisation outlays are a derived sub-set of defence outlays after catering adequately for the maintenance needs of the defence forces. Our resolve to earmark a greater quantum of resources for modernisation is reflected in the fact that the modernisation maintenance mix has changed significantly from around 25:75 in 1998-99 to around 47:53 in the coming years (42:58 in Budgeted Estimates (BE) 2007-08). Given the resource restrictions, the modernisation thrust and process have to be per force carefully formulated and heavily prioritised in inter-Services and intra-Service terms and aspire to create in a cost and time efficient frame, the most potent contemporary mix of mutually reinforcing defence capabilities.

Before dwelling on the challenges and opportunities of this endeavour, let me briefly recount the historical perspective. Both on account of our small resource

Shri **Vinod K. Misra** is former Secretary Defence Finance, Ministry of Defence, Government of India. He delivered this Keynote Address at the 4th Subroto Seminar organised by the Centre for Air Power Studies on November 18, 2007.

The essential thrust of our modernisation effort has to involve a distinct superiority over our immediate neighbour and a strong dissuasive capability for the rest.

base and the problem of availability as well as prices in sourcing supplies from the West for several decades in post-independent India, the modernisation effort of the defence Services was largely confined to what the erstwhile Soviet Union could offer to us, albeit under extremely attractive credit terms. This largely set the pace for capability build-up in the decades up to the 1980s and we should never really overlook the strong Soviet contribution

to our modernisation process in this era.

The essential thrust of our modernisation effort has to involve a distinct superiority over our immediate neighbour and a strong dissuasive capability for the rest. It also has to factor in reasonable strategic capability by way of handling out of area contingencies in sync with our current aspirations as a significant voice in the Asian region and the world. I must also hasten to add that acquisitions and upgrades of weapon platforms alone would not modernise us adequately and attention would simultaneously have to be devoted to the necessary dynamic reorientation of doctrines, strategy, tactics, operations and training as well.

The key determinants of the modernisation strategy would be the defence objectives set out by the nation, flowing ideally from the national security policy frame, likely nature and duration of potential warfare, force level comparisons with likely adversaries and the consequent capability mix necessary to ensure victory in war. All other considerations such as the potential limitations of the resource base and cost and time frames would need to have only a supplemental role.

The evolution of an optimal mix of capabilities in a mutually reinforcing mesh is a daunting challenge.

The evolution of an optimal mix of capabilities in a mutually reinforcing mesh is, however, a daunting challenge. It requires clarity in terms of sharply defined mission objectives, mandatory generation of choices based on current technologies for meeting the likely needs, determining the most important

capability elements for attaining our own country-specific capability basket and acquiring them in the requisite cost and time frames. This would be rendered even more complex when jointness considerations are brought into play for reasons of both enhanced operational efficiency and costs.

There is also the dilemma of retaining the contemporariness of technology for weapon systems when the calendar life for most is 30-40 years. Given the rapid march of defence technology, it becomes difficult to ensure that the bulk of the assets of a weapon type is based on mature and modern state-of-the-art technologies. But given the high maintenance cost of old systems, tough decisions to replace rather than sustain an old system are often called for. Then there is the need for enormous rigour in the matter of quantitative assessment of the requirement of different weapon systems in relation to our boundaries, operational philosophy, weapon capabilities and force level comparisons.

To put the force modernisation issues in some perspective, some facts and statistics need to be recounted. The aggregate defence budget has grown from Rs. 16,347 crore in 1991-92 to Rs. 39,897 crore in 1998-99 and Rs. 96,000 crore in 2007-08. The total capital budget which funds the modernisation has in turn grown from Rs. 193 crore in 1951-52 to Rs. 10,036 crore in 1998-99 and to Rs. 41,922 crore in 2007-08. Of this, modernisation alone accounted for Rs. 8,663 crore in 1998-99 and Rs. 32,827 crore (around 34 per cent of the defence budget) in 2007-08. The period 1999-2000 till 2007-08 witnessed an overall average growth of around 10.5 per cent per annum, with revenue expenditure showing an average yearly increase of approximately 7 per cent, while capital spending grew by an average of 19.7 per cent during the same period. As observed earlier, the revenue capital mix has improved significantly from 74:26 during the 9th Plan period to 58:42 in 2007-08 and is expected to be around 53:47 in the years ahead, which is perhaps the

There is the need for enormous rigour in the matter of quantitative assessment of the requirement of different weapon systems in relation to our boundaries, operational philosophy, weapon capabilities and force level comparisons.

optimal level at which it would need to be stabilised. Coming more specifically to each Service, the army's capital allocations have improved steadily from around Rs. 2,100 crore in 1995-96 to around Rs. 6,900 crore in 2007-08. The navy's capital outlays have increased from Rs. 1,920 crore in 1995-96 to nearly Rs.10,000 crore in 2007-08. The air force is clearly the frontrunner in terms of capital budget allocation, with modernisation outlays receiving a massive boost from around Rs. 2,900 crore in 1995-96 to around Rs.15,900 crore in 2007-08.

The overall share of the three Services in the defence budget is 47.2 per cent for the army, 28.15 per cent for the air force, 18.26 per cent for the navy and 6.13 per cent for the Defence Research and Development Organisation (DRDO). However, the capital outlays for the three Services show an entirely different mix in view of the capital intensity of modernisation effect in the air force and navy, on the one hand, and large quantum of revenue spending in the army on account of maintenance needs of a 1.3 million strong standing army, on the other. Thus, the revenue-capital mix stands at 74:26 for the army, 38:62 for the Indian Air Force (IAF) and 40:60 for the navy in the 2007-08 defence budget.

The projected maintenance and modernisation needs of the defence Services over the next five years would, however, be adequately served with an average overall growth of around 12 per cent, implying a gross domestic product (GDP) share of around 2.3 per cent vis-à-vis 2.1 per cent at present and around an average of 16.2 per cent of Central Government Expenditure (CGE) vis-à-vis approximately 15.8 per cent at present.

CONTENT OF MODERNISATION

Modernisation in the current context spans all the four dimensions of land, sea, air and space. Preparedness for potential warfare also involves capabilities creation

Modernisation in the current context spans all the four dimensions of land, sea, air and space.

both in relation to symmetric and asymmetric scenarios covering the full range of conventional warfare based on current state-of-the-art technologies as well as capabilities for sustained success in low intensity conflicts, counter-insurgency/counter-terrorism, international

peace-keeping, disaster relief, aid to civil power and, finally, out of area contingencies. This has called for comprehensive force level and capabilities comparison with potential rivals and then drawing up a modernisation roadmap based on existing equipment voids and capability gaps consistent with our strategic doctrine of an appropriate mix of offensive and deterrent power.

Given the current state-of-the-art defence technologies and the experience of recent wars, the capability spectrum is truly staggering, making evolution of an appropriate capability matrix a huge doctrinal and strategic challenge. From space-based systems, anti-missile deterrence, strategic missiles, multi-role combat aircraft and strategic bombers with stealth features, directed energy weapons, air defence, cruise and ballistic missiles, nuclear, biological chemical (NBC) defence and strategic lift to communications, command, control, computers, information, intelligence surveillance, reconnaissance (C4I2SR), network-centric warfare, electronic warfare (EW), intelligence encompassing electronic intelligence, human intelligence, communication intelligence, imaging intelligence (ELINT/HUMINT/COMINT/IMINT), modern tanks, self-propelled 155 mm or heavier guns artillery, capabilities essential for a blue water navy, mine warfare, precision guided munitions (PGMs), precision navigation and guidance of platforms and weapons, unmanned aerial vehicles (UAVs) and unmanned combat air vehicles (UCAVs), potent helicopters, amphibious warfare capability is a vast canvas to relate to for planners and decision-makers alike.

In so far as the army is concerned the modernisation focus is on induction of adequate numbers of 155 mm towed and SP guns (the latter in their wheeled and tracked versions), additional T-90 tanks, additional Arjun tanks if the two regiments under induction prove equal to the army's expectations, full range of modern air defence (AD) capabilities, ultra-light howitzers for the artillery, night

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The modernisation process, in a conceptual sense, involves cutting down on mobilisation time-frames, enhancing the ability to conduct a swifter war, being able to engage the adversary in the full spectrum of warfare.

capabilities for all existing tanks, mine and anti-mine capabilities , UAVs, and army aviation in terms of helicopters, including the advanced light helicopter (ALH).

For the navy, the modernisation roadmap over the next 15 years would involve induction of aircraft carriers, submarines over and above the Scorpene under manufacture at MDL, additional follow-on destroyers/ frigates/ corvettes with stealth features, mine counter-measure vehicles, long range maritime patrol aircraft, additional landing platform decks,

land attack cruise missiles, rotary UAVs, naval communication satellites and significant enhancement in maritime dimension awareness.

The most richly resource endowed IAF envisions additional fighter aircraft of the Hindustan Aeronautics Limited (HAL) manufactured SU 30 MKI kind, several squadrons of medium combat aircraft, upgrade of the MiG-29 and M-2000 fleet, a collaborative effort for development of the fifth generation fighter aircraft, a similar joint venture for the medium transport aircraft to replace the ageing AN-32 transport aircraft, medium range surface-to-air missiles to replace the really old Pechora squadrons, additional airborne warning and control systems (AWACs) and aerostats, UAVs, survey and target towing aircraft, additional FRAs, additional AJTs, IJTs for stage 2 training , EW capabilities, a fully networked and integrated combat support system and fully augmenting the war-waging reserves in terms of the requirement of bombs, rockets, PGMs and missiles.

The modernisation process, in a conceptual sense, involves cutting down on mobilisation time-frames, enhancing the ability to conduct a swifter war, being able to engage the adversary in the full spectrum of warfare in an all weather/all terrain/day and night engagement, minimising one's own attrition of war-waging capabilities, creating surge capacities, in the defence economy and being able to rapidly destroy the enemy's potential and will to fight. Weapon systems

comprise the basic platform, various sensors and the armament delivery capability of the system. Considering the high cost of platforms and a life ranging from 20-40 years for most systems, modernisation has often concentrated on sensors and armament alone, with necessary refurbishment and life extension for the basic platform. But often this may not be a feasible proposition. In the context of platforms, modernisation entails significant changes in mobility, speed, autonomy, night fighting, manoeuvrability, transportability, self-protection, survivability, thrust to weight ratio, propulsion efficiencies, maintainability, stealth, electronic counter-measures/electronic counter-counter-measures (ECM/ECCM), reliability, deployability, upgradability and modularity features of the system. Modernisation of sensors has impacted full 3D coverage in terms of range, height and azimuth, all weather and all-terrain capabilities, ECM/ECCM features, higher accuracies and reliability and well networked data links, all in an effort to shorten the sensor-shooter loop. Armament modernisation has an obvious focus on the destructive quantum of firepower as well as sustained rate of fire, range, guidance and navigation, accuracy as reflected in first salvo effectiveness/circular error probability/hit probability, penetrability, and the like.

Based on the defence technology roadmap of each of the Services, comprehensive and systematic scanning of all available and under development technologies is needed for identifying our key technology gaps and making appropriate choices for acquisition of these capabilities in an urgent time-frame based either on joint design and development and production or in-country defence research and development (R&D) in the governmental and private sectors.

Indeed, in this context, it might be eminently desirable for us to broaden our collaboration basket even if it implies single source acquisitions whereby we could enter into a series of joint collaboration arrangements with all the leading weapons manufactures/design houses in the frontline weapon economies of the world in their different core strength areas. This would not only guard against the pitfalls of all

It might be eminently desirable for us to broaden our collaboration basket even if it implies single source acquisitions.

Another key element of the modernisation and empowerment process is undoubtedly self-sufficiency in the manufacture of the entire range of ammunition.

eggs in a single basket but lead to mutually beneficial arrangements with a large number of highly capable R&D and production entities worldwide and hopefully help us imbibe their best design, development and manufacturing practices and efficiencies.

This process could also provide us with long-term strengths by way of tapping of the rich defence exports potential with all its attendant benefits. Another key element of the

modernisation and empowerment process is undoubtedly self-sufficiency in the manufacture of the entire range of ammunition required to be used from different platforms and weapons. This inadequacy came to the fore during the Kargil War and it is critical that there is an adequate manufacturing capability and surge capacity in the country to meet our potential requirements rather than the heavy import dependence which persists in this critical area.

Maximising outlays for modernisation necessarily implies minimising outlays on maintenance. Consequently, operational and cost efficiencies would have to be constantly searched out in areas such as logistics, outsourcing of tasks that can be handled by the private sector, and ensuring a youthful profile for the armed forces which would also result in very substantial cost reductions. Modernisation also must impact on diverse areas such as married and other than married accommodation, upgrade of RMO facilities/ training infrastructure, modernisation of firing ranges and road connectivity in remote areas.

Joint exercises with major defence forces of the world is also a very vital element of the modernisation process in as much as it provides intimate exposure to different battle doctrines/tactics/operations and weapon capabilities.

Capability development plans and effects-based planning find reflection in the 15-Year Perspective Plans and 5-Year Plans of the Services in terms of specific programmes and individual schemes. In the event, adequate due diligence by way of generation of options and making rational and cost-efficient choices has not occurred, the plan projections would suffer from an innate deficiency.

An intense modernisation thrust also demands that there is a certain sanctity to the programmes and schemes embedded in the plan documents and only a radical change in doctrine or technology or capabilities of potential adversaries should dictate a change in the plan projections. Constantly changing perceptions can seriously impede the pace and momentum of the modernisation thrust, as past experience has shown.

Let us look at some of the other key elements of modernisation. Since qualitative requirements (QRs) determine both competitiveness and costs, it is essential that these are set out against the backdrop of life cycle costs and future sustainability. In terms of time outlays, technical evaluation of the offered systems is the defining activity in the entire acquisition process. While it would be folly to overlook our truly complex operational environment in terms of climatic conditions, temperatures and terrain which might require India specific ruggedisation warranting protracted evaluation for operational sustenance and maintainability, innovative solutions are required to compress this time-frame even while enhancing the transparency, reliability and comprehensiveness of this process.

Defence acquisitions are cast in an extremely elaborate and comprehensive procedural frame in as much as the DPP 2006 defines the ground rules of this process with clarity and full transparency. Yet the procedures would continue to be modified in consonance with ground realities and in line with the avowed objective of securing all the acquisition efficiencies that can be targeted in the light of the best practices prevalent elsewhere and our own dynamic experience. Effective remedies, however, need to be found for delays and complacency in decision-making which does incalculable harm to the modernisation growth momentum. Similarly, there could be no let up in the constant targeting of acquisition efficiencies from the point of view of providing a level

Defence acquisitions are cast in an extremely elaborate and comprehensive procedural frame in as much as the DPP 2006 defines the ground rules of this process with clarity and full transparency.

Larger association of Indian private sector entities in areas of supply chain management and other tasks which are conducive to outsourcing is also expected to be mutually beneficial for ensuring higher reliability, operational efficiency and readiness levels.

playing field and a sustained focus on pre/post contract project implementation.

Offsets hold the strongest potential for bringing about a sea-change in the indigenous defence capabilities landscape. Even on the basis of a 30 per cent offset obligation on defence acquisitions, around \$10 billion is the estimated direct offset inflow into the Indian defence sector over the coming five years. This would potentially go into joint collaboration and development, joint venture defence production, repair, maintenance, OH and training and other infrastructure, defence exports and the like. Carefully channelled offsets would not only supplement the defence resource gap but also help bring about a radical transformation in the R & D and production

culture and capabilities of the Indian defence sector.

Greater public-private synergies in the country would also serve this purpose in a very significant way. Larger association of Indian private sector entities in areas of supply chain management and other tasks which are conducive to outsourcing is also expected to be mutually beneficial for ensuring higher reliability, operational efficiency and readiness levels.

It is also expected that performance based logistics (PBL) where the responsibility for an assured level of serviceability of complex weapon platforms is cast on the OEM, would also translate into greater operational efficiency as well as empowerment of the Indian defence industrial base.

Indeed, without the vibrant and full scale association of Indian private sector entities in the defence empowerment effort in terms of R&D, production and infrastructure creation, we would never be able to attain the operational efficiency, optimal serviceability levels and cost-effectiveness in defence operations crucial for long range sustainability and an affordable defence.

Given our rapidly expanding economic base and the role we would be expected to play in the comity of nations, time-bound empowerment of our defence forces is an urgent national task. In my assessment, we would need to step up significantly the outlays on modernisation in order that we attain a capability level consistent with our aspirations over the next 15-20 years which could be relatively peaceful and whereafter a modest incremental effort might suffice. But the next two decades are critical from the point of view of reaching a mandatory minimum level of military strength and capability to preserve and sustain our likely destiny at that point of time. While long-term fund commitments even on a tentative basis are essential for any form of long range planning, pragmatic and innovative funding solutions would be possible as long as intense efforts continue apace to target empowerment of the defence production and infrastructure base, provide a fillip to the defence R&D, bring about fuller integration of the vibrant Indian private sector for defence needs, seize the offsets opportunities, ensure optimal acquisition efficiencies and make a success of the complex defence project management challenges. It goes without saying that the augmentation of our strategic capabilities in terms of weapons and delivery systems would continue to be a critical component of our deterrent power.

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AIRSPACE MANAGEMENT: A SYNERGISED APPROACH

ATUL KUMAR SINGH

The growth of India's civil aviation industry is one of the shining stories of contemporary India. The accelerated globalisation in the 21st century and consequent economic expansion have propelled the phenomenal growth in the civil aviation sector. The sector has grown at the rate of 20 per cent in 2004 and 2005 and is expected to grow at the rate of 25 per cent for the next ten years. The annual report of the Ministry of Civil Aviation (MoCA) 2006-07, records a 41 per cent growth in passenger traffic, and forecasts a whopping 400 per cent growth in passenger traffic and 600 per cent growth in cargo traffic over a period of the next 20 years.¹

The unprecedented growth of civil aviation in India has overwhelmed the aviation infrastructure in the country. The lack of an adequate number of airports, runways, radars, communication, navigation systems and control facilities have made this growth look more gigantic than it actually is. The crowding of airspace, prolonged holding periods and uneconomical methods of airspace management, owing to waste of fuel and time, are often quoted as the reasons for near miss incidents in the air. However, when compared to the air traffic over comparatively smaller nations in Europe and elsewhere, it would

The unprecedented growth of civil aviation in India has overwhelmed the aviation infrastructure in the country.

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1. "Civil Aviation in India: Surging Skies," *VAYU*, III /2007, p. 34.

emerge that countries like the UK, France Germany, Singapore and Hong Kong have higher traffic density in terms of take-off, landing and transit of domestic and international flights as compared to India, yet those countries seem to be managing their airspace in a much more organised manner, primarily because of better infrastructure, integration of air traffic control assets, centralised control of airspace and policy regulations that have kept pace with the rapidly changing nature of air space management.

Military aviation, and particularly the air force, is the other largest user of airspace, followed by private companies, state governments and owners of smaller jets and helicopter services. Military aviation is an imperative of national security and with the changing geo-strategic scenario and increasing dependence on aerospace power, the role of military aviation will expand in the years to come. Also, the armies and navies the world over are more inclined to expand their aviation assets, thus, enlarging the size of the military aviation inventory.

The responsibility of airspace management in India is divided between the Airports Authority of India (AAI) and Indian Air Force (IAF). The airspace is divided, regulated and controlled by the two agencies under different sets of policies and regulations. The IAF is responsible for the air defence of national airspace, and therefore, plays a vital role in airspace management and in safety and security of civil aviation. The demarcation of airspace for civil and military use, a number of controlling agencies and different sets of rules for identification of air traffic, climb and descent procedures, radio telephony (RT) communication procedures, air operations over restricted and prohibited areas under the control of different controlling agencies often lead to conflict of interest and priorities, and complicated coordination procedures result in air incidents and, occasionally, in air accidents.

Against this backdrop, this paper intends to analyse the growth of civil aviation and its impact on airspace management, the role and peculiarities of military aviation, the issues and problems that afflict the passage to more efficient airspace management and the ongoing coordination and cooperation between civil and military organisations. The paper briefly touches upon the

international norms and principles on which the most acceptable solutions should be based and how similar problems are being dealt with by the developed countries. The paper concludes with a pathway to better airspace management in India. It is restricted to airspace management by civil-military coordination and does not intend to deliberate on inter-Services airspace management in the tactical battle area.

THE FUTURE OF CIVIL AVIATION

The annual report of the MoCA (2006-07) forecasts the growth of passenger traffic by 400 per cent in the next 20 years. In 2006-07, airlines have carried nearly 86.76 million passengers as compared to 73.35 million in 2005-06. The domestic passenger traffic has witnessed a massive growth of 41 per cent in 2006-07.² This has resulted in an ever-increasing number of full-time airlines, low-cost carriers and regional airlines, and a rising demand for helicopter services and smaller jet services for the corporate sector.

The civil aviation sector is likely to grow at the rate of 25 per cent or more for the next 10 years.³ It is expected that by 2020, the passenger air traffic, currently at 96.4 million, is likely to reach 280 million, and air cargo is likely to jump from the current 1.6 million metric tonnes to 9 million metric tonnes. The Civil Aviation Ministry has planned investment worth Rs. 41,000 crore over the next five years.⁴ Meanwhile, the fleet sizes have also increased from 150 to 300 in the past two years, and in the next six years, more than 300 new aircraft are likely to fly in Indian skies. It is estimated that the fleet size of Indian carriers will increase by almost 200 per cent by 2012, reaching the figure of 700 aircraft. Boeing estimates an additional 856 new orders for all manufacturers over the next 20 years, while Airbus raises the figure to 1,100 aircraft.⁵ Based on these figures from the MoCA and civil aviation experts, it could be assumed that by 2020, the Indian civil aviation industry will have a fleet of approximately 1,800 aircraft or more, and it will fly approximately 280 million passengers (domestic and international), and lift 8-9 million metric tonnes of cargo.

2. Annual Report 2006-07, Ministry of Civil Aviation, available at <http://civilaviation.nic.in>, accessed on 16 Aug 2007, pp.7-49.

3. n.1 p.36.

4. "The Way to Go," *The Indian Express* (New Delhi), August 15, 2007.

5. n.1.

It is estimated that by the year 2030, the number of domestic and international passengers is likely to shoot up to 400-450 million.

These estimates are mainly about the major players and larger aircraft. Apart from primary aviation activity, secondary aviation activities will also swell, paramilitary and police forces will acquire their own fleets for organisational requirements, and a variety of smaller – from two to twenty-seater fixed wing – aircraft for private operators and chartered services, flying clubs and helicopter services, tourism, pilgrimage, sporting, adventure aviation activities and metro air taxi services from roof tops are like to saturate the air space from low-level to 1,5000 feet.

If the growth rate projected by the MoCA up to 2020 is extrapolated for the next ten years at the moderate growth rate of 6 to 8 per cent, it is estimated that by the year 2030, the number of domestic and international passengers is likely to shoot up to 400-450 million, further boosting the number of aircraft, airports, air traffic services and technologically advanced CNS/ATM systems required for efficient airspace management. If the presumed growth of civil aviation by the year 2030 was to be plotted on the Indian map, the emerging picture will indicate that the skies may not be saturated but a very large part of the Indian airspace will have a high density of aviation activity.

The AAI controls and manages 127 airports (all inclusive)⁶ and the IAF controls and manages 61 (19 open for joint operations).⁷ It is expected that the increasing demand of aerial connectivity and expansion of civil aviation activities over the period of the next 20 years would require 200 or more operational airports (including construction of new airports). The metro cities and international airports like Delhi, Mumbai, Kolkata, Chennai, Bangalore, Ahemdabad, Pune, Hyderabad, Amritsar, Thiruvananthpuram, Goa, Guwahati, Nagpur, etc will remain the primary hub centres. Cities like, Srinagar, Jammu, Ludhiana, Chandigarh, Agra, Jaipur, Jodhpur, Lucknow, Patna, Varanasi, Bagdogra,

6. Comptroller and Auditor General of India, "Review of Infrastructure & Operational facilities, Airports Authority of India" (Report-17 of 2007), pp. 38-41, available at www.cag.nic.in accessed on September 20, 2007 and Annual Report 2006-07 MoCA, n.2 p.45.

7. "Air Traffic Services: Indian Air Force," available at <http://indianairforce.nic.in> accessed on September 17, 2007.

Dibrugarh, Jorhat, Bhopal, Indore, Bhubneshwar, Vishakhapatnam, Port Blair, Coimbatore, Mangalore, Madurai, Trichy, Calicut, etc would emerge as secondary hub centres, and smaller airports at Pathankot, Shimla, Dehradun, Jaisalmer, Gwalior, Agartala, Belgaum, Bhuj, Dimapur, Kandla, Khajuraho, Imphal, Silchar, Pondichery, Ranchi, Raipur, Cochin, Vijayvada, Tirupati would emerge as feeders for primary and secondary airports.

The network of primary, secondary and feeder airports would generate 8,000 or more flights every day. International arrivals/departures and transiting air traffic are likely to generate another 4,000 flights, thus, boosting the civil air traffic up to 12,000 flights from altitudes of 2,000 to 46,000 ft. Military fighters, transports, helicopters and unmanned aerial vehicles (UAVs) will generate approximately 3,000 operational and training flights that will operate within the web of civil flights. Therefore, we could safely assume that in a cycle of 24 hours, 12,000 to 15,000 aircraft will fly in the Indian airspace, thus, generating a volume of a minimum 43,80,000 (12,000 × 365) aircraft movements per annum, registering a growth of 450 per cent against the projected figure of 9,54,080 for year 2006-07.

The network of international, domestic and smaller regional airports and flow of traffic along these routes also indicates that states like Delhi, Punjab, Gujarat, Maharashtra, Uttar Pradesh, Karnataka, the northeastern states, the southern peninsula south of the Mangalore-Bangalore-Chennai axis, and the triangle formed by Kolkata-Patna-Bhubaneshwar would emerge as choke points, with high density and variety of air traffic. In such a scenario, military aviation will not be able to enjoy the freedom of operation over restricted areas that it enjoys today. A large portion of restricted areas will have to be released for free flow of air traffic. The air operations at a few air force bases in Punjab, Gujarat, and Maharashtra and Delhi would be impeded by air congestion

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between 6,000 to 40,000 ft. And, in certain cases, the air force bases may have to be shifted to locations with less density of traffic, leaving only the assets which are operationally imperative for the security of the airspace. For example, the air traffic density would be lower between latitude 1800 N to 2500 N and 7800 E to 8500 E, along India's eastern coast line. This is also the area of India's strategic depth in central and southern India. The geographical area could be highlighted by a triangle formed by the Gwalior-Varanasi-Kolkata axis in the north, Kolkata-Vishakhapatnam-Chennai axis along the coast line and Chennai-Nagpur-Gwalior axis in the west. Within this area, the air traffic is likely to be at higher altitude and of transitory nature. Therefore, as a measure of long-term plans, military aviation needs to work out how the operational military aviation would function effectively in the continuum of the airspace shared equally by all users, with minimal conflict and maximum capacity management.

The technologies in the 21st century will allow the next-generation supersonic passenger jet that would fly 300 passengers at more than 1,500 miles per hour. The high speed civil transportation (HSCT) is expected to cross the Pacific or Atlantic in less than half the time of modern subsonic jets. The air travellers of the future may step onto a double-deck jetliner that resembles a flying wing, capable of carrying up to 800 passengers over 7,000 miles at a cruise speed of approximately 560 miles per hour (mph). The blended wing body (BWB) design will maximise the overall efficiency of the aircraft by integrating the engines, wings and body into a single lifting surface. The BWB will also provide new technologies for many future aircraft, and some applications of BWB technology include commercial transports and very-long-range military cargo aircraft. On the other hand, military aviation may see introduction of hypersonic aircraft (hypersonic speed is defined as speed above Mach 5 or above five times the speed of sound). Hyper-X is an experimental hypersonic flight research programme at the National Aeronautics and Space Administration (NASA). The purpose of the programme is to develop a hypersonic air vehicle powered by an air-breathing engine. The hypersonic propulsion systems will allow the development of very high-speed strike aircraft, manned or unmanned, capable of attack at great distances deep in

hostile territory in a very short time.⁸ By the middle of this century, unmanned airliners may become a reality. The advent of such technologies in the civil aviation industry would mean very high speed aircraft, less reaction time, fully automated global CNS systems. Such technologies require minimal human interface and may not require any active controlling, thus, demanding extensive prior coordination, with no margin of error.

The future air navigation systems (FANS) were first conceptualised in the mid-Eighties. The International Civil Aviation Organisation (ICAO) first developed the high level concept of FANS in 1984, and FANS as we know them today, had their beginning in 1991 with Pacific engineering trials (PET). The FANS concept was developed to improve the safety and efficiency of airplanes operating under procedural control. This method uses time-based procedures to keep aircraft separated. The separation standard is determined by the accuracy of the reported positions, frequency of position reports, and timeliness of communication with respect to intervention. The continuous process of development and upgrades on FANS has resulted in seamless navigation, communication and surveillance services. The benefits of FANS include fuel economy, reduced flight time through direct routing, increased payload capability for flight limited by take-off weight, and reduced lateral and longitudinal separations and selection of optimum altitude for a combination of distance, route and fuel consumption. Automatic dependent surveillance (ADS), satellite navigation systems (GPS, GLOSSNAS, GALILEO), controller-pilot data link communications (CPDLC), required navigational performance (RNP) and required time of arrival (RTA) are the main features of FANS. Approximately, 15 airlines are operating aircraft with integral FANS upgrades. Larger civil aircraft manufacturers have already introduced FANS on their modern fleets. In India, AAI is in the process of installing a dedicated satellite communication network (DSCN), the global positioning system (GPS) aided geo-augmented navigation (GAGAN) is likely to be operational in 2008, ADS and CPDLC that have been installed and operationalised at Mumbai and Delhi airports, have been under trail since December 2006.⁹

8. NASA, "Air Transportation in the 21st Century and X-43A Hypersonic Aircraft," available at www.nasa.gov and www.aerospace-technology.com, accessed on August 23, 2007.

9. n.6.

SECURITY OF AIRSPACE AND SAFETY OF CIVIL AVIATION

The security of the airspace from unwanted intrusion/violation or activities that jeopardise the national security and aviation safety is an important task of the IAF

The security of the airspace from unwanted intrusion/violation or activities that jeopardise the national security and aviation safety is an important task of the IAF which has been the largest occupant and user of airspace hitherto.

which has been the largest occupant and user of airspace hitherto. In July 9, 2004, Minister of State for Civil Aviation Praful Patel informed the Lok Sabha that “airspace available to military and civil aircraft is 35 per cent and 65 per cent of the total of the Indian airspace respectively.”¹⁰The IAF occupied and controlled the major portion of the segregated Indian airspace, primarily for two reasons. Firstly, the responsibility of the air defence of the Indian airspace, including the territorial waters, island territories and littorals lies with the IAF which, therefore, needs to have a control mechanism to

execute this responsibility. Secondly, the nature and peculiarities of operational and training activities of the IAF require segregated airspace to avoid interference with civil aircraft and enhance safety of civil aviation.

In pursuance of this responsibility to defend the national airspace, the entire Indian airspace is divided into five air defence identification zones (ADIZs), which extend well into the ocean to cover island territories and economic assets like oil rigs, etc. It is the responsibility of the IAF to scrutinise flight, plans, issue air defence clearance and identify each and every flight, civil or military, entering, transiting or originating from an ADIZ. Prompt identification, initiation of appropriate tactical action to identify the aircraft or initiate other necessary actions, as specified in standard operating procedures to deal with the situation, require round-the-clock surveillance of the airspace, flow of information, real-time coordination and constant monitoring of traffic in a defined airspace by both civil and military control organisations and often in a

10. Shri Praful Patel, MoS for Civil Aviation, while answering an Unstarred Question 572, in the Lok Sabha on July 9, 2004, available at <http://civilaviation.nic.in>.

time critical and stressful environment. The current air traffic management system, based on ground-based navigational aids, voice communication and radars, will eventually be unable to cope up with the predicted growth of air traffic, further complicating the task of air defence.

In addition, there are other restrictions on the use of airspace, for example, prohibited, danger and restricted zones for the security of strategic political, civil and military assets and areas earmarked for safety of civil aviation, like air-to-ground and artillery firing ranges. The new technologies have led to expansion of military aviation and the number of airspace users have also been increasing; new aircraft induction, unmanned aerial vehicles (UAVs), aerial refuellers (ARs), airborne warning and control system (AWACS), increasing number of missiles and expansion of army and naval aviation demand segregated airspace and impede unrestricted use of airspace. The other peculiarities of military aviation and particularly of the air force that demand segregation of the airspace are:

- Unrestricted aerial combat manoeuvring in the horizontal and vertical planes.
- Very large band of vertical airspace for combat training and exercises.
- Quick reaction high priority missions like air defence missions that demand highest priority for take-off and landing. Time critical no communication missions, search and rescue missions and intelligence missions require exclusive use of airspace.
- The classified nature of some of the military missions precludes the possibility of placing all military movements on the open flight plan network.
- Operational and training flying of UAVs has added to the complexity and demand for additional airspace.
- Separate communication, navigation and air traffic control procedures.
- Short duration of flights, with frequent take-off and landing and low endurance as compared to civil aircraft.
- Weather conditions, like poor visibility, low clouds, precipitation, thunder, lightning, etc adversely affect military aviation as compared to civil aviation. The operational objectives, flight safety considerations, training and experience of pilots play a vital role in the decision to fly in marginal weather conditions.

- The operational and training flying cannot be segregated, for the combat pilot training is a continuous and never ending process. Different aircraft, military avionics, procedures, peculiarities of operations over different terrain, ability to accomplish missions by day and night in all weather conditions require constant practice, and keeping abreast of evolving tactics makes training a routine task. Therefore, the combat squadrons deployed at forward airfields are required to fly regular training missions to maintain high operational readiness.

The aforementioned and a variety of other peculiarities demand that military aviation is segregated from civil aviation primarily for reasons of safety, divergent operational environments, organisational requirements and ease of control. However, this situation is rapidly changing. During, the mid and late Nineties, civil aviation in India comprised a small segment of airspace users and civil air traffic could be easily managed within the confines of existing air traffic services (ATS) routes and marshalling areas in the vicinity of airfields. The unprecedented growth of civil aviation witnessed in the last decade has put extreme pressures on air traffic services and there is a constant requirement of additional airspace for safe, efficient and economical flow of traffic. The segregation of airspace for specific airspace users puts restriction on other airspace users which, in turn, leads to uneconomical routing, excessive fuel and time consumption and impediments to smooth flow of traffic. This situation causes the conflict of requirement between civil and military aviation.

CIVIL-MILITARY COORDINATION: STUMBLING BLOCKS

In last three to four years, there have been numerous instances of flight safety incidents where civil and military aircraft have had a close shave, causing safety concerns for both civil and military aircraft. A recent media report cited 21 near miss reports in 2005, and 26 in 2006, and out of 26 incidents in 2006, the IAF and civil aviation aircraft were involved in seven incidents.¹¹ Lack of coordination, poor communication leading to blockages in flow of information, different control agencies controlling air traffic in the same airspace and procedural lapses

11. Manju V., "Air Scare: 2 Near Misses Every Month" *The Times of India*, April 2, 2007.

are some of the main reasons. However, now the government has set up an Inter-Ministerial Coordination Committee to discuss various issues pertaining to the management and security of the Indian airspace in accordance with recommended practices laid down by the ICAO. The terms of reference for the Inter-Ministerial Coordination Committee are:¹²

- Civil-military coordination and cooperation in managing airspace and airspace security in India.
- Suggesting measures for flexible use of airspace while keeping in view the international changes and commitments.
- Integration of civil-military radars and related infrastructure.
- Optimum human resource utilisation for effective airspace management.
- Creation of a Joint Control and Analysis Centre at all airports in India.
- Any other issue vital to airspace management and security in India.

The Inter-Ministerial Coordination Committee has suggested a roadmap for civil aviation and various issues pertaining to civil-military coordination have been discussed with the Ministry of Defence (MoD) but the civil-military coordination has not taken off. The main concerns of civil aviation are:¹³

- Large parts of the Indian airspace are reserved for defence use, thereby restricting the choice of optimal routes for commercial aircraft.
- In order to meet the expanding requirements of civil air traffic, there is an urgent need to widen the existing air corridors, provide them uni-directional air corridors, to provide smooth flow of air traffic and, thus, enhance air safety.
- Restrictions on civil aviation movements in terms of choice of altitudes, timings and routing of the aircraft which is uneconomical.
- The airspace management model of developed countries like the USA should be followed to make the airspace permanently available for civil aviation and ensure that segments of airspace are re-vested and made available to defence on request.
- To optimise the utilisation of restricted airspace, by networking of radar and data systems, which should be acquired on the basis of mutual compatibility.

12. Shri Rajiv Pratap Rudy, MoS for Civil Aviation, while answering an Unstarred Question 922, in the Lok Sabha, December 8, 2003, available and downloaded from <http://civilaviation.nic.in>.

13. Naresh Chandra Committee report, MoCA, *A Roadmap for the Civil Aviation Sector* (2003). Available on <http://civilaviation.nic.in/moca/nccommittreport.pdf> on August 17, 2007 and AAI, Policy on Airport Infrastructure downloaded from <http://aai.aero/misc/policy> on August 17, 2007.

- Additional land is to be provided at civilian enclaves in military airports.
- Additional slots should be made available for civilian flights at military airports.
- To facilitate effective coordination and cost sharing, civil and defence air traffic controllers (ATCs) may be co-located where feasible.

There is no formal organisational structure to coordinate the airspace between

There is no formal organisational structure to coordinate the airspace between civil and military aviation except air force liaison units at the four metropolitan airports.

civil and military aviation except air force liaison units at the four metropolitan airports, therefore, there is no platform to discuss and formulate a national level strategic airspace management mechanism, and the existing mechanism for tactical or routine liaison has proved grossly inadequate. However, there is a general understanding between the AAI and IAF that “flexible use of airspace” is the way forward and formal discussions and official interactions have

resulted in a better understanding of each other’s requirement, and as a result:

- All IAF aerodromes are made available for civil aviation. At present, 19 of these airfields are being used by civil aviation.
- The airspace above Hindon airfield near Delhi has been made available above 3,600 ft, to decongest the airspace above Delhi.
- Five ATS routes have been allowed to be routed through restricted IAF airspace to save time and fuel.¹⁴
- Use of restricted IAF airspace above FL 280 in Hyderabad area.
- Extension of watch hours at IAF airfields to accommodate civil flights.
- Acceptance of international flights at IAF bases and acceptance of civil flights at strategic IAF airfields where civil enclaves do not exist.
- Releasing IAF ATCs on deputation to AAI for cross-training and utilisation of IAF controllers in times of crisis.

In line with the “open sky policy,” Chief of Air Staff, Air Chief Marshal F. H. Major has assured, “We do understand that expansion of the civil aviation sector is

14. Press Trust of India, “IAF Opens up 5 Routes for Civil Air Traffic,” *Hindustan Times*, July 24 2007, downloaded from <http://www.hindustantimes.com> on August 07, 2007.

a must for our nation's progress and we are extending all assistance in this regard." The flexibility demonstrated by the IAF notwithstanding, a lot more needs to be done to achieve an efficient, if not ideal, airspace management mechanism to meet the burgeoning civil aviation and operational requirements of military aviation. The concerns of both the IAF and AAI need to be addressed at the highest level to resolve the apprehensions and find a mutually agreeable path of accelerated progress. The draft civil aviation policy of the MoCA envisages that management of the entire Indian airspace be vested with civil aviation and released for use by the defence Services as per requirement projected, which impinges upon the IAF's right to utilisation of airspace and does not identify it as an equal partner in policy formulation. The IAF, therefore, would like the issue to be resolved by a Joint Working Group comprising representatives of all relevant agencies like the MoCA, MoD, IAF, DGCA and AAI.

Unlike the smaller European and Southeast Asia countries, India has a large landmass, larger number of airfields and enormous airspace which can accommodate both the growing civil aviation and military aviation. It is more a question of management of national resources in a manner that would meet the requirements of growth in civil aviation, national airspace security and also accommodate the operational imperatives of military aviation. There is an inescapable requirement of integrating civil and military radars to share a common air picture; secondly, the CNS/ATM system should also be on a common grid, and the military aircraft are to be upgraded to meet the requirements of future air navigation systems; thirdly, we need to have a common cadre of civil and military air traffic controllers who are familiar with each other's controlling procedures and operational requirements. The common pool of controllers could be developed by sharing resources and sending controllers on cross-training or deputations. Fourthly, civil and military aviation organisations need to share real-time communication and data links to share flight plan information, deviations, delays to handle contingencies more efficiently. The existing system of liaison units needs to be reviewed in terms of its capability to handle increasing traffic, communications and procedural methods all of which need to be restructured to meet the futuristic requirements.

In the overall interest of the growth of the national economy and expansion of safety requirements in air-space, there is necessity for a clear-cut policy on the *modus operandi* for sharing of airspace.

And, most importantly, sharing of airspace through flexible use need to be formalised. In the overall interest of the growth of the national economy and expansion of safety requirements in airspace, there is necessity for a clear-cut policy on the *modus operandi* for sharing of airspace. There are bound to be inherent organisational interests that would cause apprehensions and inertia; however, these could be resolved through institutionalised structures and legislative provisions.

INTERNATIONAL NORMS

The conflict between the growth of civil aviation and the requirements of military aviation is not new to the world of aviation – the more developed and larger nations across the world have faced similar dilemmas in the process of economic growth and security concerns. In the USA, the Federal Aviation Act of 1958 gave the Federal Aviation Administration (FAA) the sole responsibility for a common civil-military system of air navigation and air traffic control. The European Civil Aviation Conference (ECAC) states in Europe are managing civil-military coordination through mechanisms of Euro-control which adopted flexible use of airspace (FUA) in 1996. The global principles of air traffic management are governed by the guidelines and regulations of the International Civil Aviation Organisation (ICAO) issued in the form of Standard and Recommended Practices (SARPS). The ICAO lays down the fundamental communication, navigation, and surveillance procedures, and regulations for air traffic management. The guiding principles of ICAO's global ATM concept are¹⁵:

- **Safety.** Highest priority in air traffic management.
- **Humans.** Responsible for managing, monitoring and intervening when necessary.

15. Arthur Bradshaw, chairman, Air Traffic Management, in a presentation on, "Global Air Traffic Management Concept" Cairo, December, 2005.

- **Technology.** Technology for integrated and interoperable ground-based and airborne systems.
- **Information.** Sharing of timely, relevant, accurate, accredited information on a system-wide network.
- **Collaboration.** Strategic and tactical collaboration with airspace users and ATM community.
- **Continuity.** Maximum continuity in the face of major outages, major disasters, security threat, etc.

Within the framework of the aforementioned guiding principles, the global concept of airspace management is expected to provide equal access, improved traffic handling capacity, cost-effectiveness, global interoperability, aviation safety and security, efficiency, and meet the environmental guidelines.¹⁶

The problem of airspace management needs to be resolved within the framework of ICAO regulations and guiding principles because safety, interoperability and cost-effectiveness can be achieved only when there is global uniformity in air traffic control and airspace management. The requirements of air defence and military operational flying would have to be given precedence over general aviation whenever the situation demands; however, it should preferably be pre-planned and with the exception of time critical contingencies (air defence missions, casualty evacuation and search and rescue (SAR) missions, etc). There are bound to be certain geographical areas that would have to be decongested depending upon the density of flying activity – civil, military or private. Both the civil and military aviation authorities have identified and addressed some of the critical areas although a clear-cut policy on FUA has not been formalised owing to organisational apprehensions. The concept of FUA is briefly explained below.

FLEXIBLE USE OF AIRSPACE (FUA)

The basis of the FUA concept is that airspace should no longer be designated as either military or civil airspace but should be considered as one continuum and used flexibly on a day-to-day basis. Therefore, any airspace restriction or

16. Bradshaw, *Ibid.*

Effective application of the FUA concept requires the establishment of a high level national airspace body tasked with reassessment of the national air space, the progressive establishment of new flexible airspace structures and introduction of procedures for the allocation of these air-space structures.

segregation should be of temporary nature. One of the major objectives of FUA is the more efficient use of airspace by civil and military users. It increases the flexibility of airspace use and provides air traffic management (ATM) with increased capacity management. FUA allows the joint use of air space by appropriate civil-military coordination to achieve separation between general and operational flying. The segregation of airspace is based on real usage within a specified time-frame. The advantages of FUA are:¹⁷

- Increase in air traffic control capacity.
- Decongestion of the airspace reduces delays to general air traffic, civil or military
- Enhanced real-time civil-military coordination, resulting in enhanced safety.
- Increase in flight economy by reduction

in distance, time and fuel.

- Reduction in airspace segregation needs.

Effective application of the FUA concept requires the establishment of a high level national airspace body tasked with reassessment of the national airspace, the progressive establishment of new flexible airspace structures and introduction of procedures for the allocation of these airspace structures on a day-to-day basis, which will require real-time civil-military coordination procedures and facilities. The FUA concept is based on three levels of airspace management (ASM) which have been identified as:¹⁸

- **Strategic ASM.** National and international airspace policy.

17. Euro-control Handbook on Airspace Management, *The Concept of the Flexible Use of Airspace Management* (Edition 2.0, October 22, 2003) pp. 2.1-2.3, available on <http://www.eurocontrol.int>, accessed on September 20, 2007.

18. Ibid.

- **Pre- Tactical ASM.** Day -to-day allocation of airspace.
- **Tactical ASM.** Real-time use of airspace.

The strategic ASM consists of a joint civil-military process established by the “high level national body for airspace policy” which formulates the National Airspace Management Policy. The strategic objectives of the high level national body for airspace policy are:¹⁹

- To maintain safe and effective management of airspace and its supporting infrastructure.
- To carry out fair and effective regulation of that airspace system.
- To build confidence and respect between the airspace regulators and airspace users through consultations and cooperation.
- To maintain and improve the standards of service through effective planning and monitoring of the high level body’s activities and key processes.
- To accommodate shared use of the airspace by all user groups.
- Harmonise airspace management procedures.

The national body for airspace management formulates the national airspace policy and reassesses the national airspace structure for flexible use of airspace; and publishes the national airspace structure and ATS routes in AIP. The body also coordinates the planned major events like large scale military exercises and notifies these events. The guiding principles for the national body are similar to the ICAO principles of airspace management such as safety, consultations, cooperation and environment, etc. The national body is charged with reconciling civil and military operational needs, without affording preferential treatment to either, and ensuring that airspace planning takes into account the interest of all airspace users.²⁰

The pretactical airspace management consists of the day-to-day management and temporary allocation of airspace through national and regional airspace management cells. The allocation of airspace, setting up of approved agencies (AA) to coordinate and approve use of airspace and airspace management cells,

19. *Ibid.*, pp. 3.1-3.3.

20. *Ibid.*

central airspace data function (CADF) and integrated flight plan processing system (IFPLS) are all controlled and coordinated at the pre-tactical level. Setting up of temporary restricted areas (TRAs), temporary segregated areas (TSAs) and conditional routes (CDRs), notification on reduced flying activity, overflying of restricted areas or danger areas are the functions of approved agencies and airspace management cells at the pre-tactical level of airspace management.²¹

The tactical airspace management at level-3 consists of the real-time activation, deactivation or real-time reallocation of the airspace allocation made at level-2 and resolution of specific airspace problems or traffic situation between civil and military ATS units or controllers. (This task is presently done by air force movement liaison units and FIC). The real-time civil-military coordination capability enhances the flexibility in the use of airspace. The civil-military coordination includes the prompt exchange of information relevant to safe and expeditious conduct of civil and military flights which could be done in either active or passive mode. The active mode of coordination relates to the coordination of traffic situations requiring controller(s) action and is usually done by verbal or speech methods, whereas the passive mode of coordination relates mainly to communication of information (transmission of data) without any action by the controller. Silent coordination is used in situations which require prior coordination, for example, crossing of airspace and/or route structures. Crossing of ATS routes, controlled airspace, transfer of control responsibilities, transit through TRA or TSA and routine exchange of traffic information are executed at the tactical level or level-3 of airspace management.²²

THE PATHWAY AHEAD

Airspace management is a set of complex issues and every aspect has to be dealt with separately, whilst issues pertaining to communications, and navigation are addressed on priority by civil as well as military organisations; even though it may take a few more years to have a common interoperable platform, plans are underway to have satellite-based capability for seamless navigation and

21. Ibid., pp. 4.1-4.6.

22. Ibid., pp. 5.1-5.7.

communication facilities over the entire continent and beyond. However, in view of the rapidly increasing traffic and safety concerns, one of the main challenges for aviation over the two decades is the creation of a continuum of the Indian airspace for air traffic management. Some of the important milestones for such a roadmap are enumerated as under:

National Airspace Strategy

The national airspace policy should define the vision for use of airspace by all airspace users as a national asset. Access and equity should remain the basic premise for use of airspace. The main objective of managing the Indian airspace and enhancing civil-military coordination is to provide a common approach to airspace policy, planning and management issues, and formulate a national airspace strategy. The national airspace strategy will have to be implemented by enacting relevant legislative provisions which are obligatory upon all players with time-bound feedback accountability procedures.

The Civil-Military Coordination Group

Responsibility to implement the National Airspace Strategy should flow from top to bottom in the respective organisations. A joint working group (JWG) or a central coordination committee, comprising members from the MoCA, MoD, DGCA, IAF, AAI and navy needs to be set up to oversee the implementation of the national airspace strategy, reassess the requirements of actual airspace use, formulation of airspace structures, and execute the strategic level functions for flexible use of airspace. This group will jointly formalise the airspace management procedures for all three levels of control for flexible use of airspace.

Designation of Approved Agencies and Airspace Management Cells

The civil-military coordination group may designate appropriate agencies as approved agencies for centralised airspace requirements and regional airspace

The national airspace policy should define the vision for use of airspace by all airspace users as a national asset. Access and equity should remain the basic premise for use of airspace.

management cells for level-2 or pre-tactical ASM functions. These cells may be set up at Flight Information Centres with military representatives for larger areas with high density traffic or at military air defence units in security sensitive areas.

Integration of Radars

The policies and procedures would require the requisite infrastructure on the ground that would support the integrated airspace management programme. Even in the era of space-based global navigation systems and communication satellites, radars and V/UHF communications will remain the primary tools of air traffic control and air defence. The 12²³ existing civil air surveillance radars (ASRs) and monopulse secondary surveillance radars (MSSRs) are grossly inadequate to cover the entire Indian airspace. The air force has a much larger number and variety of radars; however, these radars are deployed based on threat perception and air force surveillance requirements. There is an urgent necessity for integration of civil and military radars to enhance the radar cover over the entire landmass and extending over the sea as far as possible. The main problems of integration are different make, different vintage, different countries of origin, different data sharing protocols and eventually the issue of intellectual property rights. The radar procurement policies of the MoD and MoCA need to be rationalised with an aim to share the radar picture and work on a composite air picture to share traffic information.

Communication and Navigation

Similarly, civil and military aviation controlling agencies need to be connected on real-time data link for sharing of relevant flight plans and flight data to reduce the verbal communication and consequent delays. As mentioned earlier in the paper, the AAI is in the process of installing a Dedicated Satellite Communication Network (DSCN) comprising the very small aperture terminal (VSAT) at 80 airports with full redundancy, including the space segment for highly reliable communications. The Space-Based Augmentation System (SBAS) more popularly

23. Air Traffic Services, "Airport Equipped with Primary and Secondary Radar," available on www.civilaviation.nic.in, accessed on September 20, 2007.

known as GAGAN would include hardware for eight reference stations, master control centre and a part of the uplink station. GAGAN will provide en-route navigation for the entire landmass of India and precision approaches to aircraft at all airports.²⁴ The automatic dependent surveillance / controller pilot data link (ADS/CPDLC) has also been installed at Delhi and Mumbai airports to reduce RT congestion, remove drawbacks of HF communication and enhance the area of surveillance.²⁵ On the other hand, the air force is also in the process of modernising its communication, and navigation facilities. What is more important is that any modernisation or upgrade in civil or military aviation communication navigation systems must cater to the interoperability between the systems.

Technological Interoperability

The implementation of FANS, installation of GAGAN, ADS, CPDL and voice communication system are all integrated technological upgrades of ground-based, airborne and space-based systems. The advanced technology in communication, navigation, meteorology and surveillance system is the only way to handle the growing air traffic situation. In airspace which is shared by multiple users, all the users need to be at the same plane as far as technological upgrades are concerned or there will be interoperability problems that would lead to safety hazards, an absolutely unacceptable condition in the 21st century. The military aviation also needs to upgrade the existing systems to match the requirements of international norms of communication and navigation. It starts from the basic requirements of fitting RVSM compliant altimeters in non-combat aircraft. The deficiency of IFF mode C (automatic altitude transmission) in some of the aircraft often creates an air traffic situation. IFF mode S has been a long outstanding deficiency in military aviation, though induction of new generation of fighters, transports and helicopters may have IFF mode S. However, the military ground stations would have to be upgraded to utilise the system. The liaison and coordination procedures between military and civil control agencies need to be reviewed and upgraded with the latest technology to meet the challenges. The air force network of various radars and

24. n.2, p.11.

25. Ibid., p.50.

sensors to create a composite air picture needs to take into the account the requirement of selectively integrating civil aviation radars and communications to provide a seamless, surveillance, navigation and control facility. The IACCS, ODL and Indian Regional Navigation Satellite System are different aspects of an emerging net-centric environment, which should not only be fully integrated with the civil aviation environment but also meet the international norms of aviation technology and safety norms.

Air Traffic Control Capacity

The shortage in the number of air traffic controllers is a global phenomenon and this needs to be addressed by creating a common cadre of controllers who could handle both civil and military aviation. The organisational structures like joint working groups, airspace management cells and airspace management approving authorities should have adequate representations from civil and military air traffic controllers. Regular joint training programmes, and cross attachment for controlling duties would help understand each other's rules regulations, controlling constraints and the working environment, and create better understanding amongst the controlling community. The joint cadre of air traffic controllers should not be viewed as prospective loss of turf – rather, it should be treated as reinforcement that would assist and cooperate to achieve larger organisational goals.

CONCLUSION

The objective of sustained economic growth and national development remains the primary one for the country. The civil aviation sector is the driving force for economic growth and military aviation is the powerful instrument of ensuring enduring peace, thus, creating the suitable environment for such a development. Instead of being independent, both are interdependent and complementary. Any policy on management of airspace, therefore, should identify and work on this fundamental premise.

Flexible use of airspace is the inescapable necessity of the times to come and the fundamental need of FUA is cooperation and coordination. Both the civil and

military aviation authorities have accepted the necessity of, and initiated, measures that would eventually pave the path for FUA. Nonetheless, urgent steps need to be taken to resolve the issues of mistrust and apprehensions pertaining to encroachment in each other's organisational independence. While the process of installing or acquiring enabling prerequisite technologies, integrated CNS/ATM system, integration of radars, development of space-based capabilities and ground infrastructure (larger numbers of runways) is underway, the interim period needs to be utilised to formulate the national airspace policy, define airspace structures and generate an environment of trust and cooperation. The AAI, DGCA and IAF need to intensify efforts to find mutually acceptable solutions which would address:

Both the civil and military aviation authorities have accepted the necessity of, and initiated, measures that would eventually pave the path for FUA.

- The requirements of increasing civil aviation activity.
- Prioritise the role of military aviation in the national airspace security.
- Identification of all airspace users.
- Equitable access to airspace for all airspace users.
- Airspace structures to meet the national and regional requirements
- Enacting new legislative provisions for enforcement of the airspace management policy in consonance with established international norms set by the ICAO.
- Establish an appropriate organisation, a joint working group (JWG) or a central coordination committee for planning and monitoring the implementation of all three levels of FUA

Military aviation would have to lead the way and accommodate the requirements of civil aviation by sharing its assets, be it airfields, human resource or airspace, as far as possible. Eventually, as a measure of long-term planning, some of the air force assets would have to be relocated to minimise the conflict and enhance air safety.



ROLES AND MISSIONS OF THE INDIAN AIR FORCE - 2032 AD

VINOD PATNEY

The goal of combat is not always the destruction of the enemy's forces.

– Clausewitz

INTRODUCTION

The Indian Air Force (IAF) has just completed 75 years since it was formed on October 8, 1932. This is as good a time as any to discuss the probable role and missions of the IAF in the centenary year–2032.

The last 200 years or so have seen phenomenal progress in the growth of technology. The technological advances in any given 25 years span far exceeded the progress made in the previous 25 years. Of late, the gulf in the quantum of progress made in two consecutive 25-year spans has increased considerably. The pace of technology is accelerating and the rate of acceleration is increasingly rapidly. Yet we are readily able to accept and take in our stride the near momentous changes that take place. Humans continue to show great adaptability. The next 25 years will surely prove this point once again.

In order to get a feel for the probable environment in 2032, it may be instructive to compare the situation in 1982 to the situation as it obtains today. In 1982, unification of Germany had not yet occurred; the USSR had not splintered and was still a major power bloc; Kashmir was a tourist paradise; terrorism was far less prevalent and posed no grave threat. It was generally thought that the

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RMA is now taken for granted and, since 1991, major progress has been made in the more effective employment of air power.

comfort of 'status quo' in most things would continue and the world would progressively become a better place to live in. It was fondly believed that no major changes that would seriously affect our lives were in the offing. Again, the few mobile phones that were available outside India were bulky, unreliable and expensive; in India, mobile phones were

yet to be introduced; means of communication were comparatively rustic and unreliable; colour televisions in India were few and prized possessions; indeed, even the issue of a credit card was an article of faith. Bill Gates was just a name in the telephone directory and Microsoft was unknown, if it was born at all; there was nothing known as the "Internet" leave alone Internet banking or even trading; terms like information warfare, network-centric warfare and cyber warfare were not even imagined leave alone representative of strategies in the making or already formulated. Undoubtedly, much has happened in the last 25 years, politically, and, most importantly, in the technological sphere. In the military field, the manner of waging wars has undergone a sea-change. The revolution in military affairs (RMA) was emphatically demonstrated in the Gulf War of 1991. RMA is now taken for granted and, since 1991, major progress has been made in the more effective employment of air power. Some of the changes were witnessed in the conflicts in Bosnia, Kosovo, Afghanistan, Iraq and Lebanon. The utility of reach, speed of action and reaction, precision and lethality – the essential products of RMA – has been demonstrated time and time again. In the last 25 years, India was also involved in the Kargil conflict – a conflict whose nature and manner of prosecution had not been imagined earlier. The same holds true for Operation Parakaram – the 11 months standoff after the attack on our Parliament on December 13, 2001, with the armed forces fully deployed for war. The attacks on the World Trade Centre and the Pentagon on September 11, 2001, brought terrorism onto centre-stage and the growth of terrorism is now recognised, worldwide, as one of the most important problem areas facing us.

The changes in the last 25 years have indeed been very marked and few would have successfully forecast them in 1982. It is at least as difficult if not even more difficult to accurately forecast the 2032 scene. Conventional wisdom suggests that there will be continued acceleration in the pace of change and the year 2032 is likely to be very different from 2007 in almost every respect. However, human nature is likely to remain a constant and military conflicts will probably continue to occur. Also, there is fair probability that the IAF will have to play an increasing part in the prosecution of such conflicts. This paper attempts to analyse the nature of employment or the recommended manner of employment of the IAF. A good starting point of the discussion would be to define the role of the IAF. Thereafter, the nature of likely conflicts can be examined and 'conservative estimates' made on the technological capabilities likely to be available in 2032. Finally, the employment of the IAF and some attendant factors will be addressed.

ROLE OF THE IAF

It will be instructive to discuss what is meant by the term "role of the IAF." Indeed, the phrase suffers from different interpretations. The connotation of the phrase should also go well beyond the concepts of what constitutes a strategic or tactical air force.

In 1995, in a report by George K. Tanham on "IAF Trends and Prospects," sponsored by the RAND Corporation, some rather uncharitable remarks were made. For instance it was stated, "At least from the outside, it appears that the IAF did not take the initiative in pushing concepts of air power or in preparing an air plan for the defence of India." Also, the author writes that, as told to him, the roles of the IAF were air defence of India, counter-air operations, army support, transportation of supplies and paratroopers, and strategic and tactical reconnaissance.

The report was naturally not well received in India. Some scathing comments had been made by an outsider on the basis of interviews and perceptions rather than facts derived from actual knowledge and experience. Be that as it may, the fact that it was a RAND study ensured substantial readership but few converts to the writer's point of view. In the view of this author, George Tanham was incorrect in

The strategic vision will alter with time. It is a dynamic and near continuous thought process that should lead to more effective long-term planning.

stating that the IAF did not try and explain the concepts in the utilisation of air power, or that there was no air plan for the defence of India. In fact, the IAF has always used every opportunity to explain its concept of the optimum utilisation of air power. Again, an updated air plan, modified as required with changes in equipment, training, enemy capability, etc was always in existence and suitably disseminated.

Without it, the Service would not have had the basis for a procurement philosophy, training or operational planning. Possibly, the IAF could be faulted for not effectively articulating its doctrine but this was rectified with the issue of the "Air Force Doctrine", albeit as a "restricted" publication.

George Tanham's comments can be taken forward to elicit the strategic vision of the IAF. It has often been mooted, even by some insiders, that the IAF lacks a strategic vision. This is not quite true but it would be a fair comment to state that a strategic vision has not been officially articulated. There are good reasons for this. Unfortunately, the strategic vision cannot be static; it cannot be cast in stone. The strategic vision will alter with time. It is a dynamic and near continuous thought process that should lead to more effective long-term planning. Apart from those that spoke about a lack of strategic vision, there were also a few who insisted that the IAF was a tactical air force intended to only support our army and navy. Possibly, this was a shortsighted, less well thought out approach as even the support to our army and navy has strategic connotations. An acceptable definition of a strategic force would be a force with capabilities to perform tasks that cannot be carried out by other means, or at least not carried out as well or as cost-effectively. By this yardstick, all air forces, including the IAF, have always had strategic responsibilities. The quick reaction and other unique capabilities of air forces, enhanced by modern technology, make them the instrument of choice to defeat the enemy strategy. That must be viewed as strategic capability. The use of the term "tactical air force" is a legacy or relic of World War,II a war that ended 62 years ago. Much has happened since then.

Can a strategic vision be synonymous with the stated role of the IAF? The answer has to be in the negative as the vision must change to suit changed circumstances. This has to be a continuous process, but the role of the IAF should be a more permanent statement.

George Tanham wrote in the RAND report referred to earlier that he was told that there were five roles for the IAF, namely air defence, counter-air operations, army support, transportation of supplies and paratroopers, and strategic and tactical reconnaissance. The list of possible air force tasks is patently incomplete and highly simplistic. The suggestion that air operations can actually be divided into near water-tight compartments is also incorrect. More importantly, the so-called “roles” as Tanham refers to them, are merely terminologies to describe the different types of air operations. Air power is indivisible and the different air operations of war are interdependent and have to be integrated. They should not be viewed as mutually exclusive. Be that as it may, the role of the air force must be unitary in concept and should form the basis of long-term acquisition, training and operational planning of the IAF. Without a formally or informally defined role, planning will be on ad hoc basis. It is preferable that the role be formally stated. The essence of a long-term strategic vision is to formulate and adopt such a role.

The essential purpose of the armed forces is to deter, to coerce, and to win the war in case deterrence or coercion fails.

The essential purpose of the armed forces is to deter, to coerce, and to win the war in case deterrence or coercion fails. A joint approach is essential and a commonality of view should be established amongst the three Services as to core competencies, responsibilities and accountability of each Service. Each Service should have a defined ‘role’. With well understood and defined ‘roles’, necessary understanding and synergy will automatically develop, The responsibility for defining, and formal adoption of, a ‘role for the IAF’ must rest with those that are charged with the responsibility at present. However, a possible definition could be: *“Exploitation of the vertical dimension to help shape the employment of military power in pursuit of national goals.”*

Implicit in the definition is the recognition that the IAF is only one of the contributors towards 'military power,' but it is the specialist Service to exploit the vertical dimension. Also implicit in the definition is the conviction that even though a single Service operation is a valid operation of war, it will be beneficial if it is the result of joint planning. Joint operations may not be the option of choice on some occasions. Joint operations represent a mere alternative but joint planning should be viewed as inescapable. The definition of the 'role' is also independent of capabilities or relative capabilities. In the pursuit of the 'role', the IAF will attempt to maximise the exploitation of the vertical dimension but the degree of success will be dependent on the relative capabilities and the manner in which such capabilities are used.

The role of the IAF as defined has long-term validity and its applicability extends throughout the spectrum of conflict, including limited or non-conventional wars. Also, the requirement for aerospace domination has been clearly emphasised. This is a classic concept and it will be the ground forces that will be most affected by adverse air power effectiveness. Again, it is air power and its ability to dominate the battle ground that will facilitate expansion of the battle space, when, and to the extent, it is desirable to do so. Air domination is not synonymous with air supremacy or favourable air situation. Air domination implies not only adequate freedom from interference by enemy air, but also the capability to effectively engage surface or airborne targets

The vertical dimension encompasses air, near space and space. Air, near space and space cannot be viewed as independent constituents of the vertical dimension. They represent a continuum and the entire vertical dimension should be effectively integrated in its exploitation. The exploitation applies to both defensive and offensive applications. Aerospace is a composite entity that favours unitary control. Undoubtedly, all the Services and other national agencies need to use space assets, but it is advisable that the IAF be appointed as the lead agency for planning and control of the military dimension of aerospace. In planning, necessary inputs and requirements of all the Services have to be collated and an approved plan worked out. The organisational aspects are not dealt with in this paper, but it is emphasised that, whatever be the organisation,

the IAF should take upon itself the responsibility and accountability for planning and establishment of adequate aerospace capability. This implies that the IAF should accept the responsibility to look after air, space, cyberspace, intelligence, surveillance, and reconnaissance (ISR) and associated requirements, information warfare, network-centric warfare (NCW), etc in a highly integrated manner. It is an onerous responsibility but necessary in the interest of efficiency and effectiveness of the IAF, and the build-up of the required expertise.

LIKELY NATURE OF FUTURE CONFLICTS

It will be stating the obvious that the armed forces must be prepared for all contingencies throughout the spectrum of conflict. In fact, the readiness to conduct warfare, whatever be the nature and extent of the war, is a determinant of our deterrent capability. This is now widely accepted. Also widely accepted is that wars with the objective of capture of territory on a long lasting basis, rather than as a bargaining chip, are unlikely. Attempts to rule another land by force are likely to be counter-productive.

Globalisation and the 'shrinking' of the globe have resulted in a significant increase in commercial competition. Commercial interests rather than ideological aspects are the major considerations that lead to the creation of bilateral, multilateral, regional or international relationships. Such relationships can be represented by concentric, intersecting and overlapping circles, with emphasis shifting from one area to another. Competition also ensures that there is no permanency in international relations. A joint approach in one area need not imply a joint approach in most areas. Similarly, nations could be competing with each other in some areas whilst being on the same side in others and concurrently to boot. In a polycentric world, with a number of centres of power, a nuanced diplomacy is needed to try and ensure that our self-interests are best served. At the same time, the high cost of military conflict is a dissuading factor. Therefore, discords that earlier could have led to military disputes may remain as mere disagreements; possible conflict areas need not go beyond the realm of competition; and adversaries could be content to remain rivals. Similarly, wars could be avoided not so much by the

deterrence provided by military power but by interdependence that exists between the possible warring parties. However, one cannot legislate to the enemy and rationality may be viewed differently by different states. Some wars could break out, particularly if there are historic and religious differences. Again, unless a country or side is economically very strong, constant attempts will be made to bring the war to an early close. The above sounds reassuring, but if a war were to break out where a failing or failed state is involved, few rational norms are likely to prevail. A highly flexible approach will be needed. A failing state or states is bad enough and eminently avoidable, but the eventuality of a failed state in combat is too dangerous to comprehend and defies contingency planning. Unarguably, the worst condition would be a failed state with nuclear weapons. We should also be conscious of the likelihood of spillover of trouble from states in our neighbourhood.

The economics of geo-politics can result in conflict. Historically, nations have often gone to war to secure natural resources or cheap labour, etc. This aspect is unlikely to change. Today, it is often said that China has adopted a "resource based foreign policy." More countries will also do so, and competition and, may be, conflict will occur. Hopefully, the competition will not escalate and peaceful attempts will succeed in fashioning a new, more acceptable order, but a short sharp military conflict could occur. Once again, the attempt on both sides would probably be to bring the conflict to a close as soon as possible and in as advantageous a manner as possible. Non-traditional security issues like global warming, water scarcity, etc will also become increasingly relevant. Hopefully, if military conflicts do occur, they will be short and with the limited objective of short-term gains only. It can be stated with some certainty that near continuous attempts to change the status quo will occur. It must be our endeavour to foresee likely occurrences and ready ourselves for the situations that may arise in order to ensure that the changes are in our favour.

A major difference between the last 25 years (1982-2007) and the 25 years period before that (1957-1982) was the impetus that was given to space issues. The Sputnik was launched in 1957 and some progress was made in that 25-year period, including a manned moon landing in 1969, but there has been a sea-

change in the utilisation of space in the last 25 years. The next 25 years are bound to be even more exciting. Starting from the 1991 Gulf War, increasing use of space has been made by the USA. Few countries have the desired space capability at present to seriously influence warfare, but the advantages that accrue with the use of space assets are so great that all countries will try to continuously upgrade their space capabilities and India is no exception. In fact, we have a fairly good space industry, and programmes in the offing indicate an accelerated approach to enhance space capability. Our reliance on space in war and in preparing for war is bound to increase. In the civilian sector as well, we are becoming increasingly dependent on space. Use of space assets touches our life to a significant extent and this will rapidly increase with time. The dependence on space in both the military and civilian domains also implies that we are becoming increasingly vulnerable to interference with our space assets. Such dependence demands defensive capabilities and, if possible, offensive capabilities to deter the adversary from inimical designs. At the same time, tremendous progress has been made to commercialise space. Now space transportation, basing industry in space, colonisation of the moon and beyond, etc are no longer in the realm of fantasy. As per a report by the US Space Foundation, "space economy" was worth \$160 billion in 2005, double what it was at the turn of the century. Of the \$160 billion space economy in 2005, 60 per cent was accounted for by commercial goods and services. Space economy is likely to grow even more rapidly in the years to come. Conflict is bound to follow commerce, and space warfare, in some form or the other, should be expected. We must be prepared for this eventuality that is bound to occur before 2032 even though the actual nature of space warfare will be determined by the then technological capabilities.

We have a fairly good space industry, and programmes in the offing indicate an accelerated approach to enhance space capability. Our reliance on space in war and in preparing for war is bound to increase.

Nuclear and weapons of mass destruction (WMD) proliferation is certainly on

the cards in spite of threatened sanctions and attempts to strengthen the non-proliferation and counter-proliferation regimes. The feeling of security that accrues with nuclear capability and the resultant confidence is too strong, and the temptation to achieve nuclear capability too difficult to resist. Attempts at excessive exploitation of lesser states will probably add to proliferation problems. However, it is extremely unlikely that nuclear weapons will be used against another nuclear power. The 'deterrent' is likely to remain in place but we can strengthen it by enhancing the credibility of our deterrent. In the realm of WMD, the essential danger lies in their use by non-state actors and the vicarious acts of adversaries. Both these possibilities are strictly not warfare between states but a terrible form of terrorism. Radiological bombs and, may be, even a nuclear explosion can be disastrous, but bio-terrorism can lead to millions of casualties. Well orchestrated use of the anthrax, botulism or even small pox virus can be contagious or can spread fast even across international borders before remedial actions can be put in place. The means of causing large scale deaths and serious damage to our planet are the weapons that readily fall into the hands of future terrorists.

Terrorism has certainly taken centre-stage and it is likely to remain a scourge throughout the next 25 years and more. It has been shown that it is an efficient form of warfare, with the gains far in excess of the effort involved. Also, counter-terrorism operations are often reactionary, with the terrorists retaining the initiative. With continuing modernisation in electronics and communications, white collar crime will also increase. In the September 14, 2007 edition of the *Hindustan Times*, it was stated that organised crime is a "Rs 80.75 lakh crore threat." The link between crime and terrorism is far from tenuous and the threat could increase unless a truly international approach is adopted. That is unlikely as it is in the nature of international relations not to worry about a problem that affects somebody else even if the problem could come home to roost in due course. Also, history records that the strong will always exploit the weak and wherever there is considerable asymmetry in capabilities and strength, asymmetric warfare will occur, either directly or by proxy. War by proxy may also be the preferred option to avoid responsibility. Asymmetric warfare is also referred to as 4th Generation Warfare in view of the sophistication of the means

to wage war. Technology will continue apace and, within the time period under consideration, possibly, 5th, 6th or even 7th Generation Warfare is well within the realm of the probable. It is difficult to guess the form that such wars will take.

A common denominator in the different types of conflicts that could occur is the need for speed and a deterrent posture. Also, our planning should permit inherent flexibility. Air power has to be the option of choice as it promises flexibility; speed of action and reaction are its inherent characteristics; its use can be very effective; and it is the instrument best suited to provide escalation control in order to contain the conflict.

SOME CONSERVATIVE ESTIMATES

There is general agreement that technological progress in the next 25 years will be astounding. In spite of the fact that by 2032, our gross national product (GNP) in purchasing power parity (PPP) terms will probably be the third highest in the world, it is extremely unlikely that we will be able to match the technological capability of the advanced countries. Also, the defence budget as a percentage of the gross domestic product (GDP) is unlikely to vary markedly. The size of the IAF will probably be similar to what it is at present, with relatively minor increments. However, capability-wise, we should be much better placed than at present as a result of absorption of the acquisitions in the pipeline. We should have better and, may be, even adequate combat and transport aircraft, helicopters, unmanned aerial vehicles (UAVs), balloons, radars, airborne warning and control system (AWACS,) air refuelling aircraft, weapons and weapon systems, and the infrastructural wherewithal needed for conduct of operations. In-house technical and operational expertise is also likely to be much better and, hopefully, the indigenisation drive would have been successful in large measure. Again, international cooperation would probably be at a considerably higher level. However, all these aspects will not come about automatically but will have to be brought about. Better capability is relative and it cannot be said with certainty that we will be better off against our adversaries than we are at present. We will have to make the best use of available resources and use imagination and initiative to make good some deficiencies in equipment. Use of air power lends itself to imaginative approaches. Again, conflicts

Our planning and conduct of operations will undergo major changes as a result of new acquisitions and support systems available.

undergo major changes as a result of new acquisitions and support systems available. New technologies and capabilities will lead to altered utilisation of assets and, possibly, to a transformation in the manner of waging war. The rate of technological progress suggests that there could be two or more transformations in the next 25 years. We should be able to absorb the changes and use them to advantage. Our mindset should be conducive to acceptance of change. For instance, it is on the cards that with increasing speed and height of operation of combat aircraft, a much larger area is threatened and the task of air defence made far more difficult. This aspect should be viewed as only illustrative of the change in thinking that may be required; the recommended optimum utilisation of assets is beyond the pale of this paper.

Of critical importance will be the high cost of military acquisitions and the much higher replacement costs. Sheer economics will dictate that the attrition rate is minimised. This implies more effective weapon systems. A sound stand-off capability in the air or against targets on the ground will be inescapable. At the same time, electronic counter-measure (ECM) and electronic counter-counter-measure (ECCM) functions will become increasingly important, even though the equipment and manner of carrying out the functions may vary markedly. Again, with increased range of combat aircraft, a much larger area will come under threat. Combating the threat will become more complicated, and could necessitate that we base our military and civilian assets at greater distances from the border. With rapid increase in the number of civilian and commercial aircraft in the skies, the air defence task will become even more complicated. Hopefully, technology will come to the rescue.

involve not only military forces but are multi-disciplinary endeavours – diplomacy, politics, economic considerations, etc all have a part to play. However, it can be safely assumed that whilst there could be military interdependence with some countries, we will not be a part of any military alliance.

Our planning and conduct of operations will

Our dependence on space is bound to increase. The increasing relevance of space in military conflicts has been recorded and chronicled. Satellites will play an even more significant part in the creation of communication networks and to provide reconnaissance and surveillance. An Aerospace Command should be established in the next few years and a military communication satellite launched as well. However, the increasing need for bandwidth will demand use of some civilian capability in war and even then, technological measures will be needed to increase the use of the available bandwidth.

In the next 25 years, civilian space transport on a significant scale and commercialisation of space, including the possible beginning of colonisation of the moon is a fair probability. The USA has also selected a site for the initial colonisation – Shackleton Crater near the moon's South Pole. It has been opined that in Asia, a race to the moon has started. India's Chandrayan is scheduled to be launched on April 9, 2008. China launched a moon probe on October 24, 2007. Earlier, Japan launched a constellation of satellites for moon exploration on September 14, 2007. One of the Japanese satellites, weighing three tonnes, will orbit the moon at a height of 100 km for a year and two smaller satellites of 50 kg each will be in the lunar polar orbit. The increasing civilian and commercial use of space and consequent competition could degenerate into conflict in space. The possible conflict necessitates that we ensure redundancy. One measure to provide redundancy is the use of mini satellites weighing around 100 kg. Milli satellites (10 to 100 kg) and micro satellites (1 to 10 kg) are also under development. Such satellites will be less expensive to manufacture and to place in orbit. In fact, a number of small satellites could be launched by a single launcher and very economically. India should also have this capability in the next few years. The mini satellites will really come into their own with effective miniaturisation. With miniaturisation, more powerful sensors could be produced in sizes small enough to permit a number of them to be carried by a single mini satellite.

Improved data processing, coupled with adequate bandwidth availability and effective sensors will permit the synergistic application of networked capabilities. A proper NCW capability may not be available to us till towards the

Both competition and conflict require good, timely actionable intelligence. This is the single most important ingredient for success in war.

spheres as well.

Both competition and conflict require good, timely actionable intelligence. This is the single most important ingredient for success in war. Hopefully, by 2032, our capability should be much improved and effective maritime surveillance, hyper spectral imagery, and electronic 'eavesdropping' capabilities using space, aircraft and UAVs will be available to us. Eavesdropping is essential in our fight against terrorists. Again, hyper spectral imagery with automatic target recognition and change detection will help detect possible improvised explosive device (IED) locations and significantly aid counter-terrorist operations in general.

MISSIONS AND TASKS

The primary mission of the IAF must be to equip, train and prepare to fulfill the requirements of the accepted 'role'. The attendant mission is to support India's foreign policy objectives.

Unquestionably, the major military requirement is to achieve the maximum possible degree of air dominance. "Air dominance" has many attributes. Firstly,

Unquestionably, the major military requirement is to achieve the maximum possible degree of air dominance.

end of the 25 years period but it is an objective worth pursuing. We should aim to achieve incremental gains towards NCW without unnecessary time slippages. In the meantime, we could improve on our offensive and defensive capability to carry out info war and cyber warfare, a type of warfare whose ambit may extend into the civilian and commercial

it implies that we should be able to provide effective air defence of our territory. Given the vastness of our area and limited resources, full air defence cover throughout our country may not be possible but we should be able to protect defined areas over stipulated time-frames. Even then, prioritisation is essential. Secondly,

air dominance is akin to the concepts of air superiority and favourable air situation where the operations of our air and surface forces are not effectively interfered with by enemy air. Similarly, our air operations should not be hampered by enemy surface assets. Thirdly, air dominance also means that we have the ability to hit air and surface targets effectively and speedily within the defined area of air dominance. Fourthly, air dominance facilitates intelligence gathering and represents the ability for timely and effective ISR over the areas of interest. ISR includes the capability to eavesdrop on communications, both voice and electronic communications.

The effectiveness of air power will be governed by the degree of air dominance that can be achieved. The greater the air dominance that one is able to create, the more effective will be the support to surface forces. The reverse is equally true, with the added disadvantage that the enemy air will be permitted greater freedom of action. These factors should be well understood and be duly considered in the joint planning for different contingencies. Air power can be a potent weapon if used well, and could be ineffective if the essentials of air operations are ignored. It also bears mention that the phrase “deterrent value of air dominance” is gaining currency. The term “coercive value of air dominance” is equally valid.

An important mission for the air force must also be attacking targets and target systems deep into enemy country in order to definitely carry the war to the enemy as well as to expand the battle space to advantage, particularly if we are the stronger air force. The enemy should feel our presence throughout their territory if possible. Expansion of the battle space will put the enemy increasingly on the defensive.

So far, the IAF has made only limited contribution towards counter-terrorism operations. The reason for this is lack of adequate capability. Intrinsically, air power can

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use the high altitude to better see and hear (ELINT – electronic intelligence), carry men and material safely and speedily, and attack targets on the ground with precision and desired lethality. All these aspects should have a significant part to play in counter-terrorism operations provided the capabilities match the requirements. For instance, in Iraq, the IEDs were taking a heavy toll of Allied soldiers. The Allies mounted an extensive surveillance programme of ELINT and use of aircraft and

UAVs to provide hyper spectral imagery that could, *inter alia*, determine areas where the ground had been recently turned over. The raw information collection was backed by good analytical tools. In a number of cases, the IEDs were destroyed before they could be activated. Technology can really produce marvels, and products of high technology can have a major influence in counter-terrorism operations. Presumably, the IAF will seek development or acquisition of suitable tools by which it can combat terrorism more effectively. Terrorism, in one form or the other, is here to stay for a long time and the IAF must arm itself with the requisite capability so that its intrinsic potential is put to good use.

In furthering our foreign policy objectives, the IAF capability to deter and coerce will be an important factor. Joint exercises with other countries also help, particularly if our prowess is appreciated. Probably more importantly, our continued participation in UN peace-keeping operations, and the support we can speedily provide to countries in their hour of need, can pay handsome dividends. Speed of action and reaction will always be important but so is the reach to which our capability can extend. Such capability has to be carefully built up. Few special requirements are involved. The majority of assets or equipment that may be needed for the tasks will be part of available IAF inventory.

Air power must inexorably give way to the concept of aerospace power. The indivisibility of aerospace power needs little emphasis; it is generally accepted and taken for granted. Ownership issues are avoidable complications and less

important. What is important is that the IAF must take upon itself the responsibility, on behalf of all three Services, of dealing with aerospace power in its entirety. This involves air, near space, space, control of all airborne objects, including UAVs, ISR, space-based communications, NCW, and the full ambit of cyber warfare. All these issues, in smaller or larger measure, impinge on the extent of air dominance that can be achieved, a capability that could well dictate the course of conflict. It is interesting that on September 18, 2007, the US Air Force (USAF) formed a provisional cyber command with the stated responsibility to oversee all aspects of offensive or defensive cyber warfare. Within a year, a full-fledged cyber command will be established as part of the USAF. Its task has been spelt out as ‘will train and equip forces to conduct sustained global operations in and through cyber space, fully integrated with air and space operations.’ In a discussion of aerospace operations, Dr Lani Kass, special assistant to the USAF chief of staff and an expert on cyber space stated, “If we don’t dominate cyber space, we won’t be able to dominate air, land or sea domains.” She added, “Cyber space doesn’t mean just computers. It covers everything from satellite communications to gamma rays to microwave technologies.” She also highlighted the need for cross-domain dominance involving air space and cyber space, and emphasised that “if you can’t control these domains, the size of the military force employed will be irrelevant.” It will be sensible on the part of the IAF to follow the USAF lead from the beginning itself although we could probably wait for the formation of a command.

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cyber space, we won’t
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Our nuclear doctrine calls for a triad. For many years, aircraft will be the most important leg of the triad, but will always retain significance even when the other two legs are fully operational and effective. A nuclear strike is an important mission of the IAF that demands more than loading a bomb and delivering it on target. Continuous work is required to hone capabilities; and modify or alter plans, methods, and systems with change in technological, strategic or politico-diplomatic circumstances.

It is often mooted that major wars are unlikely to occur. Be that as it may, we have to be prepared for them. What is far more likely is that there will be

In a fluid, limited war or non-conventional war, we cannot wait till we have adequate information or all the desired resources before we take action.

continuous multi-disciplinary conflict carried out by multi-disciplinary agencies of which the military is but one part. In such combat, speed and escalation control will be important factors. Aerospace power lends itself to such requirements. However, a classic military confrontation of adversaries may not occur. In a fluid, limited war or non-conventional war, we cannot wait till we have adequate

information or all the desired resources before we take action. Speed of action will not only be desirable but essential. As a result, the VUCA factor – volatility, uncertainty, complexity and ambiguity – will prevail. We will have to manage uncertainty. Traditional forms of combat could also give way to non-traditional combat – a product of the information age. The inherent flexibility of air power would be put to good use. Again, where the results of any prolonged military conflict can have far-reaching adverse effects for both sides, it is important that escalation be controlled. One method of doing so is what is termed as “perception warfare.” It is a concept that suggests that we have to create conditions, by suitable actions and occurrences, where both sides can claim victory and there is no loss of face. It is a form of warfare where graded and graduated actions or responses will be an inescapable part in our prosecution of such a war. It is air power that can best ensure controlled responses as there is substantial distance between the competing forces and the available options are much greater. Perception warfare should become an important mission of the IAF. More study and preparation for the conduct of such warfare is needed. It should also be recognised that perception warfare should be a joint, multi-dimensional endeavour.

The discussion on possible missions for the air force has shied away from the preparation of a complete list that would remain applicable for the next 25 years. Much is bound to alter but the essential nature of air power capability and its use is unlikely to change. This actual utilisation of air power is effected by air power tasks. The well accepted tasks are counter-air operations, air defence, close air

support, reconnaissance, interdiction, transportation of men and material, casualty evacuation and a number of off-shoots of these basic tasks. It is preferable that 'tasks' are not confused with 'missions' and 'missions' are not confused with 'role'. A better understanding of air power will result.

CONCLUSION

The nature of conflict and the military dimension of conflict have changed in the recent past and the rate of change will probably accelerate. However, a definite consistency in the utilisation of air power will remain although technological progress will make air power more efficient and effective. Air dominance will remain the essential mission. As we become more proficient in space technology, aerospace domination will become the major mission. It is fitting that the IAF accepts the responsibility for all aspects of aerospace power including, *inter alia*, ISR, NCW and cyber warfare. The IAF will also have to learn to operate under conditions of major uncertainties. The same will apply to the other Services but, given its basic characteristics, the IAF should be better placed to deal with uncertainties.

"Perception Warfare" will, in time, find greater acceptance as a worthwhile concept. Terms like victory and success, indeed victory and defeat, suffer from major ambiguities and defy cogent explanations. The results are also transient. In this milieu, perception warfare, where everyone believes that the war or conflict ended to his advantage, promises a longer peace. The concept requires further study and may have to go through many iterations and modifications, but any means that would reduce the chances of extended military conflict must be worthwhile. One definite statement that can be made is that the IAF will have a major part to play in the prosecution of perception warfare. Preparation for perception warfare should be accepted as a mission for the IAF.



CHANGE AND CONTINUITY IN WARFARE: AN INDIAN EXPERIENCE

P. K. MALLICK

Every age has its own kind of war, its own limiting conditions, and its own preconceptions. Each period, therefore, would have held to its own theory of war.

– Carl Von Clausewitz

INTRODUCTION

Conflict is as old as human existence. As the human race progressed, the nature of warfare also changed. The development of weapons led to the creation of organisations which, in turn, depended on technology. The requirement of ideas or doctrines or strategy came up to use the equipment and organisations optimally.

There is a large number of theories on the trends in change in warfare. There is no common 'fit' in these theories. Military theorists have propagated the Clash of Civilisations (Huntington), Wave Theory (Tofflers), Revolution of Military Affairs (RMA), Fourth Generation Warfare (4GW), etc. Presently, the theories of Information Warfare, Network-Centric Warfare (NCW) Effect-Based Operations (EBO) for conventional warfare with extensive use of technology, specially Information Technology(IT), have been propagated. For the age-old Counter-Insurgency Operations (CI Ops) the theories of Revolutionary Warfare, Guerrilla Warfare, Low Intensity Conflict Operations(LICO), Asymmetric Warfare, Irregular Warfare, People's War, Proxy War, Irregular War, Unrestricted Warfare, Unconventional Warfare, Gray Area War, Sub-Conventional Warfare, Military Operations Other Than War (MOOTW), Limited War, Small War, Three

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Block War, Hybrid Warfare, Distributed Operations, etc are in vogue. All these types of warfare have overlapping characteristics. Warfare situations are too complicated for any single theory to cover.

The then British Indian Army fought in World Wars I and II with distinct glory. Field Marshal Bill Slim considered his Indian divisions as some of his best. Since independence, India has fought four conventional wars, in 1948, 1962, 1965 and 1971, with Pakistan and China. The Kargil conflict (May to July 1999), with a nuclear backdrop, gave a new dimension to warfare that we are likely to fight. In addition, the Indian armed forces have taken part in the Hyderabad and Goa operations, Operation Pawan in Sri Lanka, counter-insurgency operations in the northeast since 1955 and the ongoing proxy war in Jammu and Kashmir. (J&K) We have been successful in Punjab, Mizoram and in West Bengal against the Naxalites in the early 1970s. There are not many success stories in CI Ops all over the world. No other country in the world after World War II has had such varied experience in warfare in the two extreme spectra of war. There is likely to be a paradigm change in warfare as well as continuity. We should be ready for both and initiate action in terms of weapon and equipment, organisation, doctrine and leadership.

THEORIES OF WARFARE

Clash of Civilisations

This is propagated by Professor Samuel P. Huntington. He predicts a “clash of civilisations” between the Western, Confucian, Japanese, Islamic, Hindu, Latin American and African cultures. The clash will occur along cultural “fault lines” between people, groups or non-states who struggle for control over political military and economic power, territory, and religious values. He asks, “What will be the fundamental source of conflict in this new world?” and answers, “My hypothesis is that it will not be primarily ideological nor economic. The great divisions will be cultural. The clash of civilizations will dominate global politics.”

Wave Model by Alvin and Heidi Toffler

This describes human history going through a series of waves. Each wave is based

on the means by which wealth is created. The First and Second Wave civilisations were based on the agricultural and industrial revolutions. Presently, we are in the era of Third Wave civilisation based on the knowledge revolution introduced by computer related technology. The strength of the small and the many will dominate the large and the few of the First and Second Waves. Smaller adaptable organisations have the potential to defeat a large adversary by adapting and reacting faster to the changing situation.

The Revolution in Military Affairs(RMA)

In the 1990s, Andrew Marshall, head of the US Department of Defence's (DoD's) Office of Net Assessment, advanced the idea, calling it the revolution in military affairs. He espoused linking new technologies with emerging doctrine and organisations to make fundamental, far-reaching changes in how the military conducts operations. The basic idea is that advances in technology have made the need for mass armies obsolete. Wars can be fought by small numbers of well-trained professionals equipped with high-tech devices and weaponry, centrally coordinated with "network-centric" warfare.

RMA consists of an array of technological innovations in a number of areas that induce significant changes in the conduct of military operations. These changes include:

- Over-the-horizon targeting and fire.
- Use of unmanned vehicles for reconnaissance, targeting, and combat operations.
- Use of precision-guided munitions (PGMs) in both strategic and tactical environments.
- Use of space and the employment of a "system of systems" for combat-related command and control activity.
- Information warfare.

The traditional armies are aware of the advantages of RMA technologies. Yet, both financial and technological constraints and limitations on the supply of RMA technologies prevented them from adopting most of these technologies. The successful use of RMA technologies by the United States in Iraq stands in

stark contrast to the ineffectiveness and irrelevance of most technologies in the cases of low intensity conflict (LIC) in the region. The Indian armed forces are aware of the developments of RMA but except for a few upgradations of technology and acquisitions of modern weapons and equipment, there have been no conceptual, doctrinal or organisational changes.

Non-state actors have opted for primitive methods of warfare that have put significant dents in the doctrine and will of state actors and have rendered many of the technological innovations of the last two decades of limited relevance and effectiveness

Transformation

Today the term RMA has been supplanted by transformation, but its meaning is essentially the same, as it refers to applying new technologies, concepts, and organisations to bring about radical changes in the character and conduct of warfare. In its broadest context, transformation is about changing the character and structure of the military to meet the new security challenges.

FOURTH GENERATION WARFARE

When I was a young officer, I was taught that if you have air superiority, land superiority and sea superiority, you win. Well, in Vietnam we had air superiority, land superiority and sea superiority, but we lost. So I realized there is something more to it.

– America’s greatest military theorist John Boyd

“Fourth Generation Warfare” is a concept defined in 1989 by a group of American analysts, including William S. Lind and John Boyd, to describe warfare’s return to a decentralised form or to a form where one of the forces in the conflict is a not a nation-state but a rather violent non-state actor. Marine Corps Col (Retd) Thomas X. Hammes, an expert in insurgent warfare, argues that it is time to recognise that future warfare will move from a purely military-technical arena to a fight that takes place across the entire range of human activity – political, economic, social, and military fields. Fourth Generation War is not a military but a political, social and moral revolution: a crisis of legitimacy of the state. All over the world,

the citizens of states are transferring their primary allegiance away from the state to tribes, ethnic groups, religions, gangs, ideologies, and so on. Many people who will no longer fight for their state, will fight for their new primary loyalty.

Generations of War

First Generation War was fought with line and column tactics. Its importance for us today is that the First Generation battlefield was usually a battlefield of order, and the battlefield of order created a culture of order in state militaries. Second Generation War was developed by the French Army during and after World War I. It dealt with the increasing disorder of the battlefield by attempting to impose order on it. Second Generation War, also sometimes called firepower/attrition warfare, relied on centrally controlled indirect artillery fire, carefully synchronised with infantry, cavalry and aviation, to destroy the enemy by killing his soldiers and blowing up his equipment. Third Generation War, also called manoeuvre warfare, was developed by the German Army during World War II. Third Generation War dealt with the disorderly battlefield not by trying to impose order on it but by adapting to disorder and taking advantage of it. Third Generation War relied less on firepower than on speed and tempo.

Fourth Generation Warfare (4GW)

It has changed everything. It pits nations against non-national organisations and networks — including oppressed ethnic groups, mafias, narco-traffickers and extremist quasi-religious cults. 4GW is the chosen weapon of the weak, the downtrodden, the criminal and the fanatic. Its evolutionary roots may lie in guerrilla warfare, the Leninist theory of insurrection and old fashioned terrorism, but it is rendered more pervasive by the technologies that the age of computers and mass communication has spawned. A diagram of the generations of warfare is given at Appendix A.

4GW uses all available networks – political, economic, social and military – to convince the enemy’s political decision-makers that their strategic goals are either unachievable or too costly for the perceived benefit. In broad terms, Fourth Generation Warfare seems likely to be widely dispersed and largely undefined.

It will be non-linear, possibly to the point of having no definable battlefields or fronts. The distinction between “civilian” and “military” may disappear. Tactically, Fourth Generation War will be fought in a complex arena of low-intensity conflict, include tactics/techniques from earlier generations, be fought across the spectrum of political, social, economic and military networks, be fought worldwide through these networks, and involve a mix of national, international, trans-national, and sub-national actors.

Recently, Hezbollah’s innovative use of guided anti-tank missiles has drawn the attention of military specialists eager to glean lessons from the recent fighting in Lebanon, where the high-tech Israeli Army, considered one of the world’s most formidable fighting forces, was often stymied by militiamen using guerrilla tactics and advanced weaponry. Much discussion has been focussed on Hezbollah’s “swarm” tactics, which damaged Israel’s Merkava tanks and heavy armoured vehicles with missile volleys at their vulnerable sides and rear. Hezbollah’s swarm tactics – firing multiple missiles against a single target – proved effective against both armoured vehicles and infantry. Hezbollah’s missile arsenal included old yet effective Russian-made Sagger wire-guided anti-tank missiles, as well as the newer Russian Metis-M and Kornet.

RELEVANCE OF 4GW IN THE INDIAN CONTEXT

The presence of nuclear weapons in China, India and Pakistan makes the chances that these armies will have to fight large-scale conventional wars,

The presence of nuclear weapons in China, India and Pakistan makes the chances that these armies will have to fight large-scale conventional wars, extremely limited.

extremely limited. The only conventional wars that can take place are of the “limited” variety, which confines conflict below the threshold levels. Under these circumstances, the better option is to indulge in 4GW, which enables avoidance of a devastating full blown conventional war with a nuclear scenario. It also enables a weaker side to offset the advantages of the stronger one. Pakistan is indulging in 4GW in Kashmir. China or India

may utilise 4GW against each other. China can exert pressure on India by supporting the insurgents and militant groups in northeastern India, as it has done in the past.

The growth of mechanised forces made the army effective in mechanised plains warfare to the detriment of fighting 4GW. As a result, in the 4GW that the army was repeatedly called upon to fight, the following shortcomings emerged:

The army was ill equipped to take on 4GW foes. Its weapons for close quarter battle were not effective enough.

- The army was ill equipped to take on 4GW foes. Its weapons for close quarter battle, which is where 4GW engagements take place, were not effective enough.
- The army lacked essential elements like body armour, protective clothing and night vision devices.
- There was a lack of vehicles which were improved explosive device (IED) proof or had sufficient offroad capability.
- The army lacked language skills and cultural knowledge, even within its own country. This is not strange in a subcontinental country which has 15 official languages and hundreds of dialects.
- Since the army realised that it was fighting a new way of war, there was initially a shortage of manpower as large elements of the army were not released from previous commitments in view of conventional threats on Indian borders.
- The components of the army, which were organised, structured, trained and equipped to fight Second and Third Generation Wars, were not organised, trained or equipped to participate in 4GW.

Reorganisation

To arm and train an army conventionally and then make it fight in an unconventional manner is wasteful. While the skills of conventional warfare should not be consigned to the scrap heap, they do need to be adapted to make them suitable for 4GW. This involves organisational changes to enable the army

to overcome weaknesses that conventional armies find themselves in when engaged in 4GW. These weaknesses are mainly an inability to gather the correct intelligence, emphasis on attrition, weakness in waging information and psychological warfare in the Fourth Generation environment, and lack of skills in building a relationship of trust with the population. This requires focus on education and training from the grassroots level upwards. The weapons and equipment for conventional war are not suitable for 4GW. They are either too destructive or inappropriate. There is a requirement to identify the correct way to equip the army for 4GW.

A very large part of the army is engaged in proxy war in J&K and CI Ops in the northeast. There is a fundamental difference in that we are fighting these operations in our own country whereas the US and North Atlantic Treaty

We are fighting these operations in our own country whereas the US and North Atlantic Treaty Organisation (NATO) forces are operating in foreign countries.

Organisation (NATO) forces are operating in foreign countries. We do not use artillery, armour and the air force against terrorists or insurgents. Excessive involvement of the army in internal security duties adversely affects the combat potential of the army. In addition to the army, a large number of Rashtriya Rifles (RR) units along with sector and force headquarters are also employed in J&K. RR units were raised for counter-terrorism (CT)

and counter-insurgency (CI) operations. The performance of RR units are excellent. A cursory glance of the award lists in any year will testify to this. However, RR represents a contradiction in the army. Far from reducing the employment of the army in internal security operations, it has served to institutionalise and reinforce it. RR units were planned to be raised to reduce the commitment of infantry soldiers in CI Ops by employing ex-Servicemen and central police organisations (CPO) personnel. Today, the most of the RR forces consist of infantry personnel only. It has increased the commitment of the infantry rather than decreasing it.

Similarly, Assam Rifles (AR) units of the Director General of Assam Rifles are

also deployed in CT and CI Ops. This force comes under the Ministry of Home Affairs (MHA). Army officers on deputation provide the command and leadership of the force. In operations, AR functions under the exclusive command and control of the army. These two factors set it apart from the CPO forces under the MHA.

No army in the world likes to get involved in prolonged CT and CI Ops. The CPO and the paramilitary forces (PMF) are approximately 17 lakh strong. They are getting MI 17 helicopters, transport aircraft, speed boats and flat bottom ships. Some of them have their own commando battalions. They are not as naïve as we think. We may consider handing over CT and CI Ops to them. The army should provide very good special operation forces to support these forces and carry out specific surgical tasks. Low intensity conflict operations (LICO) are infantry predominant and manpower intensive operations. The army should carefully assess the number of infantry units and formations required to counter internal threats to national security. Suitable modifications should be adopted when committed in such tasks. Modifications should reinforce force protection, quick reaction, intelligence and interrogation, reconnaissance and surveillance, language and interpreters, aviation, combat engineering, communications, transportation, provost, medical, army dogs, media, military civic action and legal affairs.

COUNTER-TERRORISM OPERATIONS

...the US infantryman lives in a doctrinally driven, 'top-down' training environment. Such an environment cannot match the learning dynamics of its experimentally driven 'bottom-up' antithesis. Unfortunately, most Eastern armies, Hezbollah, and al-Qaeda, follow the latter. One produces standardized procedures that are painfully dismissive, painfully predictable, and technologically dated. The other produces current guidelines that are circumstantially unique, surprise oriented, and threat compensating.

– Poole, *Tactics of the Crescent Moon*, p. 234.

Maritime Terrorism

Maritime counter-terrorism has received considerable attention in India. Over 80 per cent of the terrorist organisations with a capability for maritime terrorism

It is time the Indian Navy starts paying more attention to the threats of maritime terrorism that could arise from the west.

operate in the areas and seas to the west of India. Almost our entire energy supplies come from this area. The security of the Malacca Strait has limited relevance for our energy security, whereas our entire energy security depends on maritime security in the areas to the west of India. One would have, therefore, expected that

the concentration of our maritime counter-terrorism efforts would have been on building a database of capabilities, threats and risks from the areas and seas to the west of India, adopting a vigorous proactive policy of cooperation with the navies of this region and developing preventive and termination capabilities, which would have relevance in the areas to the west of India. Unfortunately, this is not so.

The Americans do not want our navy playing any proactive role in maritime security in the waters to the west of India lest it cause any undue concern to Pakistan. This tendency has to change. It is time the Indian Navy starts paying more attention to the threats of maritime terrorism that could arise from the west. We should not leave the protection of our shipping and our energy supplies totally in the hands of the US-led coalition. We should develop our own capabilities and networking with the countries of the region. Maritime counter-terrorism experts now look upon the Bay of Bengal and the Indian Ocean region as highly vulnerable, if not the most vulnerable, to such catastrophic acts of maritime terrorism. Amongst the factors influencing their perceptions are:

- Presence in this region of terrorist or insurgent organisations with proven or suspected capabilities for maritime operations. Amongst the organisations are the Liberation Tigers of Tamil Eelam (LTTE) of Sri Lanka, with proven capabilities for maritime operations, conventional as well as unconventional; the Free Aceh Movement of Indonesia with suspected capabilities for acts of piracy to find funds for its land-based operations and the Abu Sayyaf of southern Philippines, with its proclaimed readiness to extend its operations from the land to the sea.
- Wide networking of Al Qaeda across this region—either through its own

members or through surrogate *jihadi* terrorist organisations.

- Long-known reputation of this area as the world's leading producer and supplier of heroin from the Golden Triangle and the Golden Crescent and its recent emergence as a producer and supplier of synthetic drugs.
- Continuing availability in this region—in Pakistan as well as in Thailand, Laos and Cambodia— of large quantities of arms and ammunition to anyone with the means to pay for them and with the capability for their clandestine transport to areas of intended use.
- Presence in this region of terrorist organisations such as the LTTE with a commercial shipping capability, which can be diverted for the clandestine transport of narcotics and arms and ammunition.
- Presence in this region of trans-national mafia groups such as the one headed by the Karachi-based Dawood Ibrahim, with vast financial resources, a capability for clandestine shipping and a willingness to place their resources and shipping at the disposal of Al Qaeda and other *jihadi* terrorist organisations operating across the region.
- Role of Pakistan as the region's leading supermarket for nuclear weapon-capable material and equipment and the nexus of some of its scientists, enjoying the protection of its army, with Al Qaeda and other *jihadi* terrorist organisations.
- Presence in this region of tempting choke-points such as the Malacca Strait through which passes half of the world's oil and a third of its trade.
- Reputation of this area as one of the most piracy-prone in the world.
- Presence of a large number of uninhabited islands in the region, which serve as sanctuaries and operational bases for the pirates and could similarly serve for the terrorists in the future.

There is an urgent need for a comprehensive approach to maritime counter-terrorism covering its various dimensions, such as intelligence collection, analysis, assessment and dissemination; the need to strengthen the capability for the collection of technical intelligence (TECHINT) relating to maritime terrorism through monitoring stations on the coast and the islands

as well as sea-based monitoring platforms; port security, strengthening coastal patrolling in the vicinity of sensitive establishments such as nuclear installations, oil refineries and off-shore oil platforms; intensive naval patrolling in the high seas, monitoring developments in coastal maritime communities, coastal radar network, vessel tracking and management system in all ports; an integrated communication network and regional coordination of maritime affairs; a rapid action capability to deal with a maritime situation if preventive measures fail; a crisis management capability, and regional and international cooperation.

Countering Use of Weapons of Mass Destruction (WMD) by Terrorists

The key to defeating a nuclear, biological, chemical (NBC) terrorist threat is timely and accurate intelligence collection, analysis and dissemination. Surveillance and reconnaissance are also important. Improvements in individual and collective protection are necessary to sustain operations. We need to be prepared to find and destroy weapons before they can be used against us. Deterrence may not work with terrorists because deterrence is based on the adversary being a rational actor. Special forces (SF) play a key role in combating terrorism, as they provide the ground force option short of a major war, to seize, recover, disable, render ineffective or destroy NBC weapons and associated technology.

Countering NBC attacks by terrorists requires adherence to three principles: avoidance, protection and decontamination. Avoidance includes both passive and active measures. Protection consists of hardening of positions, protecting personnel, assuming protective postures, physical defence measures and quickly reacting to an attack. Decontamination stops the erosion of combat power and reduces the possibility of additional casualties from inadvertent exposure or failure of protection.

Terrorism Affecting Energy Security

Four of these possible scenarios are, or should be, of major concern to national security managers:

- Terrorists hijacking a huge oil or gas tanker and exploding it in mid-sea or in a major port in order to cause huge human, material and environmental damage. There were 67 reported attacks on oil and gas tankers by pirates during 2004. This despite the stepped-up patrolling by the navies of different countries. What pirates with no ideological motive and with no suicidal fervour can do, ideologically-driven suicide terrorists can do with equal, if not greater, ease.
- Terrorists hijacking an oil or gas tanker or a bulk-carrier and exploding it or scuttling it in maritime choke-points such as the Malacca Strait in order to cause a major disruption of energy supplies and global trade.
- Terrorists smuggling weapon of mass destruction material such as radiological waste or lethal chemicals or even biological weapons in a container and having it exploded through a cellular phone as soon as the vessel carrying the container reaches a major port.
- Sea-borne terrorists attacking a nuclear establishment or an oil refinery or off-shore oil platforms.

India's plans for ensuring the supplies of energy to fuel its expanding economy through a network of pipelines from Turkmenistan and Iran via Pakistan and from Myanmar via Bangladesh would remain a pipedream till the already-established international *jihadi* terrorist infrastructure in Afghanistan and Pakistan and the fast emerging one in Bangladesh are neutralised by the international community through appropriate pressure on these countries.

Cyber-Terrorism

Terrorist groups today frequently use the Internet to communicate, raise funds and gather intelligence on future targets. Malicious attack programmes currently available through the Internet can allow anyone to locate and attack networked computers that have security vulnerabilities and possibly disrupt other computers without the same

Terrorists hijacking a huge oil or gas tanker and exploding it in mid-sea or in a major port in order to cause huge human, material and environmental damage.

vulnerabilities. Terrorists could also use these same malicious programmes, together with techniques used by computer hackers to launch a widespread cyber attack against computers and information systems that support the country's critical infrastructures like power, transportation, financial, communications and aviation sectors.

The till now known weapons of mass disruption are hacking and the computer virus as a stealth weapon and there have been many reported instances of the use of these weapons by cyber-vandals, cyber-anarchists and other cyber-criminals for deliberate disruption, but not yet by cyber-terrorists. However, there have been instances of cyber attacks carried out by the Inter-Services Intelligence (ISI) supported Kashmiri extremists against the web sites of the army and other agencies of the Government. of India. The dangers from these weapons are enhanced due to the following factors :

- The easy availability of the tools of mass disruption in various web sites free of cost.
- The easy availability of expertise in various chat rooms devoted to computers and hacking.
- The ease with which large-scale distributed denial of service attacks can be carried out through programmes and commands planted in the computers and servers of third parties without their knowledge.
- The likely emergence of hackers as the mercenaries of the new terrorism, offering their services to any terrorist group for a price.
- The facility of carrying out cyber acts of terrorism from safe sanctuaries, without having to cross international borders.
- The likely use of hackers and terrorists with expertise in hacking by adversary states, thereby giving rise to state-sponsorship of cyber-terrorism.

It would be reasonable to anticipate that it is only a question of time before terrorist groups, acting independently or at the sponsorship of an adversary state, start experimenting with cyber-terrorism. It is, therefore, necessary that the state remains well prepared to deal with such threats. Such preparations would include the enactment of the necessary laws to empower the security agencies, the creation

of the necessary intelligence collection capability, the setting up of special cyber-terrorism prevention cells and special cyber-terrorism crisis management drills, periodic rehearsals of such drills to locate and remove weak points, the setting-up of computer security and sensitive infrastructure security cells, etc.

CHANGING NATURE OF CONVENTIONAL WARFARE

The more mechanical become the weapons with which we fight, the less mechanical must be the spirit which controls them.

– Gen. J.F.C. Fuller, *Generalship: Its Diseases and their Cure*

War is likely to remain a chameleon, presenting itself variously in inter-state, trans-state, and non-state modes – or as a combination of these. However, a word of caution is necessary: it would be a serious mistake to dismiss the possibility of inter-state conventional war. Moreover, the conventional and the unconventional, the symmetric and the asymmetric, may occur almost simultaneously, overlapping in time and space. Advanced warfare will be largely joint-Service in character. The revolution in information technology, especially as applied to command and control, long-range precision strike, and stealth, has so compressed time and space in military operations as to create an unprecedented non-linear battlespace characterised by breadth, depth, and height. Future operations will favour simultaneous attack by joint air-ground forces that are “situationally aware” – that have substantially complete and current views of the battle space via computer and satellite. Advanced forces are also likely to be networked from “sensor to shooter” – that is, surveillance capabilities will be electronically connected to strike forces, and all of them to each other. The scale of operations, as well as the number of troops and machines involved, will continue to decline even as their complexity and sophistication increases and in direct proportion thereto. Command and control systems will continue to evolve. They will permit much greater flexibility and speed; on the other hand, by increasing a commander’s temptation to wait until he has all the information, and threatening to overwhelm him, they may be counter-productive.

Advanced warfare will be largely joint-Service in character.

Joint, Combined or Integrated Warfare

As far as jointness and synergy between the Services is concerned, it is disappointing to note that in the 21st century, the Indian Army, Navy and Air Force are still planning for conflicts essentially Service-wise. They have not yet started the journey. Even after four wars and innumerable crises, we have failed to evolve joint doctrines and concepts. Transformation of the military must be based on a new joint doctrine which follows a top-down approach and not a bottom-up approach. Gen. Shankar Roychowdhury (Retd) states, "The Indian Army individually as well as the defence forces, must no longer be allowed to function as independent disconnected entities, without the required inter-Service synergy for fullest exploitation of their respective

"This problem is made particularly difficult today because of our obsession with jointness. Jointness is, by its very nature, a source of friction in forward thinking."

capabilities. In some senses, provision of an enabling environment of jointmanship and stamping it on the individual ethos and culture of each Service may well be the most challenging task, which should be accorded an overall priority higher than many other issues."

However, the problem of one branch of Service taking direct orders from a person in another will persist through future conflicts. The Indian armed forces have a skewed ratio

between the Services, unlike countries in the West where the ratio is approximately the same. In our country, the army is a million strong whereas the strength of the navy is about 70,000. Maj. Gen. (Retd) Robert H. Scales while speaking on "Change During War: Contemplating the Future While Fighting in the Present," at a seminar on "An Army at War: Change in the Midst of Conflict," held at the Combat Studies Institute Frontier Conference Centre, Fort Leavenworth, Kansas, on August 2-4, 2005, made some very interesting observations, "This problem is made particularly difficult today because of our obsession with jointness. Jointness is, by its very nature, a source of friction in forward thinking, because everybody has to have a piece of the action. Why do we put a 'J' in front of all of our headquarters? Well, because we have to be joint. Actually, we don't. There's very little 'joint' about Iraqi Freedom, it's 95 per cent Army and Marine Corps. "

NUCLEAR ISSUE

I do not know with what weapons World War III will be fought, but World War IV will be fought with sticks and stones.

– Albert Einstein

After May 1998, when both India and Pakistan carried out nuclear tests and declared themselves as nuclear weapon states, it became clear that conventional war, if undertaken, would be fought with a “nuclear backdrop”. The impact of nuclear weapons was clearly discernible in the self-imposed restriction by India in the Kargil conflict and the caution displayed by the government during Operation Parakram in 2002. Pakistan has declared that it will go for nuclear strikes against India when a significant portion of its territory has been captured or is likely to be captured. Or, when a significant destruction of the Pakistani military machine has taken place or when Pakistani strategic assets (read nuclear deterrent) are endangered. India’s “Cold Start” war doctrine does not seem to be allowing Pakistan to reach the above conclusions by indulging in deep, long-range penetrative strikes. The Indian doctrine seems to be aimed at inflicting significant military reverses on the Pakistan Army in a limited war scenario, short of a nuclear war.

The Indian doctrine seems to be aimed at inflicting significant military reverses on the Pakistan Army in a limited war scenario, short of a nuclear war.

Restructuring Army

In this changed scenario, realistic planning should take into account the factor of short but limited war ranging from 10 days to eight weeks. The efficacy of a couple of large sized strike corps going deep into the heartland of Pakistan is questionable. The utility of the currently structured holding and strike corps is minimal. The location of our strike formations deep in the hinterland will not allow any cold start. Even our holding formations are not in a position for a cold start. Large sized strike formations may have to be reorganised into smaller, more agile and responsive and rapidly deployable formations which can be reinforced by follow-up formations.

The question, whether the existing organisation of the field army into corps, divisions and brigades should be retained, or a more flexible organisation of “task forces” directly controlled by a divisional or corps headquarters should be introduced, needs to be considered by the army. The organisation so created should not only be tactically sound, it should also result in substantial savings in manpower for the army. If the cold start doctrine is to be implemented, then a serious introspection of locations of formations would be needed.

Similar restructuring will be required for the navy and air force. There seems to be a dichotomy in the Indian Air Force having control of the strategic command and Indian Army units having the strategic missiles. *This needs to be resolved.

CONCLUSION

God grant me the serenity to accept the things I cannot change, the courage to change the things I can, and the wisdom to know the difference.

– Reinhold Niebuhr (1892-1971)

The Indian armed forces, since their inception, have fought conventional as well as CI Ops starting from World Wars I and II and Afghan campaigns to all the wars and CI Ops after independence. No armed forces in the world have such varied experience in all types of warfare in such diverse terrain. We have had some notable success and our share of failures. While the 1971 operations in Bangladesh comprised our crowning glory, the Indo-China War in 1962 was the nadir. We have had some notable success in CI Ops. Still, we are at it in J& K and the northeast.

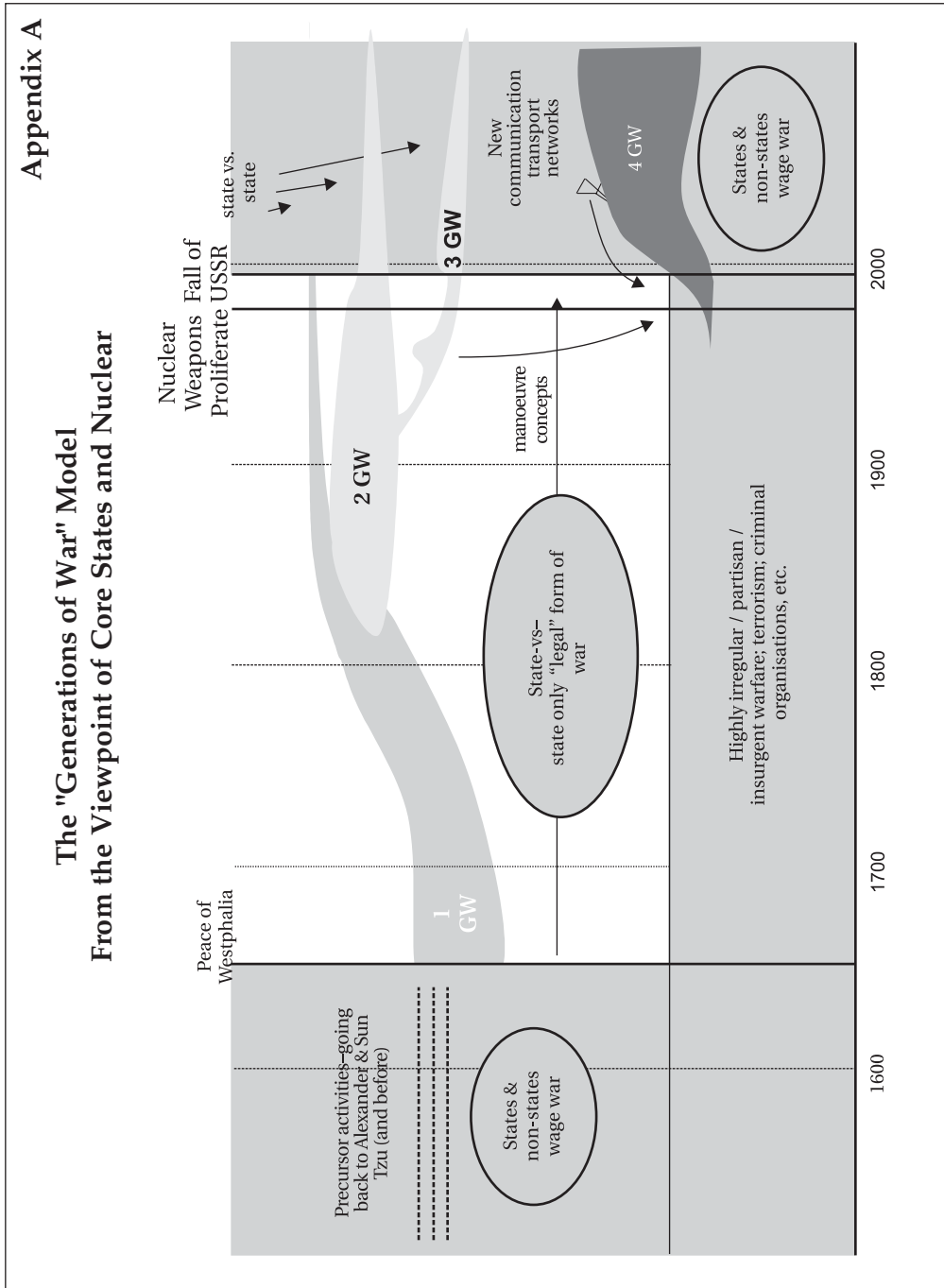
As we look to the future of war, we must face one absolute certainty: any prediction will prove faulty. Moreover, the conventional and the unconventional, the symmetric and the asymmetric, may occur almost simultaneously, overlapping in time and space. The challenge of a modern military is to fight throughout the entire spectrum of conflict. Technology is helpful when combating insurgents, but is never the solution to human conflict. While sharing information is a good idea, centralisation usually results in micro management by uninformed and

*Editor's Note : The Strategic Forces Command is commanded by a vice admiral. In any case, such "dichotomies" will increase with the current concepts of jointness and "integration."

inexperienced senior officers at distant headquarters. Complex computerised command systems require tremendous logistical support, may break down and suffer damage from enemy attacks or jamming, and may be exploited by the enemy. Advanced warfare will be largely joint-Service in character. The revolution in information technology, especially as applied to command and control, long-range precision strike and stealth, has so compressed time and space in military operations as to create an unprecedented non-linear battle space characterised by breadth, depth, and height. Advanced forces are also likely to be networked from “sensor to shooter” – that is, surveillance capabilities will be electronically connected to strike forces and all of them to each other.

In any CI Ops, the centre of gravity is the people. The first step must be focussed on the security for the people and the establishment of public safety. The rapid spread of left wing-extremism is posing a serious challenge to various states of the Indian Union. The ability of left-wing groups to run a parallel government in their strongholds is undermining the authority of the government and impeding the development of these areas. The cycle of violence is wastefully consuming already scarce resources. With the situation in Nepal, the formation of a red corridor from Nepal through Bengal, Bihar, Jharkhand, Chhattisgarh, Madhya Pradesh, Andhra Pradesh, Orissa and Maharashtra is a real possibility. The Maoist insurgency threat has to be taken in all seriousness. At least 16 districts in 14 states out of a total of 602 district, in the country are affected by Maoist violence. Terrorism in J&K affects 12 districts, while 57 districts in the northeast are under the influence of multiple insurgencies. We may have to fight Communist Maoist and Islamic extremists simultaneously at the two extreme ends of the CI Ops spectrum.

Obviously, the Services have to prepare the physical condition and training of soldiers, marines, sailors, and airmen. But equally important, they must prepare the minds of the next generation of military leaders to handle the challenges of the battlefield. And that mental preparation will be more important than all the technological wizardry that can be brought to bear in combat. The most important in that intellectual preparation must be a recognition of what will not change: the fundamental nature of war, the fact that fog, friction, ambiguity, and uncertainty will dominate the battlefields of the future just as they have those of the past.



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DISINFORMATION AND NATIONAL DEFENCE

V.K. VERMA

The First War of Independence fought in 1857, which was termed by the British as the “Sepoy Mutiny,” was triggered by a rumour that the British were coating rifle cartridges in animal fat. Contact with this fat was taboo to both the Hindu and Muslim soldiers. This ‘belief’ spread like wildfire and resulted in a tremendous uprising against the British.

The *Mahabharata* records an incident in which the news that Ashwathama had been killed was disseminated. Ashwathama was the name of a famed elephant as well as the name of Dronacharya’s heroic son. The elephant was killed but the news carefully hid this fact and only highlighted the name. The intended aim of this disinformation was to increase the vulnerability of the master warrior, Dronacharya. To lend authenticity to this piece of half-truth, an affirmation was obtained from the fountain of truthfulness, Yudishtra, who confirmed that Ashwathama had indeed died. Yudishtra took refuge in the technicality that he was referring to the famed elephant. The desired result was obtained.

In World War II, the landing site of Normandy for the Allied invasion was camouflaged by phenomenal deception measures to lead the Nazis to believe that the attacks would come at another site. The Americans in the Gulf War too managed to deceive the Iraqi forces about the direction of attack. All these were performed through meticulous disinformation campaigns executed through various media available at that time.

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The aim of this paper is to study the applicability of disinformation and propaganda as weapons of war today and the consequent media management.

ART OF PROPAGANDA AND DISINFORMATION

Propaganda must be based on information which, to the enemy, is credible. Therefore, it must have good research and intelligence at its base. It must stem from a deep understanding of the target audience and must get the right message to the right audience at the right time. It should be presented in a form which will both attract and excite, while exploiting the target's physiological and psychological needs which it should then seek to satisfy. It should be neither excessively rigid nor dogmatic, nor unnecessarily hostile or contentious. It must therefore, necessarily be selective.¹

The most important attribute of disinformation and propaganda is that both must be credible i.e. believable. Help here can be taken both from fact and fiction. The aim is to lure the receiver into believing something that would further one's cause. Audiences are more likely to accept an idea if they believe it was heard inadvertently i.e. in the style of 'matter of fact.' A message presented in an assertive way will be resisted. Opinions can be changed if a message is received from a variety of sources that mutually reinforce each other. People tend to approve of statements made by experts or by those who begin by

Disinformation and propaganda can both be classed as non-lethal weapons of war.

expressing an opinion with which the listener or viewer strongly agrees. Under some circumstances, propaganda messages can be made more potent by incorporating opposing arguments in a way that tends to discredit them. The audience gets the impression that it

is viewing both sides of the story.

Disinformation and propaganda can both be classed as non-lethal weapons of war. They are certainly not the product of modern technology and have a history dating back to mythologies. Today's vocabulary, however, does have a classification, "non-lethal weapons" that can describe them accurately.

1. Mark Llyod, *The Art of Military Deception*, (New Delhi: Book Mart Publishers , 2001) p, 139.

Their use in both war and peace to further one's cause is extremely well known and documented.

SOCIAL CONTRACT

Throughout history, war has been central to the emergence, conduct and survival of the state in all its forms, from the tribe to the modern nation-state. In turn, the origins of the state rest on the social contract, whereby men and women gathered together and subordinated their individual rights in order to gain a common defence of life and property and the other benefits that flowed from cooperation and association. However, no matter what political organisation emerged, everything revolved around the tacit bargain of consent and the voluntary abrogation of rights on the part of the individual and the community in support of the common good, with defence as the most pressing issue.

From these early times, the first demand on a monarch or a leader under the social contract was to protect the peace, to repel invasion, and to wage war in the interests of the group. Without exception, it was accepted that the ruler had the right to command the citizen's duty of obedience in time of war.

This social contract has been valid throughout history. It was reinforced in World War II where the threat of death and destruction was shared equally by the civilians and frontline soldiers. In the case of democracies, the populations readily accepted the abrogation of their rights, including that of a free Press.² At times, this social contract wears the garb of patriotism and exacts the same penalties from the population. President Bush successfully misled his nation into believing that Iraq was in nexus with the terrorists and possessed a stockpile of weapons of mass destruction. The US Senate, Congress and, in fact, the whole nation supported him when he invaded Iraq. Social contract continues to be valid and relevant.

Even in independent India, the social contract has been valid throughout. In our conflicts with China and Pakistan, the Indian public wholeheartedly supported the government. In fact, these hostilities gave rise to huge waves of

2. Peter Young and Peter Jesser, *The Media and the Military* (London, 1997), pp. 6-8.

patriotism and willingness on the part of everyone to help the military achieve its aim.

MEDIA MANAGEMENT

Initially, it was easy for the state and the military to manipulate the media so that the public opinion supported the war aims. But once the reporter reached the battlefield and possessed the means to communicate, the equation began to change.

The capability of the military and the state to manipulate public opinion weakened. The fact that the media could present views other than the war aims of the military was anathema to the military. As a result, censorship, or

The massive wave of patriotism that accompanied each conflict also did not allow the Press to seek or think of independent reporting as the unwritten social contract overshadowed such notions.

at least the limitation of information, rapidly became the norm during war. This was rationalised as a requirement of the “operational security” of the troops involved.³ To a certain degree, this was true. However, more often than not, the military used its powers to extend the fog of war. It used its powers to colour the information to its war aims and then release it. It used the ‘social contract’ and patriotism to obtain control over the media. Both the World Wars saw this. The Press and the radio were manipulated by both

sides to further their military aims. Germany was quite open about media manipulation whereas the Allies did it discreetly.

In the case of India, right up to the Indo-Pak conflict of 1971, mainly it was the Press and radio which were around as the media. The radio was a government monopoly which faithfully mouthed the official version. The Press too accepted every official bit of information as fact and reported it as such. The massive wave of patriotism that accompanied each conflict also did not allow the Press to seek or think of independent reporting as the unwritten social contract overshadowed

3. Young and Jesser, *Ibid.*, p.25.

such notions. The opportunity to 'manage the media' existed, but the Indian military did not use it.

LIMITED WARS AND "INDEPENDENT MEDIA"

After World War II, the nature of warfare has been changing and has given rise to a wide variety of war forms, the most prominent of these being the limited conflict or low intensity conflict. The 'limited' nature of the 'lower' intensity often ensures that only a segment of the population of the nation is threatened or involved, leaving the vast majority sort of 'uninvolved'. At times, the conflict is conducted a large distance away from the 'nations'. Such attributes ensure that total unqualified backing by the public is not obtained and in fact the very "justness" of the conflict begins to be questioned.⁴ In such cases, the mass media do not abrogate their rights and instead insist on their fundamental duty to inform the public. The Vietnam War was a classic example of the situation where the 'social contract' between the citizens and the government was questioned. The media became a free and independent player with the capacity to influence both the conduct of hostilities and particularly through its impact on popular sentiment, the direction of government policy. In fact, such was the sway of public opinion that the US government was finally forced to negotiate peace and withdraw. In the Vietnam War, the role of the media and its interaction with the military was an exception. Citizens and the media, by and large, continue to stay within the bounds of the social contract, support the conflict and willingly abrogate their rights. This was exemplified in the Falklands and Grenada conflicts, which saw a total collapse of the media's independence as it followed the military diktat in totality.

SPECTACULAR MEDIA MANAGEMENT IN THE GULF WAR

Much has been written about the spectacular media management achieved by the US in the Gulf War. What was remarkable about the American success was that it was used so extensively to spread disinformation and propaganda that its target audience believed everything. The media was excluded from the battlefield except for official briefings and the official clips handed out by the military. The military

4. Ibid., p. 18.

was highly proactive and provided selected pre-edited and positive news to all branches of the media. As a result, the military was able to control the media image of the conflict. The military not only used the media to present its policies in the best light but also to deceive and disinform the Iraqis. Gen. Schwarzkopf made sure that the media pools were allowed extensive coverage of the marines' rehearsal of assault. As he expected, this received wide coverage on TV networks and convinced the Iraqis of an invasion from the sea.⁵ Disinformation and propaganda were used extensively to propel the military aims successfully.

TECHNOLOGY IN AID OF MEDIA AND ITS INDEPENDENCE

One of the major hampering factors for the mediamen in their war reportage was the unwillingness of the military to accept their presence. The military justified it on the grounds of "operational security" as it rightly felt that the presence of the media and its need to report would lead to the enemy coming to know of its order of battle (orbat) and plans. The second major factor that obstructed the media was having to

In times of war, the "operational security" angle, coupled with 'social contract' and 'patriotism' severely restrict the media's independence. It has given rise to the embedded journalist, as seen in the recent Iraq invasion by US.

rely on communication channels provided by the military for onward transmission of its images. The presence of satellites, miniaturisation of photo equipment and advances in communications, presence of global networks, 24-hour news channels, etc have revolutionalised the media's ability to chart an independent course and operate outside the state and military's control. This was evident in the Kargil conflict wherein the Indian media was well equipped technologically and highly capable of independent reporting. However, in times of war, the "operational security" angle, coupled with 'social contract' and 'patriotism' severely

restrict the media's independence. It has given rise to the embedded journalist, as seen in the recent Iraq invasion by the US. This clearly permits the military to exploit

5. Ibid., p. 166.

its immense power for planting disinformation and propaganda. It is even more effective today for, by and large, the media is now perceived to be outside the control of the state. Even though it gets shackled during war, its perception continues to be that of a 'free media' providing 'factual' coverage. The scheme of 'social contract' works subtly and it should be understood by the military that it is in its interest to let the public perceive the media as 'free' of controls. Only then can the disinformation and propaganda planted purposefully produce the desired effect.

WORLD WIDE WEB: THE INTERNET

The Internet differs from the earliest agents of the media in terms of control. With the traditional mass media, be it the Press, radio or TV, a small group of editors decided which news to print, broadcast or telecast. With the Internet, this control has disappeared. The 'individual' is the controller. Anyone can create a web page. Bulletin boards and now blogs are used to churn out instant opinions. Ease of Internet polling produces results to colour public opinion. Every shade of opinion on every subject can be found posted on the world wide web. While it was easier to manipulate the traditional media in war through 'social contract,' the Internet offers a different scenario. As nobody is in charge, who will you manipulate?

The Internet in reality is a propagandist's delight due to the availability of total freedom and the anonymity offered.

Nevertheless, the Internet in reality is a propagandist's delight due to the availability of total freedom and the anonymity offered. The Internet accommodates a wide range of views, from the radical to moderate, pro-democracy activists to intelligence officers masquerading as anti-establishment rebels. With such a mixed bag, the truth often becomes mangled.⁶ Indeed, the Internet is the new tool for manipulation.

THE VERY OPPORTUNITIES OFFERED BY THE INTERNET ARE ALSO ITS WEAKNESSES

For disinformation to be effective, it must reach the target audience and it must be credible. The global reach of the Internet ensures the first. The second part of

6. Philips H.J. Davies, "Information Warfare and the Future of the Spy", www.1wrdaphi@reading.ac.uk.

credibility poses problems. The digital world has unmatched methods of falsifying information, thus, producing a doubt on the quality of information. The speed of dissemination, however, works in its favour as humans tend to believe the first image. Therefore, the Internet can be exploited profitably for disinformation, specially in combination with other media so that the slur on its veracity does not surface and is instead submerged by its reach and the speed of the reach.

MEDIA MANAGEMENT IN THE INTERNET AGE : KOSOVO CONFLICT

The Serbian military reacted to the North Atlantic Treaty Organisation (NATO) bombing of 1999 by dispersing its ground forces throughout the countryside in hard to find locations. Without a ground threat to react to, lack of air superiority and unfavourable weather, NATO bombing failed to destroy much of Serbian forces and the conflict dragged on beyond the few days NATO leaders believed it would take. Milosevic seized this opportunity to portray the Serbs as victims of NATO, and particularly US aggression. During the conflict, NATO faced a massive Serbian propaganda and disinformation campaign designed to show 'collateral damage' in NATO bombing, and refugees fleeing due to air strikes. Possessing low penetration of computers and the Internet, it mobilised its student population in launching computer attacks and propaganda campaign on the Internet. News reports, photographs and other media rained Serbian propaganda around the world as fast as NATO bombs were raining down upon Serbia. It released gripping pictures of the American F-117A and F-16C fighters that were claimed to have been shot down. Pictures of errant bombs that caused civilian destruction, and hospitals full of children and the elderly who were victims of NATO bombing were constantly broadcast around the globe to rouse sympathy for Serbia. Through constant and repeated use of the electronic media in near real-time, Milosevic left NATO behind, gasping for breath in the propaganda race. So successful was the media blitz by the Serbs that NATO felt compelled to attack the TV stations as TV was perceived as a force multiplier. The point to note here is the asymmetry involved. The NATO forces had the technology but it was the Serbs who managed to plot, plan and execute a successful propaganda campaign through a combined use of the Internet with the traditional media. Admiral Ellis stated in his

unpublished after-action report, "The length of war could have been cut in half if the US had made better use of its information warfare unit, the first it had assembled and part of whose task was to present the war in the best light to the media and on the Internet."

The Serbs treated the use of propaganda and disinformation not as individual acts but as a coordinated campaign. They used the Internet along with other elements of the media in a synchronous manner in near real-time. Its effectiveness can be gauged from the fact that it almost succeeded in achieving a near collapse of NATO due to erosion of popular support amongst its members as the conflict dragged on. The Serbs' reliance on non-lethal weapons of propaganda and disinformation helped them balance the military asymmetry they faced.

POWER OF THE IMAGE

Two events in India have shown what an image, specially the first image on television, can do. First was the expose by the Tehelka team. The scandal drew its power from a single image: the shot of Bangaru Laxman greedily scooping up a lakh of rupees in currency notes before stuffing the money into his drawer. That shot, repeated over and over again on every TV channel, finished off the Bharatiya Janata Party's (BJP's) reputation as a clean party. Any amount of explanation could not erase the power of the image. The second event was the public outrage caused by the video footage of M. Karunanidhi being manhandled by the Chennai police. The national uproar was almost entirely a consequence of the impact of the television picture. Because the images were so powerful, public opinion turned against Jayalalitha immediately. When the director general of police appeared on TV to defend his force, the anchors treated him with scarcely-veiled contempt. The point to note here is that both the images were provided by interested parties. Tehelka supplied the shots of Laxman's bribe-taking and Sun TV, controlled by DMK members, provided the Karunanidhi footage. Bangaru Laxman claims that the footage was doctored. Similarly, Jayalalitha also says that Sun TV provided

7. Robert D'Amico, Dennis Lyn and Eric Wexler, "Munitions of the Mind," *Strategic Review*, Winter 2001.

selectively-edited visuals, in which the police were made to look bad while Karunanidhi and Maran gained sympathy. In fact, says Jaya TV, the AIDMK's channel, there is footage of Maran actively obstructing the arrest and even slapping a police officer. But because it was Sun TV's pictures that reached the national channels first, that version became accepted as truth.

During the Kargil conflict, the then Prime Minister of Pakistan, Nawaz Sharif, made hectic efforts to garner the support of the international community against the so-called "large scale aggression" by the Indian armed forces. He was rebuffed by the Clinton Administration and not even offered the customary lunch which is

In all variety of war forms, it is the leaders who define the aims, the methods and the desired conditions of the war form. No state wages war. It is the leaders who do so.

normally hosted for visiting heads of states. A lasting image telecast repeatedly of the forlorn Nawaz Sharif standing all alone with his head bowed, while all the US officials walked off, sent a powerful message. Nothing could project the hopelessness of Pakistan's position better. It was a big demotivator for Pakistan, which capitulated soon thereafter. A powerful image – more importantly a powerful first image – can have devastating consequences. Timing here is

of crucial importance. A powerful visual, whether doctored or unfair, is almost impossible to refute. Here is a major lesson for the military in its quest for using disinformation and propaganda as a weapon of war.

CAMPAIGN METHODOLOGY

Issues

To launch a disinformation or a propaganda campaign, a few issues need to be addressed. What is the larger aim? What do we want the adversary to believe? What are the best tools to achieve it?

Targets

In all variety of war forms, it is the leaders who define the aims, the methods and

the desired conditions of the war form. No state wages war. It is the leaders who do so. The decision to engage in warfare or to terminate it is made by the leaders in the state or the group. Group members or the citizens of the state may influence the leader's decision, but it is primarily the will of the leadership that has to be subdued.

Thus, it is obvious that it is the 'mind' of the enemy leadership that has to be manipulated. It would be wrong to presume that there is only 'one mind' of the enemy. The enemy is really many individual enemies, many minds. If the enemy is dispersed, separate minds would have to be attacked separately. If the enemy is concentrated, the attack can be centralised. The attacks have to be directed at influencing or manipulating the leader's knowledge or beliefs or indirectly by attacking the knowledge or beliefs of those upon whom the leader depends for action. Leaders and decision-makers usually are not difficult to identify in any organisational hierarchy. Whenever any organisation applies power or force, it assumes hierarchical characteristics. Thus, the knowledge and beliefs of decision-makers comprise the Achilles heel of hierarchies.⁸ The aim of any campaign involving disinformation and propaganda should be to affect the adversary decision-makers in such a way that the decisions that result in actions support our military aims.

Affecting Beliefs

India as a democratic country, with a free Press, is slowly developing an identity of independent opinion amongst the news analysts. Compared with a closed society like China, which has a highly secretive and politically controlled media, information obtained from independent sources like BBC, CNN and the Indian media will appear to be more authentic and true. Such a belief can be utilised advantageously to propagate the notion that whatever 'closed door systems' like China offer is untrue. At a critical time, such discredit can change the quality of the 'fog of war'. To cite an example would probably serve as a forceful illustration. Today's technology and computer

8. Richard Szafranski, (USAF), "A Theory of Information Warfare - Preparing for 2020," *Aerospace Chronicles*, Spring 1995.

simulation makes everything possible. In the movie "Forest Gump" the hero is shown shaking hands with J.F.Kennedy who died almost four decades ago. The films "Titanic" and "Matrix" are good examples of the power of the computers to create 'reality', that is more believable. It will, thus, be possible to use available clips of the leader of the opposing nation, and doctor these to show as if he is rejecting peaceful negotiations. Such doctored clips, telecast at the appropriate moment, can be used to camouflage or justify an offensive action by the military. Nobody will believe the subsequent denials as everyone would have 'seen' the clips. The video clips of the arrest of Karunanidhi telecast repeatedly had such an impact that all subsequent denials failed to erase the sympathy the DMK leader had obtained.

Organisation

Such campaigns are policy decisions that have to work top downwards. A very careful analysis needs to be made of the strategic aim which then has to be broken down to its tactical parts. Continuous monitoring and feedback of the success or otherwise are extremely crucial elements of such a campaign. Another very important aspect is the timing. The timing for execution has to be selected very carefully, specially if the vehicle for execution of the campaign happens to be the media. What is obvious is that a dedicated organisation needs to be created that can organise and harmonise the various elements so that the results are in tune with one's aims. It must have a 'think-tank' cell which can translate the strategic aim into tangible tactical goals. Pre-planned presentations mixing fact with inference to influence decisions will have to be prepared. Studies show that individuals give weightage to information in the order in which it is received. Such bias and other psychological weaknesses will have to be exploited.

WHO WILL BE THE MEMBERS OF THIS THINK-TANK CELL ?

Apart from the Services, and the Ministries of Defence and External Affairs, all the other decision-makers of our national security apparatus must be represented. The cell must possess the technical back-up and computer

specialists who can doctor or manipulate the visuals – be they cinema/television clips or mere photographs. The available intelligence and operations elements in Headquarters Integrated Defence Staff could be utilised for forming such a cell which could then be tasked for scenario building and contingency planning. As time is of crucial importance, this cell must have a direct link-up with the top-most decision-makers so that its expertise can be drawn upon instantaneously. Only then would we be able to use the weapon of disinformation effectively.

Advance Planning.

In this age of media proliferation, a good example to follow would be of the advertisement campaign market research groups who carry out surveys to determine the likes and dislikes of their customer target groups in terms of media preferences.

If the enemy's leadership has a preference for CNN, BBC or Al Jazeera, then that should be the vehicle for the onslaught. The Internet has a special advantage in that it also enables 'customised propaganda' Information can specially be tailored to suit the target audience's weakness. All such efforts will have to be on a long-term basis and ,hence, the need for a specialist organisation. While dealing with the media, timing is of critical importance. These campaigns will have to be prepared well in advance for various contingencies. The speed of the media and the needs of the media all relate to crucial timing and only pre-planned campaigns, with a possibility of last minute modification, promise effectiveness.

Indian Expertise

Can the existing military-media organisation handle such campaigns? Currently, the Directorate of Public Relations (Defence) which is an element in the Ministry of Defence, handles the media on matters of

The Internet has a special advantage in that it also enables 'customised propaganda.' Information can specially be tailored to suit the target audience's weakness.

It is time the respective defence planners sat down and created an organisation so that in the future, these two non-lethal weapons of war viz. disinformation and propaganda, are utilised effectively to further one's military aim.

defence. It has representation from the three Services but is predominantly a bureaucrat controlled organisation with little specialist calibre or understanding of matters military or media. It is designed to handle peace-time interaction. During the Kargil conflict, a Press briefing by combined representatives of the Ministry of External Affairs and the two involved Services was institutionalised on a temporary basis. Both the army and the air force created an ad hoc element to handle the media. There is nothing to suggest that the army and air force attempted disinformation

and propaganda during the Kargil conflict even though Barkha Dutt of Star News was at the 'front' with the troops. (A precursor of the embedded journalist of the Iraq invasion by the US). It is time the respective defence planners sat down and created an organisation so that in the future, these two non-lethal weapons of war viz. disinformation and propaganda, are utilised effectively to further one's military aim. What is suggested is small specialised cells. They should have both horizontal and vertical connectivity between various ministries/Services/ elements. That disinformation should find a place in the planning and execution of military operations at the tactical level needs no emphasis. In fact, most military campaigns and operations include such aspects. What is needed is an awareness that in the new millennium information plays a very crucial role and is extremely vulnerable to manipulation. It is this vulnerability that must be exploited.

CONCLUSION

Towards the end of the 20th century, the search began for weapons that minimise destruction by offering precision with no collateral damage and eventually to weapons that don't kill – non-lethal weapons. In this vast non-lethal armoury that is being developed, two of the oldest non-lethal weapons are

already available: disinformation and propaganda. Both have been used extensively in the past successfully. The marvels of technology that have led to the information age have again brought these two weapons into prominence as today information is power and these two weapons directly affect the very perception of information – by manipulating it.

The vehicles of propelling these two non-lethal weapons are the myriad forms of the media that have evolved. The media has a prominent place in society as it is at the very heart of today's civilisation, referred to as the information or the knowledge age. The media's role is to keep the citizen informed. It is perceived to be a 'free agent' uncontrolled by state. As has been seen, but for a few exceptions, it is managed by the state and the military in times of war to aid and further the military's aim. The perception that the media continues to be 'free' during war lingers on even after peace has been interrupted by war. It is to the military's advantage that such a perception persists for it enables the military to manipulate the information flow through its disinformation and propaganda campaigns.

Multiplicity of the media, the Internet, the convergence of media technologies all point to a future where the 'control' on information will slowly slip away, and the individual and his ability to manipulate information will triumph. Veracity or truth will be at a premium. Anonymity is one of the chief attributes of the world wide web. It is an ideal ground for a propagandist, with ample scope for manipulation, spoilt by the premium on veracity. Unless the disinformation or the propaganda is believed, it is useless as a weapon. Kosovo has shown that a way out exists. The weakness of the human psyche to believe the first 'arrived' message, the speed of the Internet, its vast global footprint are some of the factors that favour the propagandist. The power of the image, specially the first image, provides a phenomenal opportunity to the military to exploit when it uses these two non-lethal

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weapons. These weapons don't cost much. For very little, they deliver an effect worth crores.

It is time the military seizes this opportunity with both hands. But the military alone cannot produce the desired result. All the elements that are responsible for national security must get into the act. For disinformation and propaganda campaigns to be successful, a dedicated organisation is needed to be carved that has the necessary technical back-up, is able to coordinate and interact horizontally and vertically, and has total support from the top of the hierarchy. It is time the defence planners and others responsible for national security address these issues so that both disinformation and propaganda are utilised effectively to enhance national security.

NETWORK-CENTRIC WARFARE AND ITS STRATEGIC IMPLICATIONS

M. MATHESWARAN

The world is entering a new period. The economy of nations, which depended upon natural resource, labour, accumulation of capital and even upon weaponry during its agricultural and industrial phases, will, in the future, depend upon information, knowledge, and intelligence.

INTRODUCTION

Throughout history, the central factor deciding the outcome of war has been how effectively information has been used. Effective use of information is a time sensitive issue. Information, when not acquired, processed and used in the right time, at the right place, by the right individual or leadership, and used in the right environment, does not have any value and ceases to become knowledge and wisdom. Information dominance has always been the crux of winning wars. The Mongols, Chengiz Khan in particular, were the pioneers who demonstrated the art of information dominance and conquered most of the then known world. The 21st century is the century of aerospace power. It is becoming evident that information technology is a critical element of aerospace power. Networking to make efficient and rapid use of information is a natural development consequent to exponential growth in computing and communication capabilities. During the last decade, major air forces of the world have moved with extreme rapidity towards net-related, net-enabled and net-centric operations.

The future battlespace will be, or is becoming, different in one significant

Air Commodore **M. Matheswaran**, VM PhD is Commandant Aircraft and Systems Testing Establishment, IAF.

way—it is becoming information rich. The level of information available and the ability of commanders to resolve the totality of what has been presented will depend upon the level of illumination reflecting the amount of information and the understanding achieved. These illumination levels would be in a state of constant flux. Increasing the information available in only one dimension might not lead to sufficient overall resolution. Information collected from surveillance, intelligence and identification systems combined with that received from other sources, if supported with an effective communication backbone and real-time processing power, would increase the level of resolution, allowing commanders and staff elements to observe the battlefield more clearly, share the information, decide and take action in the most efficient way.

BACKGROUND

Since military power is the foundation upon which the structure of national security is raised, it becomes obvious that this military power is reflected in terms of time relevant force structure, and hardware, including weapons, and technology. The composition of military power, in terms of manpower, equipment and weapons, and technology is governed by the nature of warfare, current as well as that evolving in the future. The nature of warfare, therefore, is a critical determinant of the structure of the national security mechanism. This nature of warfare can be seen from two basic dimensions: the first is the essential nature of warfare which remains unchanged; the second is the dynamic nature in terms of

The nature of warfare, therefore, is a critical determinant of the structure of the national security mechanism.

how the war is fought or the technique of warfare, which is fundamentally driven by new technologies and related concepts and doctrines. This dynamic nature affecting the transformations in the technique of war was conditioned, fundamentally, by technology but

also by three other related drivers which are strategy, organisational change necessary to exploit technology, and time. Effective war-fighting capability can be achieved only when these four dimensions of the 'dynamic nature of warfare' are recognised and appreciated. The military dimension of aerospace power in the

21st century rests on the critical strategies of ensuring information dominance and effective use of resources. Network-centric warfare (NCW) is a natural development under the aerospace paradigm.

The origins of aerospace warfare can be truly traced to the 1982 Bekaa Valley campaign by Israel but the first large scale integration of space capabilities in war was made in the 1991 Gulf War. The NCW as a concept evolved in the mid-Nineties. During Operation Enduring Freedom, Afghanistan proved to be a laboratory for military transformations. Units from different branches of the US military worked in unprecedented unison and were able to flatten the Taliban with minimum casualties and less damage to civilians than occurred during the Vietnam War.

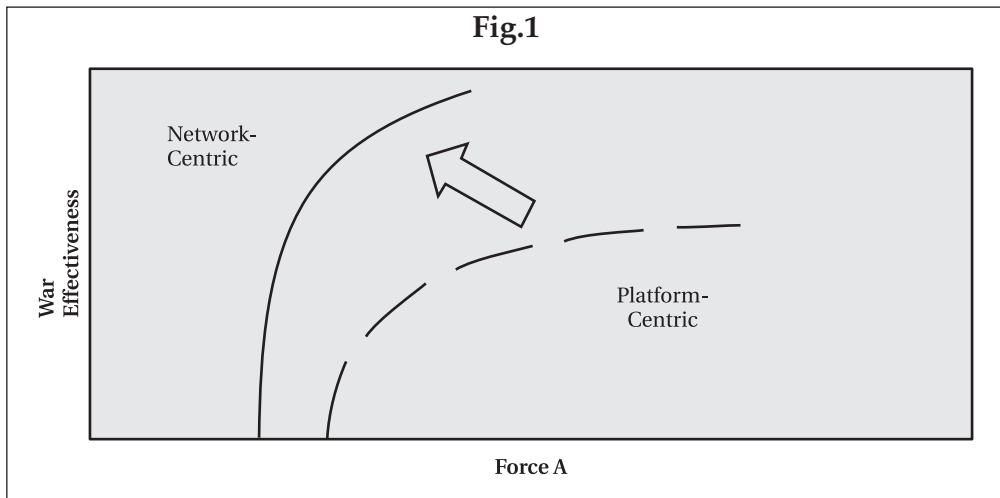
Lessons from Afghanistan were later applied on a broader scale in Operation Iraqi Freedom (OIF). As news rolled out of Iraq, more and more stories spoke of “network-centric warfare.” There were reports of troops using the global positioning systems (GPS), tactical data links (TDL), and high-powered computers to relay information between command centres and troops, speeding the pace of combat. The media repeatedly showed the animations of troopers calling in air strikes with laser pointers. There were TV talk-shows on cutting-edge technology such as smart bombs, collaboration tools, and satellite-based tracking, which provided unprecedented levels of situational awareness (SA) and precision engagement, even under adverse conditions.

Networked information technologies, some used for the first time, allowed military commanders in the war theatre and in the US to watch the battle of Iraq unfold in near real-time. The operation was a practical demonstration of how network-centric capabilities can improve the military’s ability to fight by sharing information and situational awareness.

THE CONCEPT OF NETWORK-CENTRIC WARFARE (NCW)

Information technology (IT) in the modern era has been undergoing a fundamental transformation from platform-centric computing (PCC) to network-centric computing (NCC). The concept of NCW is a derivative of NCC, where the ‘computer’ is replaced with ‘computing’, i.e. every element of war

(aircraft, soldiers, ships, etc) becomes a computing node on the network to collectively operate in a synchronised manner so that the sum of the whole is greater than the sum of the parts. The platform-centric operations enable each pilot to develop his situational awareness based on three types of inputs: (a) direct observation of the physical domain; (b) indirect observation of the physical domain through onboard sensor; (c) voice communications with other war-fighters. With network-centric operations, a fourth input is added – ‘digital information’ that is exchanged from external sources, such as other fighter aircraft, or airborne/ground surveillance and command and control (C2) centres, over a network.



Network-centric warfare is an emerging theory of war in the modern era. The network-centric approach to warfare is the military embodiment of information age concepts. NCW relies on computer processing power and networked communications technology to provide a shared awareness of the battlespace. This ‘networking’ is not merely a communications network implemented over physical cables, radio links, TCP/IP, etc. Instead, the ‘network’ in NCW emphasises a network of connections between people in the information and cognitive domains. The term ‘network-centric warfare’ broadly describes the combination of strategies, emerging tactics, techniques and procedures, and organisations that a fully or even a partially networked force can employ to

create a decisive war-fighting advantage. The working hypothesis of network-centric warfare is that forces, when in the networked condition, will outperform forces that are not so networked.

Network-centric warfare generates increased combat power by networking geographically dispersed sensors, decision-makers, and shooters to achieve shared awareness, increased speed of command, high tempo of operations, greater lethality, increased survivability, and a degree of self-synchronisation. In essence, it translates an, 'information advantage' into 'combat power' and a decisive 'war-fighting advantage' by:

- Effectively linking friendly forces within the battlespace.
- Providing much improved shared situational awareness.
- Enabling more rapid and effective decision-making at all levels of military operations.
- Thereby permitting increased speed of command and dissemination of the 'commander's intent.'
- Facilitating a higher tempo of military operations than would otherwise be possible
- Achieving greater lethality with the same military forces through synergy of efforts and sharing of target data with all possible shooters
- Providing increased survivability by networking sensors.
- Permitting a degree of self-synchronisation, as non-contiguous forces can instantaneously see all known movements on the battlefield of friendly, neutral and hostile forces.

To get a clear grasp of the concept of NCW, one needs to understand the basic tenets and governing principles of NCW.

Basic Tenets of NCW

The net-centric approach to warfare is governed by four basic tenets as identified the world over. These tenets comprise the core of NCW that help enhance the power of networked forces and also constitute a working hypothesis as a source of war-fighting advantage as follows:

- (a) Information sharing is improved in a robustly networked force.
- (b) Improved information sharing permits enhanced situational awareness
- (c) Enhanced situational awareness permits coordination of military action between units and enables self-synchronisation of all networked units
- (d) These factors, taken together, dramatically increase mission effectiveness in terms of lethality, survivability, and speed of execution

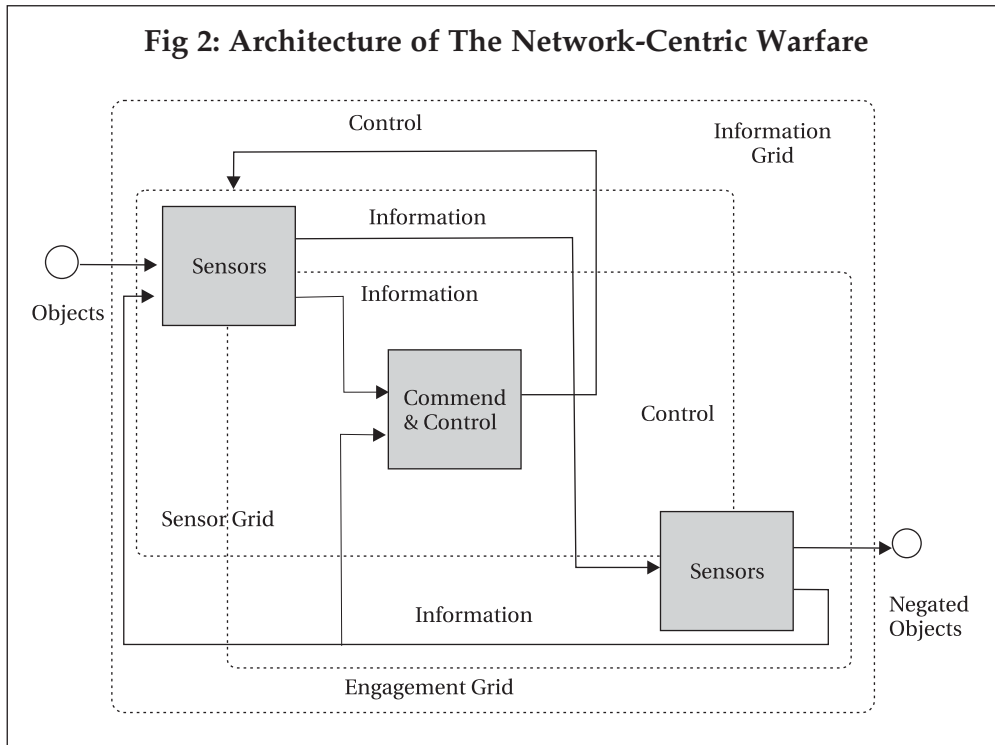
Governing Principles of NCW.

Although the principles of NCW may not replace the time-tested principles of war – mass, objective, offensive, security, economy of force, manoeuvre, unity of command, surprise and simplicity – nevertheless, they provide added direction for executing military operations in the information age. Principles that govern a network-centric force constitute the rules by which it organises, trains and operates. These are:

- (a) Fight first for information superiority.
- (b) Access to information leads to shared awareness.
- (c) Speed of command and decision-making is vital.
- (d) Self-synchronisation is a key goal.
- (e) Dispersed forces and non-contiguous operations are possible.
- (f) Demassification reduces target signature.
- (g) Deep sensor reach is a vital component.
- (h) Alter initial conditions at higher rates of exchange.
- (i) Compressed operations and levels of war

ARCHITECTURE OF NCW

NCW focusses on greater synergy by networking and electronically linking all components of the war machinery into one “sensor-to-shooter” engagement grid. The operational concepts of NCW are enabled by an architecture that closely couples the capabilities of sensors, command and control, and shooters. The underlying architecture that creates a network of these basic components, consists of potential sub- architectures: sensor grids and engagement grids hosted by a high performance information grid that provides a backplane for computing and



communications that, in turn, is empowered by a common message standard wherein everybody 'speaks the same language,' access to appropriate information sources, information on weapons, value-added C2 processes, and integrated sensor grids closely coupled to shooters.. Sensor grids rapidly generate high levels of SA and synchronise military operations. The engagement grid exploits this awareness and translates it into increased combat power. These elements will provide a shared awareness of the battlespace for fighting forces. This sharing of information and decision-making throughout the range of command and control is referred to as giving "power to the edges." NCW is a prime example of promoting power to the edges. A logical model of the NCW architecture is shown in Fig 2.

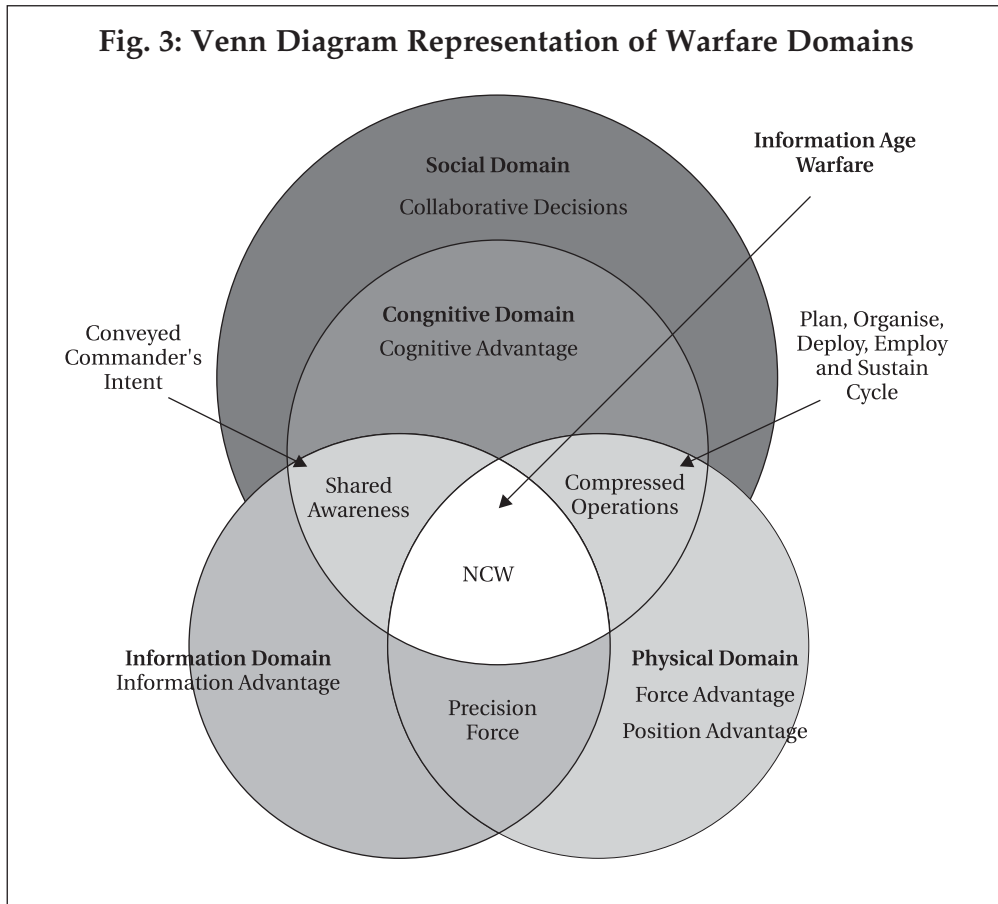
Fundamentally, the concept of **NCW is about maintaining information superiority i.e. defeating or deterring the enemy by getting the right information, at the right place, in the right format, with the right level of accuracy, at the right time.** In this context, the paradigm has now shifted from

“pushing the information to the user on time” to the “user pulling the information as required and when required.” If the new paradigm is properly established, the right amount of combat potential can be placed at the right location in the right time. This effectively puts ‘more mass’ in ‘less amount’ of armed forces.

Domains of Warfare

The jigsaw puzzle of warfare comprise four intersecting domains:

- (a) **Physical Domain.** This is the traditional domain of warfare where a force is moved through time and space, spanning the land, sea, air and space environments where military forces execute the range of military operations and where the physical platforms and the communications networks that connect them reside.
- (b) **The Information Domain.** The information domain is the domain where information is created, manipulated and shared. It is the domain that facilitates the communication of information among war-fighters. This is where command and control of military forces is communicated and the commander’s intent is conveyed, and, therefore, is a crucial domain, to be protected and defended.
- (c) **The Cognitive Domain.** The cognitive domain is in the mind of the war-fighter. Many, though not all, battles, campaigns, and wars are won in this domain. The intangibles of leadership, morale, unit cohesion, level of training and experience and situational awareness are elements of this domain. This is the domain where the commander’s intent, doctrine, tactics, techniques and procedures reside. And lastly, this is where decisive battlespace concepts and tactics emerge.
- (d) **The Social Domain.** The social domain describes the necessary elements of any human enterprise. It is where humans interact, exchange information, form shared awareness and understandings and make collaborative decisions. This is also the domain of culture, the set of values, attitudes, and beliefs held and conveyed by leaders to the society, whether military or civil. It overlaps with the information and cognitive domains, but is distinct from



both. Cognitive activities by their nature are individualistic; they occur in the minds of individuals.

Network-centric warfare is concerned with the nexus or intersection of all four of these domains of warfare and, hence, it is located at the intersection of all four domains. An intersecting Venn diagram representation of these four domains is shown in Fig. 3.

The precision force, so vital to the conduct of successful joint operations, is created at the intersection of the information and physical domains. Shared awareness and tactical innovation occur at the intersection between the information and cognitive domains. The intersection between the physical and

cognitive domains is where the time compression and 'lock-out' phenomenon occurs, where tactics achieve operational and even strategic effects, and where high rates of change are developed. NCW exists at the very centre, where all four domains intersect and, thus, where information age warfare is conducted.

BUILDING BLOCKS OF NCW

NCW, being a system of systems, consists of a group of interconnected systems. Its building blocks are as discussed in the subsequent paragraphs.

Intelligence, Surveillance, and Reconnaissance (ISR)

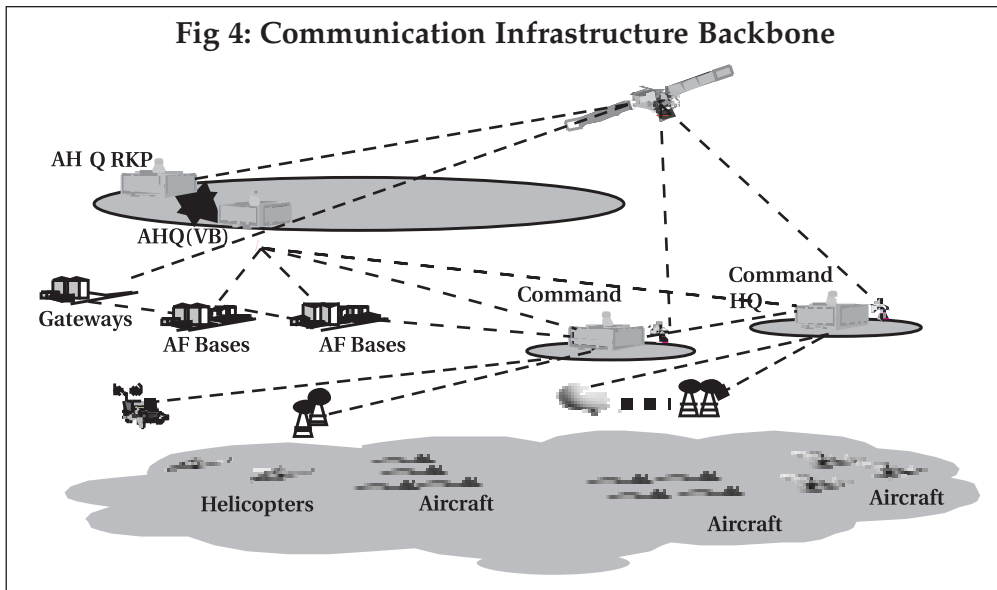
ISR functions are principal elements of defence capabilities. ISR covers a multitude of programmes ranging from billion dollar satellites to hand-held cameras. They include a wide variety of systems for acquiring and processing information needed by decision-makers and military commanders. ISR has been one of the critical mission areas of aerospace power. It enriches decision-makers at all levels of command with knowledge – not merely data – about the adversary's capabilities and intentions. Advanced integrated ISR combined with effective C2 capabilities, can improve the capabilities to find, fix, assess, track, target, and engage anything of military significance, anywhere. NCW emphasises using networked intelligence, surveillance, and reconnaissance capabilities, and pre-determined decision criteria, to support automated responses from the 'network' to threats against individual

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platforms. NCW is aimed at the opponent's command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) to make its forces blind, deaf, and unable to control themselves, thus, rendering them easy targets should they not surrender. To realise the potential of NCW, we must turn ISR data into actionable combat information, knowledge and intelligence; disseminate knowledge over robust communications networks to decision-makers and leverage;

technologies that allow for greater access to databases and analytical efforts located outside the theatre of operations, thus, enabling split-based operations.

(a) **Unmanned Vehicles (UVs).** Unmanned vehicles represent technologies that bring new capabilities such as persistence and battlespace awareness in air, ground and sea domains. They include unmanned aerial vehicles (UAVs), unmanned aerial combat vehicles (UCAVs, which are UAVs armed with weapons), unmanned surface vehicles (USVs), unmanned underwater vehicles (UUVs), and unmanned ground vehicles (UGVs). They can serve as ‘eyes and ears’ for manoeuvring ground forces. Long-range responsive UAVs, flying at altitudes of up to 60,000 ft, at high speed, controlled through a communications network from ground stations thousands of miles away, with their synthetic aperture radar, electro-optical camera, and infrared (IR) and other sensors, can see through bad weather and at night. They can be launched when needed to enhance the battlefield picture for commanders. UAVs are valued as force multipliers, as augmenters of the force, and as adding a new component to the military force mix. They do not, however, have the capability to remain overhead for long periods (long-dwell capability), and they may be vulnerable to attack.



(b) **Reconnaissance Satellites.** The new generation of reconnaissance satellites form another expensive and technologically sophisticated platform for intelligence and reconnaissance that can identify small objects from space. Satellite imagery has long been one of the most valuable tools of the intelligence profession. They can stay in orbit for years and can be shifted from target to target as needs change.

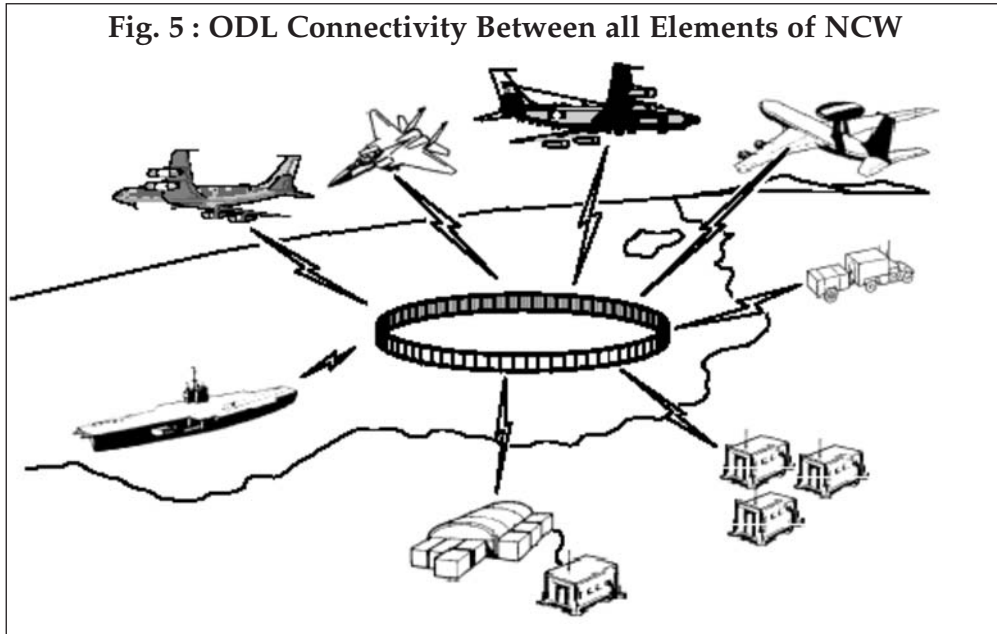
Communication Infrastructure Backbone

This comprises the physical communication infrastructure on the ground with the requisite/perceived band width (BW). The resources include OFC, land lines, routers, switches, mobile radio relays, LOS microwave links and satellite links. This forms the physical, media access, data link, transportation and protocol layers in the network. The network protocol selections such as IP are a part of this block. A schematic diagram of the communication connectivity is shown in Fig. 4.

Computers and IT Infrastructure Backbone

This consists of computers/servers located at each node and gateway containing databases and software that decide what is to be sent where and at what priority/speed. These components, both software and hardware, provide interoperability among various systems. The information content is segregated and stored based on its importance and time criticality. Some of the broad classifications are as follows:

- (i) **Real-Time Information.** It comprises information with latency times less than a second such as RT, voice, live video, and tactical data such as radar pickups, weapon launch data, aircraft emergencies and video conferencing.
- (ii) **Near Real-Time.** It would comprise information with latency times of a few seconds/minutes such as aircraft serviceability, aircrew and nav-aids availability states, BDA, tactical intelligence data, target pictures, etc.
- (iii) **Non-Real-Time but Time-Critical and Important.** This could comprise information with latency times of minutes/few hours such as met, mission plans like CATOs, target folders, operations orders, priority mail, etc.
- (iv) **Non-Time-Critical and Routine.** Information, where latency could be up to



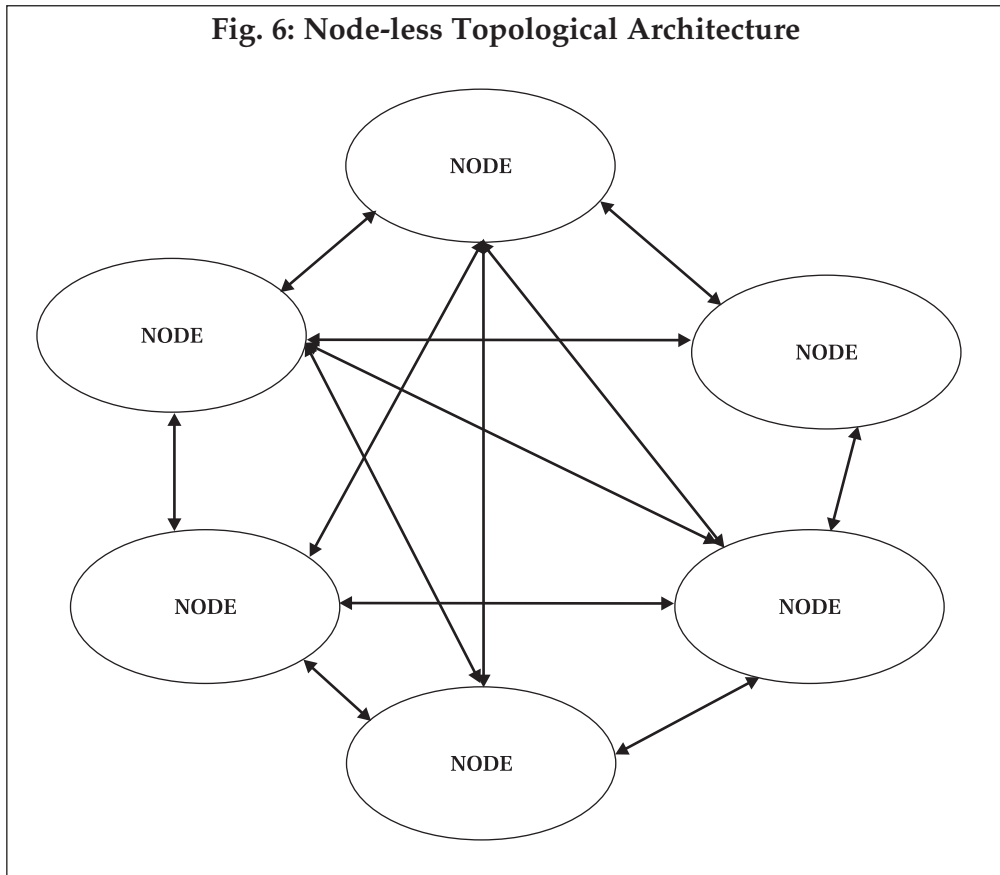
a maximum of a day, will comprise manpower state, mail, routine orders, equipment holding state and other MIS data.

Tactical or Operational Data Link

Tactical or operational data links (ODLs) are used in combat for machine-to-machine exchange of real-time information such as radar tracks, target information, platform status, imagery, and command assignments. It is a communication, navigation, and identification system that supports information exchange between tactical command and control, communications, computers, and intelligence (C4I) systems. A schematic diagram of ODL connectivity between all elements of NCW is shown in Fig. 5.

Essential features of the ODL include the following:

- (a) **Nodeless Architecture.** It should possess a nodeless architecture. As against the star connected based master-slave topology, where each slave node depends on the master for communicating to any other node, the node-less

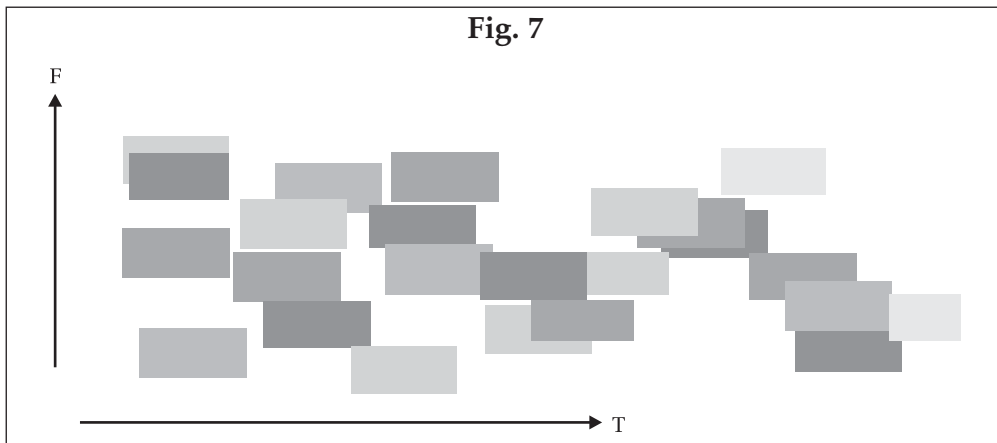


topology allows a mesh connectivity among all nodes, and, hence, there is no central point of failure. The responsibility of managing the network in node-less topology is distributed among all participating nodes i.e each node shares its own network management information with all other nodes.

- (b) **Multiple-Access Modes.** It should operate in multiple-access modes so as to support a large number of participants. The popular technique used for the purpose is TDMA, wherein each participant accesses the transmission medium only in the allocated time slot. The TDMA could be either static or dynamic. In dynamic TDMA , the time slots are dynamically allotted without any pre-planning on the ground; this allows an unlimited number of participants, each with a net-ID to transparently join and leave the network without any

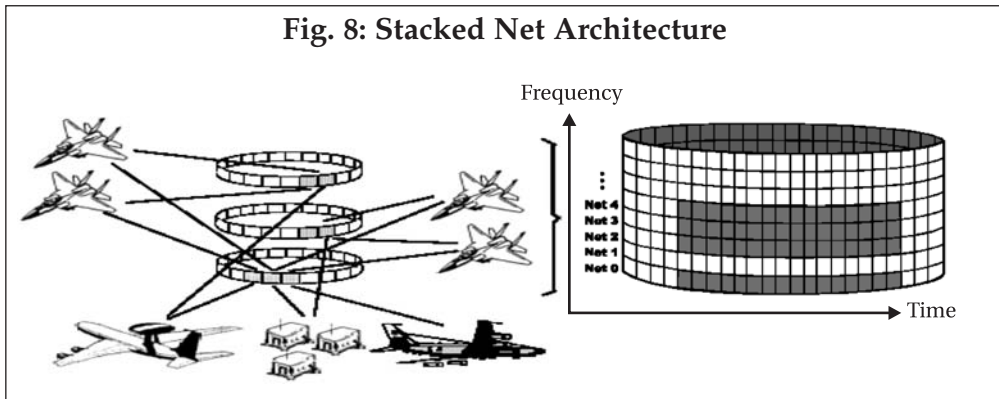
constraints. On the other hand, in static TDMA, participants are allotted pre-planned fixed time slots based on a plan worked out on the ground. Because of the dynamically expanding and contracting nature of dynamic TDMA-based architecture, the TDL system is flexible and desired in scenarios wherein a large number of participants are expected to participate without previous planning.

- (c) **Time Synchronisation.** It should have a net time reference (NTR) unit for time synchronisation of all units entering the TDL network. This is generally achieved using the GPS receivers onboard, alternatively by clock inputs supplied from external sources. In general, GPS-based systems have highly stable internal clocks to cater for synchronisation requirements during periods of GPS jamming/blockings.
- (d) **Security.** Encryption for both the incoming and transmitted messages is



carried out at both message and carrier levels. It should provide cryptographic isolation between two different groups of participants.

- (e) **Jam Resistant.** As the TDL is required to operate in a hostile electromagnetic environment, it should employ frequency hopping in a pseudorandom pattern to be jam resistant.
- (f) **Compatibility with Legacy Radio.** It should be backward compatible and, hence, must support operations in UHF LOS bands for interoperability with legacy radio.
- (g) **Stacked Net Capability.** It should support multi-net operations based on the



stacked net concept i.e. the system should support different groups of participants, each in their respective network. The operation of these so-called orthogonal networks is based on the software controlled time slot allocations. In a particular time slot, each network operates on a distinct frequency hop pattern, thus, enabling the information exchange among all its participants. The exchange of information across the nets takes place by matching their hop patterns at pre-determined time slots within a specified time cycle.

IMPLEMENTATION OF NETWORK-CENTRIC WARFARE

As a new source of power, NCW has a profound impact on the planning and conduct of war by allowing forces to increase the pace and quality of decision-making, in effect changing the rules and pace of military operations. A war-fighting force with networked capabilities allows a commander to more quickly develop situational awareness and understanding, rapidly communicate critical information to friendly combat forces, and marshal the appropriate capabilities to exert massed effects against an adversary.

While NCW is the theory, network-centric operations (NCO) comprise the theory put into action. In other words, the conduct of NCO represents the implementation of NCW. NCO involves the application of the tenets and principles of NCW to military operations across the spectrum of conflict from peace, to crisis, to war. The objective of decision superiority is to turn an information advantage into a competitive advantage. The principles of NCW

provide a new foundation with which to examine and consider changes in military missions, operations, and organisations in the information age. The full application of these principles will accelerate the decision cycle by linking sensors, communications networks, and weapons systems via an interconnected grid, thereby enhancing our ability to achieve information and decision superiority over an adversary during the conduct of military operations.

Transformation and NCW implementation deal with the co-evolution of the key functional areas of technology, doctrine, personnel, leadership, organisation, education and training. A change in any one of these areas necessitates changes in all. Therefore, the progress must be assessed in terms of the maturity of mission capabilities that integrate these key elements. Ultimately, military transformation and NCW implementation are about changing the values, attitudes, and beliefs of the armed forces. The strategy for implementing NCW in today's information age is governed by the following key elements:

- (a) **Put the NCW Rules and Metrics in Right Perspective.** Understand the theory of NCW through simulation, testing, and actual experimentation. The rules of information age warfare and the theory of NCW must be continually refined through the process of experimentation and testing and from the real world experience of forces engaged in combat and other military operations worldwide.
- (b) **Put the Concept in Practice.** Network the elements of the war-making machinery at the tactical, strategic and operational levels. As new network-centric systems, concepts, and capabilities are developed, they should be deployed to the units and combat squadrons where they can be refined and employed when needed.
- (c) **Refine and Fine-Tune the Concept.** Continuously develop and deploy new and better ways to conduct network-centric operations. Rigorous programmes of joint and stand-alone experimentation must be worked out and deployed so as to nurture new and better ways to conduct NCO.
- (d) **Develop NCW Doctrine, Tactics, Techniques, and Standard Operating Procedures (SOP) for NCO.** In order to maximise the potential for increased combat power from NCW, doctrines must evolve as network-centric

capabilities are implemented. Simultaneously, mature SOPs will be needed to facilitate the effective conduct of NCO during military operations.

IMPACT OF NCW ON VARIOUS LEVELS OF WAR

The levels of war are doctrinal perspectives that clarify the links between strategic objectives and tactical actions. There are no distinct boundaries among the strategic, operational, and tactical levels of war. Also, they are not necessarily associated with specific levels of command, size of units, types of equipment, or

There are no distinct boundaries among the strategic, operational, and tactical levels of war. Also, they are not necessarily associated with specific levels of command, size of units, types of equipment, or types of forces or components.

types of forces or components. However, certain commands tend to operate at particular levels of war, e.g. an operational command typically operates at the strategic and operational levels of war while a fighter squadron will typically operate at the tactical and operational levels of war. Actions are strategic, operational, or tactical based on their effect or contribution to achieving strategic, operational, or tactical objectives. These levels of war help commanders visualise a logical flow of operations, allocate resources, and assign tasks. The rise of information age media

reporting has compressed the time-space relationships of event occurrence and awareness; events occurring in one place can be reported with almost instantaneous visibility and implications globally.

TACTICAL IMPACTS OF NCW

NCW provides the ability to enlarge the engagement envelope, reduce risk profiles, increase responsiveness, improve manoeuvrability, and achieve higher kill probabilities. Some major tactical advantages of NCW operations include the following:

- (a) **Reduced Sensor to Shooter Time.** The enhanced SA shrinks the observe-orient-decide-act (OODA) loop because, as the number of questions decrease,

ambiguity decreases, collegiality increases, and timelines shorten. The shortened timelines in integration with, and interaction of, the three major entities of a conflict – sensors, decision-makers and actors – enable the processing of the OODA cycle at a faster pace. These could involve reducing the following:

(i) Time between target detection and delivery of munitions on target.

(ii) Time to plan.

(iii) Time to react i.e. to form and equip forces to conduct operations.

(b) **Cooperative Engagement Capability (CEC).** This provides the ability to conduct effective air defence against threats capable of defeating a platform-centric defence. All elements of air defence in this mission area are stressed to their limits, especially against high speed or low-observable intruders where the time to detect, track, classify, and engage the targets is extremely small. The CEC is enabled by the close coupling of an integrated communications capability with a computational capability. This info-structure, combined with automated decision support capabilities, forms a high performance backplane which is the key to increasing the velocity of information among sensors, C2 and fire control nodes. The final outcomes are extended engagement envelope, enabling incoming targets to be engaged in depth, with multiple shooters with increased probability of kill.

(c) **Self-Synchronisation.** Self-synchronisation is the ability of doing what needs to be done without traditional orders. It enables a well-informed force to organise and synchronise complex warfare activities from the bottom up. This is achieved by the availability of integrated SA, which contains a high level of knowledge of one's own forces, enemy forces, and all appropriate elements of the operating environment. SA, thus, brings out the visualisation of the war scenario from the commander's mind onto the HMI displays for all to see and march in synchronism towards the common goal. Introduction of this concept brings about a shift in the conventional linear logic of effort concentration during war to the non-linear, i.e. the field commander need not wait for the result of a mission before launching another; rather, he may direct his resources into several parallel missions which are self-regulated, based on the minute-to-minute changes in the war scenario. Such 'parallel war' can

Combat power significantly increases through the ability of tactical units to self-synchronise operations based on a shared combat operational picture and shared knowledge of the commander's intent.

produce the systematic disruption of the enemy's operational functions, create despair, and even lead the enemy to give up.

(d) **Increased Combat Power (Economy of Effort).** The combat power significantly increases through the ability of tactical units to self-synchronise operations based on a shared combat operational picture and shared knowledge of the commander's intent. By reducing duplication of effort, the network allows members to achieve greater results. The engagement grid consisting of shooters, though

spread over a large area, would be able to concentrate precision weapons rapidly upon targets hundreds of miles away. Greater destructive power can be delivered more accurately and in a timelier manner than before. With enhanced battlefield transparency and less time taken in decision-making towards force allocation, deployment and redeployment, greater effectiveness can be achieved with fewer quanta of military resources. NCW, thus, facilitates optimum use of weapons through cooperative targeting and optimises employment of the combat assets of all the Services through integration.

- (c) **Increased Survivability.** A realistic knowledge of the location of all the friendly/enemy elements during war reduces the chances of fratricide, thus, increasing the survivability in the war scenario.
- (d) **Swarm Capability.** Networked forces can fight using 'swarm tactics,' by which unit movements are conducted rapidly. All know each other's location. If one unit gets into trouble, other independent units nearby can quickly come to its their aid, 'swarming' to attack the enemy from all directions at once. The benefits of swarming may include the following:
 - (i) Networked forces can consist of smaller-size formations that can travel lighter, move rapidly and can perform a mission effectively at a lower cost.
 - (ii) It is harder for an enemy to effectively tackle a widely dispersed formation.
 - (iii) Combat formations can cover much more ground, because they do not have

to maintain an unwieldy formation size for reasons of mass as known until now for self-protection.

(iv) Knowledge of the location of all friendly units reduces fratricide during combat operations.

STRATEGIC IMPLICATIONS OF NCW

Impact on Leadership

The success of net-centric operations will depend on leadership, which is defined as “influencing people by providing purpose, direction, and motivation – while operating to accomplish the mission and improving the organisation.” The NCW environment will require leaders at all levels, who are comfortable in the information environment, are adaptive and innovative, and who foster these same traits in subordinate leaders. These leaders must also be comfortable in the knowledge that their unit’s situation and intra-unit communications may be monitored by the higher levels of commands as part of the increased level of shared situational awareness. This requires a high level of trust between leaders at all levels, who must clearly communicate their intent and provide mission-type orders, allowing subordinates the freedom to execute the missions and providing them with the necessary resources for execution.

The NCW environment will require leaders at all levels, who are comfortable in the information environment, are adaptive and innovative, and who foster these same traits in subordinate leaders.

Impact of Networking in the Deployment Process

The deployment process is a direct function of the common visibility of strategic forces. Availability of a common operational picture (COP) in an NCW enabled environment provides sufficiently flexible, transparent, user-friendly and disciplined conditions. The increased level of shared situational

awareness due to the access to the near-real-time COP would allow the supporting command to anticipate, plan and change missions. This process would enable increased collaboration and synchronisation and would increase the effects of strategic firepower. This level of networking exploits friendly capabilities and has the potential for generating increased reach and synergy to the battlespace.

Impact of Information Sharing on Standardisation Across the Force

Sharing information across the forces will require strict adherence to standards. The force cannot afford non-compatible communications and information systems. The rapid acquisition of new information systems and the fielding of these systems to the forces in the theatre would be mandatory for populating the COPs. This would enable the units to benefit from the greater situational awareness afforded by these systems. There is a constant challenge of developing systems that are truly interoperable among the Services, as different commercial vendors providing the systems use different proprietary technologies. This would require development of an architectural standard which all systems must adhere to in order to plug-in and play in the network.

Impact of Increased Situational Awareness on the Decision-Making Process

At the tactical level, the increased situational awareness and the capability to talk with other commanders would change the decision-making process from a staff-centric course of action development process to a commander-centric, directed course of action process. This is a shift to greater collaboration and information sharing between commanders, resulting in rapid situational understanding and knowledge of what would be needed next. Enabled by the information environment, commanders would be able to communicate their intent and rapidly issue mission-type orders that would allow maximum flexibility to their subordinate commanders. Commanders at the tactical through strategic levels would now be able to observe and listen in on the development and the execution of the orders as the campaign is executed.

Impact of NCW on Force Design

NCW plays a central role in the transformation of the military. At the tactical, operational, and even theatre strategic levels of war, the evolving tactics, techniques, and procedures need to rapidly adapt to the new capabilities provided by the networking of sensors, decision-makers, and shooters. At the strategic level, these developments would necessitate evolving new concepts and paradigms so as to move towards achieving forces that are more interconnected and jointly interdependent, with ground forces that are smaller, faster, and lighter. This would provide a strategically agile force and one that should provide a considerable capability for the rapid achievement of national military objectives.

Moore's Law, a Challenge in Maintaining a NCW Concept-Based Force

Moore's Law and its impact on the capacity of computer chips and, therefore, systems are well known. Considering the rapid and continuous advances in information and communications technologies in today's world, we cannot afford a long drawn development, testing, procurement, and implementation process. Military systems today rely on commercial computer technologies with a half-life of eighteen months to two years. On the other hand, our design-develop-acquire-deploy programmes run into decades, ensuring technology obsolescence by the time the systems are fielded. These time schedules would enable our potential adversaries to leapfrog to new generations of commercial technologies, which could be equal to, or more capable than, our own. Only a dramatic reform in the acquisition process can ensure the timely arrival of NCW enabling systems in our country.

Impact on Joint and Coalition Operations

The basic requirement for conducting operations across the spectrum of war necessitates and pre-supposes an ability to communicate, share information, and coordinate actions in allied and coalition environments. It should not only be backward compatible without limiting our own network-enabled capabilities but also seamlessly interoperate with more "high-tech" forces.

CHALLENGES OF NCW

The NCW concept does have some disadvantages which need to be addressed carefully while acquiring the capability. These disadvantages are given below:

- (a) **Information Flooding.** Due to the networking, there would be too much of information at each level which may render the same ineffective despite availability. Therefore, it is important to apply the 'need-to-know' paradigm.
- (b) **Dependency on NCW Capabilities Leading to Ineffective Performance in a Degraded Environment.** The degradation in the NCW environment and its assured availability may come from technology failures, enemy actions or an enemy adapting asymmetrically to the environment. A level of non-net-centric redundancy needs to be maintained and trained for. We need to determine when, where, and to what degree soldier and leader development is necessary for training both new net-centric skills and maintaining non-net-centric skills.
- (c) **Vulnerability.** The network is vulnerable in terms of machine failure during most critical junctures, human errors, virus attacks, electromagnetic fallouts (directed energy devices could theoretically burn out computer circuits at a distance), software dependability for command and control operations, sabotage, bugging, jamming, signals intercepts etc.

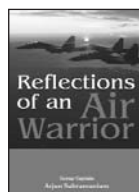
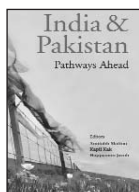
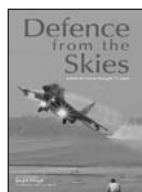
CONCLUSION

NCW, together with, ISR promotes the value of information sharing, collaboration, synchronisation, and improved interoperability within the information domain. It suggests that information superiority and victory on the battlefield will be dependent on technological solutions that will help us acquire process, exploit, disseminate, and protect information. It is aimed at paralysing the nerve centres in a battle that is no longer three-dimensional but includes cyberspace as its fourth dimension. By 2020, it will be possible to localise with 90 per cent probability and 10 cm accuracy any event within a 360 x 360 km battlespace within 30 seconds of its occurrence. That means that tomorrow's operational decision-maker will have very accurate knowledge, very rapidly and over a very broad area.

NCW requires changes in behaviour, process and organisation to convert the advances of information age capabilities into combat power. With technology advancing at an incredible speed, we cannot afford to wait any longer. If we decide to fight on a network-centric rather than platform-centric basis, we must change how we train, how we organise, and how we allocate our resources. Delays will mean higher costs and reduced combat power. If adversary targets are neutralised by NCW systems before they can engage in fighting with our forces, then the battle can be finished before it has really begun.

NCW requires changes in behaviour, process and organisation to convert the advances of information age capabilities into combat power.

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LEVERAGING OUTER SPACE FOR NATIONAL SECURITY

RANJANA KAUL

The world of diplomacy was much like the world of business, in which respect for sanctity of contract does not prevent the most startling reverses of fortune. Many diplomats were ambitious, some vain or stupid, but they had something like a common aim - to preserve the peace of Europe without endangering the interest or security of their country....

– A.J.P Taylor’s magisterial survey of “The Struggle for Mastery in Europe.”

The theme of the national seminar “Leveraging Outer Space for National Security” is an acknowledgement that in order to ensure national security to its fullest measure, it is critical to understand, harness, secure and control the fourth dimension: outer space. India has a well developed and mature space programme and the proposal to leverage outer space for national security has not come a day too soon. In order to achieve such a national security policy, it is imperative to understand *outer space* in the context of the rights and obligations of state parties under the international space law conventions and in the context of the current index of *global space security*. Such a background will be of assistance in identifying those aspects of outer space that can, and should, be leveraged to enhance national security. It will assist also to prioritise that into *long* and *immediate terms*, the identified goals. It needs no reiteration that India

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will necessarily achieve its goal of leveraging outer space for national security without seeming to deviate from the UN Charter, the space law conventions and steadfast adherence to the principle of the use of outer space for peaceful purposes.

It is given, of course, that only realistic goals and timelines will ensure success. The *long-term goals*, among others, would be: (i) to ensure uninterrupted and continued access to outer space; (ii) to control our space assets; (iii) to defend India's terrestrial and space assets from attack by terrestrial or space enabled weapons; and (iv) to be capable of managing effectively the fallout of such an attack. The *immediate goals* must be: (i) to revisit all current policies and guidelines pertaining to space-related activities that are the cause of ongoing security concern; (ii) to deconstruct

A large number of states are increasingly focussing on the security uses of outer space within national military doctrines.

identified policies/ guidelines to allow for an analysis of their effect on security; (iii) to establish how these should be amended to address India's present and future national security infrastructure needs; (iv) to identify such other collateral policies and systems (administrative, legal, technical, among other) which may need to be amended; and (v)

to carry out the identified changes within the established timeline to achieve the imperative national security infrastructure needs.

GLOBAL TRENDS IN SPACE SECURITY

The technology driven space age led inevitably to a race between the two superpowers to gain military superiority in outer space. However, although all space-faring states emphasise the importance of cooperation and the peaceful uses of space, including the promotion of national commercial, scientific, and technological progress, the fact is that trends in the recent years indicate that a growing number of states, led by the US, China, Russia, Japan, Israel, India and the European Union (EU) are placing greater emphasis on national security space applications. Furthermore, a large number of states are increasingly focussing on the security uses of outer space within national military doctrines.

The 2006 US National Space Policy¹ declares freedom of action in space as being equally important to the US as air power and sea power and includes the policy to deny access to space to perceived adversaries. Furthermore, the exercise by the US of the doctrine of *preemption*² has impacted the way in which countries are viewing their own security needs³. Consequent to their dependence on space

1. The 2006 US National Space Policy: www.ostp.gov

The conduct of US space programmes and activities shall be a top priority, guided by the following principles:

- The United States is committed to the exploration and use of outer space by all nations for peaceful purposes, and for the benefit of all humanity. Consistent with this principle, “peaceful purposes” allow US defense and intelligence-related activities in pursuit of national interests;
- The United States rejects any claims to sovereignty by any nation over outer space or celestial bodies, or any portion thereof, and rejects any limitations on the fundamental right of the United States to operate in and acquire data from space;
- The United States will seek to cooperate with other nations in the peaceful use of outer space to extend the benefits of space, enhance space exploration, and to protect and promote freedom around the world;
- The United States considers space systems to have the rights of passage through and operations in space without interference. Consistent with this principle, the United States will view purposeful interference with its space systems as an infringement on its rights;
- The United States considers space capabilities — including the ground and space segments and supporting links — vital to its national interests. Consistent with this policy, the United States will: preserve its rights, capabilities, and freedom of action in space; dissuade or deter others from either impeding those rights or developing capabilities intended to do so; take those actions necessary to protect its space capabilities; respond to interference; and deny, if necessary, adversaries the use of space capabilities hostile to US national interests;
- The United States will oppose the development of new legal regimes or other restrictions that seek to prohibit or limit US access to or use of space. Proposed arms control agreements or restrictions must not impair the rights of the United States to conduct research, development, testing, and operations or other activities in space for US national interests; and
- The United States is committed to encouraging and facilitating a growing and entrepreneurial US commercial space sector. Toward that end, the United States Government will use US commercial space capabilities to the maximum practical extent, consistent with national security.

United States Space Policy Goals

The fundamental goals of this policy are to:

- Strengthen the nation’s space leadership and ensure that space capabilities are available in time to further US national security, homeland security, and foreign policy objectives;
- Enable unhindered US operations in and through space to defend our interests there;
- Implement and sustain an innovative human and robotic exploration program with the objective of extending human presence across the solar system;
- Increase the benefits of civil exploration, scientific discovery, and environmental activities;
- Enable a dynamic, globally competitive domestic commercial space sector in order to promote innovation, strengthen US leadership, and protect national, homeland, and economic security;
- Enable a robust science and technology base supporting national security, homeland security, and civil space activities; and
- Encourage international cooperation with foreign nations and/or consortia on space activities that are of mutual benefit and that further the peaceful exploration and use of space, as well as to advance national security, homeland security, and foreign policy objectives.

2. The doctrine of preemption is the foundation of the ongoing US war against Iraq.

3. David Lange “Beijing Mystery: Who Runs Military?” *International Herald Tribune*, article dated June 25, 2007. He writes in reference to China’s foreign policy goal in respect to Taiwan: “But China’s current thinking about when force is justified or what perceived threats are driving its accumulation of firepower remains unclear for most foreign governments and analysts. Some military analysts believe that there is now considerable debate underway in the Chinese military about the role of pre-emptive forces in some circumstances including the use of nuclear weapons.”

assets, every country views an *uninterrupted access to space* and the *control of its space assets* as cardinal goalposts of its national security policy⁴.

In 2006, there was a continuation of the increased focus on the security uses of space by a growing number of actors. These developments could have both positive and negative effects on space security. Whereas the security benefits of sustainable access to, and use of, outer space can have a positive benefit on space security, doctrines intended to serve national interests by developing negation capabilities may eventually threaten that security.

Equally, the increased emphasis on national security aspects of space has combined criticism of the 2006 US National Space Policy and, to a lesser extent, of the 2006 Chinese White Paper on Space Activities⁵, underlining growing international tension concerning national uses of space. However, in general, states continued to promote international cooperation on the peaceful uses of outer space in new policies released in 2006. In so far as cooperation promotes transparency and confidence-building among space-faring states, this trend continues to exert a positive influence on space security⁶.

That being said, the norms and practices of international society mandate enlightened, rather than narrow, self-interest. They call upon states to abstain from forcible intervention in the affairs of other states, to obey international law, particularly the principle of *pacta sunt servanda*, and to cooperate with others wherever possible, which in the post-1945 world involves commitment to global institutions like the United Nations. This is of particular relevance in the context of outer space, its exploration and its use. That is because the concept of 'sovereignty' over 'territorial acquisition' which lies at the heart of traditional international law, in both its customary and conventional applications, has been categorically and consciously eschewed in the context of outer space.

International space law had its genesis in the overriding desire of the two space powers to prevent the other from laying 'claim' or 'appropriating' or 'putting to

4. www.spacesecurity.org/BNLawsPoliciesandDoctrines.pdf, accessed on June 25, 2007

5. "China's Space Activities in 2006," *People's Daily Online*, October 12, 2006, online: *People's Daily* <http://english.people.com.cn/200610/12/eng20061012_311157.html> (date accessed: 25th June 25, 2007)).

6. Space Security Index www.spacesecurity.org accessed June 24, 2007.

military use' any part of outer space. The process for preventing the application of the principle of '*sovereignty*' to outer space, and the emphasis on its exploration and use only for '*peaceful purposes*' was spearheaded by the USA immediately after the launch of the Sputnik in 1957. The USSR had scored a resounding first over the US⁷. That single event changed the geopolitical dimensions of the world inexorably. Consequently, space law is based entirely on international treaties and conventions, founded on general principles of international law, framed under the aegis of the UN.

International space law had its genesis in the overriding desire of the two space powers to prevent the other from laying 'claim' or 'appropriating' or 'putting to military use' any part of outer space.

There are two reasons why the challenge of outer space became critical to both the USSR and USA. First, the deployment on earth of intercontinental ballistic missiles (ICBMs) carrying deadly nuclear warheads which could reach their terrestrial target within 24 minutes, by following a trajectory through outer space, over the North Pole. Second, because the presence of that nuclear threat necessitated placing satellites in space to give surveillance coverage as well as strategic and tactical warning. The 1967 Outer Space Treaty (OST 1967), thus, reflects the imperatives of the superpowers. It was the outcome of diplomatic wrangling, negotiations and compromises. In other words, it was the product of 'consensus' achieved by international diplomacy at the UN, "to preserve peace without endangering the interest and security of their country."

Given that at the time the two spacepowers were not expecting any competition in space in the foreseeable future, it is not surprising that the US and USSR readily accepted the principles enshrined in the OST. The focus was firmly on the orbit seen in its 'military' dimension. From the US point of view, the OST put an effective

7. The US had itself decided to build a rocket for launching during the International Geophysical Year. The attempt to launch the Vanguard test satellite ended in failure, although this three-stage launcher provided experience in the use of solid-propellant engines as stages for later space vehicles. However, stung by Russian success in 1957, the USA put its mind to rapid development of space technology and scored its first on July 27, 1969, by putting a man on the moon. Meanwhile, the USSR seemed to have lost its advantage in the race though it did first launch military space platforms, the SALYUT 1-7 series, of which many details are available.

Although the signatories to the OST had agreed in terms of Article XI to inform the secretary general of the UN, there is no information in the public domain that any country has to date, informed the secretary-general of the UN of their numerous military satellites that are in orbit.

international brake on the perceived dangerous ambition of its rival. A sentiment wholeheartedly reciprocated by the USSR. Both countries had supported inclusion of the principle of “peaceful use” and “scientific research for peaceful purposes” in the OST, because it was the perfect camouflage for the frenzied pace at which each proceeded to develop space technology capable for military applications, in the race to attain military supremacy over the other.

Not surprising, then, that although the signatories to the OST had agreed in terms of Article XI to inform the secretary general of the UN to the greatest extent feasible and practicable, of the nature, conduct, locations and results of such activities in outer space, so

that such information could be disseminated *immediately and effectively*, there is no information in the public domain that any country has, to date, informed the secretary-general of the UN of its numerous military satellites that are in orbit.

The devil lies in the self-defeating wording of the Article, a clear victory for the diplomats on either side of the table. Article XI requires the secretary-general to be informed, if the country in question considers such information to be “practicable” and “feasible” to furnish, a determination left entirely to that country in the absence of a test for such determination outlined in the treaty. Yet, on the flip side, it is the Outer Space Treaty 1967 and the principles enshrined therein, that proved to be a fortuitous tool for countries aspiring for their share of the pie in the sky. It was in the 1970s, with the development of satellite telecommunication and broadcasting technology, that the potential attributed to outer space changed dramatically. Outer space became a resource which would earn countries lucrative returns, while, at the same time, enable development. Almost overnight, the focus shifted from development of technology for military applications in space to the development of technology for civilian applications compatible with commercialisation of space. In

fact, we could quite easily draw a parallel between the late 20th century global debate on the direction and control of satellite orbits, with the 17th-18th century contest to control terrestrial trade routes⁸. Today, we have come a full circle. In our century, the weaponisation of space seems imminent and countries are concerned about the security of their access to, and assets in, space.

This paper is guided by the belief that a nation formulates a national security policy in response to developments beyond its boundaries that are perceived as threatening to its external and internal security, whether carried out by an individual nation or at a multilateral level. In the present context, the time is appropriate for India to articulate a space policy in the context of national defence. Therefore, it may be useful to analyse the parameters set out by the international space law regime to identify the dos and the don'ts, as it were. At the end of the day, leveraging outer space for national security must be synonymous with a policy that builds the architecture of sustainable space security for the country.

Against that background, this paper will briefly focus in Part I on: (i) an overview of relevant provisions of the UN Charter; (ii) international space law conventions; (iii) UN space principles; (iv) international institutional framework mandated to address space security issues. Part II of the paper will focus on India in the context of (i) the current legal regime for outer space in India; (ii) security concerns for India from space-related activities; (iii) leveraging outer space for India's national security.

PART I

(I) THE CHARTER OF THE UNITED NATIONS

The most general UN document which pertains to space is the UN Charter. As a Charter, it is a constituent treaty, and all members are bound by its Articles. Furthermore, the Charter states that obligations to the United Nations prevail over all other treaty obligations.

The Charter establishes the objective of peaceful relations between state actors,

8. Monroe E. Price "Satellite Broadcasting as Trade Routes in the Sky," WPTC-99-12, Programme in Comparative Media Law and Policy, Centre for Socio-Legal Studies, Wolfson College, University of Oxford, OX2 6UD, October 1999.

including their interactions in space. Article 2(4) of the Charter prohibits the threat or use of force in international relations, while Article 51 codifies the right of self-defence in cases of aggression involving the illegal use of force by another state(s).

Article 51 states, *inter-alia*,
Nothing in the present Charter shall impair the inherent right of individual or collective self-defence if an armed attack occurs against a Member of the United Nations, until the Security Council has taken measures necessary to maintain international peace and security. Measures taken by Members in the exercise of this right of self-defence shall be immediately reported to the Security Council and shall not in any way affect the authority and responsibility of the Security Council under the present Charter to take at any time such action as it deems necessary in order to maintain or restore international peace and security. (Emphasis provided).

In our world, an “armed attack” can be launched from all or any of the four dimensions: land; air; sea; and outer space. Consequently, all actions and developments undertaken by a state to put itself in a condition of constant preparedness to ensure national security and defend and repel a hostile attack from, or in, outer space, is in consonance with the UN Charter.

Today, the challenge is not only that outer space has become a crowded environment or that it has long since been militarised. The challenge is that outer space is under threat of being weaponised.

Today, the challenge is not only that outer space has become a crowded environment or that it has long since been militarised⁹. The challenge is that outer space is under threat of being weaponised. Two added dimensions that require critical consideration are: (i) the possible access, and use of, outer space by non-state parties, perhaps through a third party, to launch an attack against target nations; and (ii) the

9. Today, George W. Bush’s America is actively talking putting in place a National Missile Defence with a focus on use of space-based platforms and concepts for anti-satellite kill weapons (ASAT). If the US implements such a policy, it would clearly be *ultra vires* the OST. But we must see this in context to President Putin’s statement that Russia would use its technology to pierce that shield, if the US embarked on locating a missile defence shield in outer space.

possibility of a state (other than the US) launching a *preemptive attack* in/ from outer space to deal with perceived adversaries or for achieving its foreign policy goals.

(II) INTERNATIONAL CONVENTIONS ON OUTER SPACE

At the foundation of the five international conventions that govern human activities in outer space, including the moon and other celestial bodies, is that all human activity in outer space shall be carried out only for “peaceful purposes”. The treaties establish the fundamental rights of access to space as well as state responsibility regarding space activities. They prohibit national appropriation and certain space military activities, such as the placing in orbit of objects carrying weapons of mass destruction.

However, questions have arisen as to the meaning of “peaceful purposes” in the context of the military use versus weaponisation of outer space. From the very beginning of the space age, the US has maintained that “peaceful” is synonymous with “non-aggressive.” The Soviet officials, on the other hand, had favoured “peaceful” to mean “wholly non-military.” In any case, the state practice over the last four decades has generally favoured the “non-aggressive” interpretation. Thus, space assets have been used to guide munitions, identify and track troop movements, surveillance and navigation. These military uses of outer space have stopped short, however, of weaponisation, which would involve the direct striking of targets from space, using conventional, nuclear or other means.

*1967 Outer Space Treaty*¹⁰

Often referred to as the Magna Carta of outer space, the Outer Space Treaty (OST) represents the primary basis for legal order in the space environment. However, it is important to note that the OST contains no verification or enforcement provisions.

Article I declares that outer space, including the moon and other celestial bodies, is “the province of all mankind” and “shall be free for the exploration

10. The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies opened for signature at Moscow, London and Washington, on January 27, 1967. Source: 610 UNTS 205. (hereinafter referred to as 1967 Outer Space Treaty or ‘OST’)

and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law.”

Pursuant to **Article II**, outer space, including the moon and other celestial bodies, is not “subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.” Unlike terrestrial practice, then, space cannot be nationally appropriated and does not belong to a single entity.

Article III, however, confirms that general principles of terrestrial international law – including rules of customary law – and the UN Charter are applicable to outer space. Therefore, the prevalent view is that Article 2(4) of the UN Charter applies to outer space and, as a result, it is unlawful for a state to interfere in a hostile manner with the space-borne assets of another state. Nevertheless, should such hostile actions occur, a state can legally use force to defend itself pursuant to Article 51.

Article IV contains the only provision of the OST dealing directly with military activities. Under paragraph 1 of this Article, the contracting parties “undertake not to place in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.”

In addition, paragraph 2 also stipulates that the “moon and other celestial bodies” are to be used “exclusively for peaceful purposes,” with even conventional military installations, weapons testing, and manoeuvres expressly prohibited.

However, the OST does not expressly prohibit the development, testing, and deployment of conventional weapons in the expanses of outer space, nor does it prohibit the development, testing, and deployment of ground-based systems that can reach targets in space using conventional, nuclear, or directed-energy kill mechanisms.

As a result, **Article IV** has often been cited to support the claim that all military activities in outer space are permissible, unless specifically prohibited by another treaty or customary international law. For example, the Soviet Fractional Orbital Bombardment System (FOBS) was not covered by the OST, but new incarnations of an FOBS-type system are prohibited under the current SALT

II Agreement. However, neither the January 2007 Chinese anti-satellite (ASAT) test nor the US missile defence system is in violation of the OST.

Article VI of the OST provides that states are internationally responsible for “national activities in outer space,” including cases where activities are “carried on [...] by non-governmental entities.” Thus, the activities of non-governmental entities – such as the private sector – in outer space shall require “authorization and continuing supervision by the appropriate State Party to the treaty.”

The importance of the common interest of all nations permeates the treaty text. In particular, **Article IX** stresses that parties to the treaty shall be guided by the principles of cooperation and mutual assistance in the exploration and use of outer space, and shall conduct their activities with due regard to the corresponding interest of all state parties to the treaty. **Article IX** further requires state parties to undertake international consultations before proceeding with any activity that would cause potentially “harmful interference” with the “peaceful exploration and use” of outer space by other states.

Since the term “harmful interference” is not defined in the treaty, the question could be raised about whether the words “harmful interference with activities in the peaceful exploration and use of outer space” also covers military activities in outer space. As of today, and as far as is publicly known, no state party has ever undertaken consultations pursuant to this provision.

*1968 Rescue Agreement*¹¹

This agreement designates astronauts as “envoys of mankind,” and as such accords them a kind of diplomatic immunity. Astronauts in distress are to be tendered assistance and rescued whether on sovereign or foreign territory. The agreement stipulates that astronauts and their spacecraft are to be returned promptly to the launching authority should they land within the jurisdiction of another state party.

11. Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space opened for signature at Washington, London and Moscow on April 22, 1968. Source: 672 UNTS 119 (hereinafter referred to as 1968 Rescue Agreement); 82 countries have ratified and 23 have signed the Agreement. [‘Rescue’]

*1972 Liability Convention*¹²

Article I of the Liability Convention defines the term “launching state”. **Article II** mandates a two-tier liability system. In the first tier of cases, absolute liability for damage caused on the earth or to aircraft in flight is established. In other words, no proof of damage caused on earth or to aircraft in flight is required to receive compensation. In the second tier, **Article III** stipulates that damages to assets in space are to be compensated by the state at fault.

In both these cases, the convention reiterates that state parties remain responsible for the activities of their nationals and non-governmental entities. An important point to note is that it is the state, and not a private person whose space object has caused damage, that is directly held internationally liable. Therefore, a national legal system needs to be in place for the reimbursement of the compensation to the state which has been required to pay to the victim(s) of an accident by the space object of a non-governmental organisation (NGO). This obligation is most often fulfilled via regulations, national legislation, and licensing provisions, primarily via insurance requirements.

However, the evolution in the use of outer space into a more commercial and military-based environment is challenging the liability structure of this convention. For example, in dealing with concerns regarding the commercial use of global positioning system (GPS) signals, legal publicists do not agree on the applicability of the Liability Convention to aviation accidents caused by erroneous satellite navigation signals. Another issue of concern, related to the growing number of private and international actors undertaking space launches is the definition of the term “launching state.”

*1974 Registration Convention*¹³

The convention establishes a mandatory system of registration of space objects

12. Convention on the International Liability for Damage Caused by Space Objects opened for signature at London, Moscow and Washington on March 29, 1972, Source: 961 UNTS 187 (hereinafter referred to as 1972 Liability Convention); 74 countries have ratified and 27 countries have signed the convention. [‘Liability’]

13. Convention on Registration of Objects Launched into Outer Space. Adopted by the General Assembly of the United Nations, at New York, on November 12, 1974, Source: 1023 UNTS 15 (hereinafter referred to as 1972 Registration Convention) 37 countries have ratified and 4 have signed the convention. [‘Registration’]

launched into orbit and beyond, with registries to be maintained at the national (**Article II**) and international (**Article IV**) levels.

It is mandatory to report to the secretary-general of the United Nations such data as (i) the date and location of the launch; (ii) the changes in orbital parameters after the launch; and (iii) the recovery date of the spacecraft. This central registry's purported benefits are the effective management of traffic, enforcement of safety standards, and imputation of liability for damage.

However, the convention remains an incomplete tool. First, information is to be provided "as soon as practicable," which in practice can take weeks, if not, months. Second, states are not obliged to disclose the true function of the satellite, but only the "general function of the space objects." To date, not even a single launching registered has ever been described as having a military function. Third, the convention does not require a launching state to provide appropriate identification markings for its spacecraft and its component parts.

Various proposals have been advanced to resolve its enumerated shortcomings. The proposals reflect the convention as an instrument via which some outer space activities of military value may be governed. This view, however, is not shared unanimously. Some countries are of the opinion that the Registration Convention is neither an arms control nor a confidence-building instrument, but a legal instrument establishing an international registry of space objects for the purpose of giving practical effect to the Liability Convention.

*1979 Moon Agreement*¹⁴

This agreement generally echoes the language and spirit of the OST in terms of the prohibitions on aggressive behaviour on and around the moon, the installation of weapons, weapons of mass destruction (WMD), military bases and other non-peaceful activities.

Of the five multilateral treaties devoted entirely to outer space, the Moon Agreement is the most recent and enjoys the least support. The apprehension of the

14. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (hereinafter after referred to as the 1979 Moon Agreement). Source: UN doc. A/RES/34/68 of December 5, 1979. The agreement has been ratified by 10 countries while 5 countries have signed the instrument. [Moon].

UN member states about whether the provisions of the Moon Agreement will serve their individual national interests is obvious from the fact that to date there are just eleven ratifications (Australia, Austria, Belgium, Chile, Kazakhstan, Mexico, Morocco, Netherlands, Pakistan, Philippines and Uruguay) and five signatories (India France, Guatemala, Peru, and Romania). Perhaps it is not a coincidence that although most nations, particularly the US and Russia, have ratified the Outer Space Treaty 1967, they are unwilling to ratify the Moon Agreement 1979.

Vast natural resources are said to be locked in that celestial body. Moreover, the moon has the potential to be used for establishing military stations thereon. Such enterprises will be technology and capital intensive. Governments will have to harness private investment¹⁵. That will be possible only if tangible collateral security for such investment is made available. The best collateral for investment is property. Investment will, therefore, be conditional upon getting title to property *in rem*. Such a proposition would be in direct conflict with the principle of prohibition of "national appropriation" of any part of outer space. Nor are the principles of "province of all mankind", "peaceful purpose", "non-discrimination", "equality", "non disruption of existing balance of its environment by harmful contamination", "free access" and "dissemination of information" enshrined in the various international space treaties seen as conducive to achieving the political objective of conducting foreign policy that successfully meets the demands of domestic business, driven by scientific discoveries and technological developments enabled within the framework of the OST 1967.

(III) UN SPACE PRINCIPLES

In addition to the treaties, there are four sets of UN Principles which have been adopted by the General Assembly for regulating special categories of space activities.

15. The American industrial establishment seems to be deeply involved in the new strategic doctrine and is nurturing this approach for obvious industrial and economic gains. Speaking at the Space Foundation's 17th National Space Symposium in April 2001 in Colorado Springs, the executive Vice-President of Lockheed Martin Space Systems Co., Mr. Albert E Smith said, "Space is the next theatre [US must] control to ensure superiority." According to him, the implementation of a 'space control' doctrine should be implemented in three stages, the last of which would involve new space capabilities including "a space-based laser system and a military space plane." Cited in W.B. Scott, "Space Control Issue Finally Moves to Centre Stage," *Aviation Week and Space Technology*, April 23, 2001.

1. 1962 Principles Governing the Use of States of Artificial Earth Satellites for International Direct Television Broadcasting.¹⁶
2. 1986 Principles Relating to Remote Sensing of the Earth from Outer Space.¹⁷
3. 1992 Principles Relevant to the Use of Nuclear Power Sources in Outer Space.¹⁸
4. 1996 Declaration of International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States Taking into Particular Account the Needs of Developing Countries.¹⁹

(IV) INTERNATIONAL INSTITUTIONAL FRAMEWORK MANDATED TO ADDRESS SPACE SECURITY ISSUES

The United Nations General Assembly & Committee on Peaceful Uses of Outer Space, New York (UNGA) & (COPUOS)

The COPUOS is a permanent body of the United Nations General Assembly (UNGA) and the primary agency responsible for making space laws. Its resolutions, based on consensus, are passed in the UNGA. The fact that no new international space law has been possible since the 1979 Moon Agreement is a telling commentary, although there have been UN sponsored agreements on specific space-related activities. COPUOS been unsuccessful in persuading states to ratify the Moon Agreement. Nor has its ceaseless effort to encourage member states to adopt national space legislation met with much success.

International Telecommunications Union, Geneva (ITU)

The ITU is a UN agency that is responsible for managing the two most limited and highly prized natural resources in outer space – orbital slots and radio frequency – critical for every space related activity.

The current applicable 2006 ITU Constitution and Convention govern the international use of the finite radio spectrum and orbital slots used by satellites

16. UNGA Resolution 41/65.

17. UNGA Resolution 47/68.

18. UNGA Resolution 47/68.

19. UNGA Resolution 51/122.

for communications purposes. The two most important articles of the convention are **Articles 35 and 38**.

Article 35 stipulates that “all stations, whatever their purpose, must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other members...” Endangering, obstructing, or degrading the signal of another space asset using one’s own signal would fall under the category of “harmful interference,” as defined in the convention under Annex 2.

Article 38 exempts military telecommunications from the convention, though they must nonetheless observe measures to prevent harmful interference as much as possible. Additionally, parties are allowed to stop the transmission of any private telegram or telecommunication that is threatening to state security or which appears to pose such a threat.

Finally, the constitution states that radio frequencies and the geo-stationary orbit “must be used efficiently and economically so that countries or group of countries may have equitable access to both.” In the case of the GEO orbits allocated by the ITU, the principle has been interpreted as meaning that such positions should be made available on a first-come first-served basis.

However, ITU has been dogged by controversies pertaining to procedure for allotting orbital slots /spectrum. The ceaseless efforts by the developing countries to access space resources have been noteworthy. The case of warehousing of orbital slots or paper satellites in the context of the Tonga Sat case and the Bogotá Declaration by the equatorial countries of Central and South America succeeded in shaking the developed world’s monopoly of space resources.

Conference on Disarmament, Geneva (CD)

Established in 1979, the CD is a multilateral forum established by the international community for negotiating multilateral arms control and disarmament agreements. The CD is not formally a UN organisation. However, it is linked to the UN through a personal representative of the UN secretary-general, who functions as the secretary of the conference. The CD has 65 members, including all the nuclear weapon states.

The most important achievement of the CD was its success in negotiating a multilateral agreement on the Resolution on the Prevention of an Arms Race in Outer Space (PAROS).

The voting patterns at the CD that have clearly demonstrated nearly unanimous support for the PAROS Resolution, suggest a consistent and widespread desire on the part of states to expand international law to include weapons in space. However, US opposition to the CD has kept it deadlocked since 1998. Consequently, no formal work on PAROS has been possible.

Furthermore, in 2002, the US unilaterally withdrew from the 1972 Anti-Ballistic Missile (ABM) Treaty on the limitation of the anti-ballistic missile systems used in defending areas against missile-delivered nuclear weapons. Thus, the elimination of the self-imposed prohibition on space-based conventional weapons between the US and USSR-Russia, immediately renewed concerns about the potential for the weaponisation of outer space.

The shift was reflected in 2005 when Israel and the US voted against the PAROS Resolution, registering the first opposition votes in its history. To counter the negative vote, Russia tabled a new resolution, inviting states to provide inputs on measures to promote transparency and confidence-building in outer space. In addition, China and Russia submitted a non-paper to the CD on Definition Issues Regarding Legal Instruments on the Prevention of Weaponisation of Outer Space.

The present ground reality was expressed as recently as June 15, 2007, when United Nations Secretary-General Ban Ki-Moon suggested to CD member states that it was critical to adopt a decision to start substantive work in the conference, supplemented if necessary to overcome any reservations, that would have a positive impact on the international security atmosphere. He went on to suggest that if the conference did not move forward, it would have a devastating impact on multilateral and bilateral disarmament efforts.

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World Trade Organisation, Geneva (WTO)

As a result of the increasing diversity of activities of space-related activities, legal issues pertaining to outer space have been emerging increasingly in different international fora. International trade and access issues are increasingly being addressed in the WTO. In fact, the WTO has an annex concerning telecommunications services.

International Institute for the Unification of Private Law (UNIDROIT)

UNIDROIT is playing an important role in developing an international instrument that will facilitate the private financing of space assets, potentially improving access to space.

International Civil Aviation Organisation, Montreal (ICAO)

Firstly, the ICAO has mooted the idea of developing an international instrument for the global navigation satellite systems (GNSS) in the context of CNS/ATM once consensus is established among member states. However, presently there is a clear division of views between the US, which does not support an international legal regime for GNSS and the Europeans, who support it. Most countries that are proposing or already have regional navigation satellite systems, have tended to support the US. The lack of consensus is basically on the question of whether or not the 1972 Liability Convention should be applicable in cases of aviation accidents caused because of the failure of satellite navigation signals.

Presently, India has not yet articulated a space policy.

Second, the ICAO has added to the Council Agenda the question of sub-orbital flights in the context of international civil aviation. This will inevitably lead to a debate on the delimitation of airspace and outer space.

PART II

(I) CURRENT INDIAN LEGAL REGIME FOR OUTER SPACE

1. Presently India has not yet articulated a space policy

2. India has not enacted national space laws as yet. As such, state practice is rooted in terms of Article 53 of the Constitution of India which empowers the executive to fulfil international treaty obligations.
3. The Department of Space has spelt out its goals in the Citizen's Charter.
4. The SATCOM Policy, which is part of the 1999 New Telecom Policy, is the only policy statement on space enabled activity. It is limited to permitting the Ku Band for satellite communications.

The SATCOM policy is implemented in terms of (i) norms, guidelines and procedures for implementation of the SATCOM Policy dated January 12, 2000; (ii) and Procedure for Implementation of the SATCOM Policy issued on May 8, 2000, both issued by Indian Space Research Organisation (ISRO).

5. Current norms for IRS data distribution, both nationally and internationally.

(II) SPACE RELATED SECURITY CONCERNS FOR INDIA

Satellite Imagery and National Security

Security concerns have been expressed by the government about ready access on the Internet of high resolution satellite images of sensitive locations within the country which have the potential to be used by terrorists against the country.

Consequently, because America monopolises the Internet, it is proposed that the Ministry of External Affairs should hold bilateral discussions with the US and that the Ministry of Information Technology should hold meetings with the concerned private commercial companies. However, success can be met only if all American private satellite operators/distributors respond to our concerns and the US Administration agrees to establish a monitoring and enforcement mechanism.

The problem arises because presently IRS data products, including unedited high-resolution data, are distributed internationally through an exclusive marketing contract between the Antarix Corporation Ltd and Space Imaging, USA. As such, IRS satellite imagery distributed worldwide

In India, one can access sensitive and critical information in complete anonymity.

will remain subject to US law until 2010²⁰.

Domestic users are served by the National Remote Sensing Agency, Hyderabad, on receipt of advance fee by way of a demand draft. IRS data is distributed to domestic users

against advance payment by way of bank draft, after 'sensitive' topography is first blocked out.

Yet it is no secret that competing foreign suppliers are transmitting the same data, edit free, directly to users via the Internet. Google Earth is the obvious example. In India, one can access sensitive and critical information in complete anonymity.

Given the perceived challenge to national security, from non-state parties and hostile nations, is it worth enquiring whether IRS data marketed through Space Imaging, USA, is a possible source of supply of sensitive information about India? Or, if in the absence of law to the contrary, the existing grey market is legal? Or what kind of legal regime will ensure easy access to reliable IRS data without compromising national security? Finally, is the time appropriate for India to revisit its current IRS data distribution policy?

Secondly, it is also proposed for India to seek an international protocol on security concerns arising out of earth observation satellites and an international agreement to make mandatory prior permission of sensed states.

In this context, it is useful to recall that diverse political ideologies and power positions have made consensus in negotiating international law on remote sensing almost impossible. Competing arguments ranging from the policy of 'prior consent' to the 'open sky' doctrine have informed debates thus far. Typically, developing countries support the prior consent principle on the

20. Historically, by launching the world's first civilian satellite LANDSAT-1 in 1972, the US signalled that it would not restrict remote sensing exclusively for military purpose. By 1992, US global market dominance in civilian reconnaissance was challenged, prompting President Clinton to enact a law to help private operators/distributors gain future commercial opportunities in the global data market by supporting investment in new technologies and removing unnecessary restrictions on dissemination of privately gathered data remote sensing systems. Nonetheless, alive to the security needs, American companies are mandated to deploy commercial remote sensing satellites under the "Shutter Control" regime which allows the Department of Commerce legal authority to limit the collection and distribution of commercial satellite imagery when national security, foreign policy interests or international obligations are deemed to be compromised.

ground that remote sensing violates the territorial integrity of a sensed state. The US and Western powers, however, support an 'open sky.' Indeed, the adoption of the 1986 UN Principles Relating to Remote Sensing of the Earth was a hard earned achievement.

Principle XII is illustrative. It mandates that the "sensed state shall have access to data concerning the territory under its jurisdiction on a non-discriminatory basis and on reasonable terms and conditions." The primary organising principle of terrestrial law is 'sovereignty'. Thus, the right of a sensed state to control resources within its territory was recognised. The right "to explore" and "to use" outer space is the organising principle of space law. Thus, the right of developed countries to acquire imagery by remote sensing was also recognised. But the textual protection for sensed states is negated because they do not have jurisdiction over foreign satellite operators who collect/ disseminate remote sensed images of their territories. Moreover, no formal definition of "sensed state" exists, although it is a commonly accepted term in international and US domestic remote sensing laws.

India has articulated its concern in the 2002 UNCOPUOS Legal Sub-Committee, that the "legitimate rights and interests (of sensed states) are compromised (i) if they have no definite means to know whether their territory is imaged by commercial operators; and (ii) if they have no access to the data of their territories on a non-discriminatory basis soon after they are imaged." But there is no international consensus on the subject.

A national policy, backed by substantive and procedural law in respect of both passive and active remote sensing satellites, including issues of licensing, access, distribution, security (issues of low-level data and high-level data), copyright and

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protection of data rights is a security requirement. Legal issues in earth observation include data policy, particularly vis-a vis-private enterprise licensing (whether to license certain activities or licensing certain entities to undertake certain activities); good conduct ; financial responsibility; obligatory insurance or reimbursement; operational knowhow; technical competence certification; minimum safety requirements; whether to respect nationals or territories in a manner in consonance with international obligations; dispute resolution; and whether it would be a criminal breach of national law to operate such a satellite system without a licence.

Web Security

The security threat from social networking websites like Facebook, Orkut, Myspace, Friendster, among others, in particular in respect of the armed forces, is the latest challenge for the intelligence agencies. It is reported that personnel have been exchanging classified information that poses a serious security risk.

An appropriate policy with both upstream and downstream guidelines/procedures is urgently required. It may also be considered whether the Army; Navy; and Air Force Acts should be appropriately amended to cover such offences.

FDI Policy for Telecommunications

A question was raised in the context of the Hutch/Vodafone acquisition deal, about whether permitting Orascom (which holds shares in the Pakistani telecom incumbent) to continue to hold shares in Hutchison, the majority shareholder in Hutch Essar, will be a security risk.

There is a current foreign direct investment (FDI) proposal from Malaysia Telekom, in which Saudi Telecom holds equity interest, for Aircel, the service provider. It has been clarified that Saudi Telecom will have to obtain permission separately from the government for this deal to be approved in the present shareholding pattern of Malaysia Telekom.

Sub-Orbital Flights: International Civil Aviation and Defence

There is no formal definition of outer space. However, it is accepted that

airspace ends and outer space begins at 100 km or 62 miles above the earth. There is no doubt that sub-orbital flights will be commercialised in the foreseeable future. The commercial use of the “sub-orbit” will have implications for both international civil aviation and national security.

It will be imperative to reconcile the mandate of **Article I** of the **1944 Chicago Convention**²¹ which recognises “that every State has complete and exclusive sovereignty over airspace above its territory”; and the mandate of **Articles I & II** of the **1967 OST** which define outer space as the “province of mankind” which is not subject to national appropriation.

Thus, the pressure to redefine the boundary of airspace/outer space will emerge. It is suggested that the stand to be adopted in this matter should be formulated sooner than later, given its critical implications, even if not immediately articulated in public fora.

Commercial Space Launch Services and National Security

Security concerns in respect of commercial launch services have international and national implications that are difficult to distinguish in separate contexts. Typically, national security concerns cover issues that pertain to (i) export control regime to prevent proliferation of dual use technologies; and (ii) validation, certification and monitoring systems to ensure that non-state parties cannot access launch services or that the country offering launch services does not inadvertently become a victim of the ‘flag of convenience’ syndrome.

Although, such access by non-state parties to Indian launch service facilities may not be foreseeable since an applicant seeking grant of licence to establish a private satellite system²² is required to get a security clearance certificate from

21. Convention on International Civil Aviation. Signed at Chicago, on December 7, 1944. Source: ICAO Doc. 7300/6 (1980).

22. Ministry of Information and Broadcasting www.mib.nic.in.

Define India's security objectives and outline a space strategy together with procedures/law to provide overall direction and objectives.

Ministry of Home Affairs in terms of the guidelines issued by the Ministry of Information and Broadcasting before ISRO actually launches the satellite, such access to launch service facilities offered by other countries cannot be ruled out.

(III) LEVERAGING OUTER SPACE FOR INDIA'S NATIONAL SECURITY

1. Define India's security objectives and outline a space strategy together with procedures/law to provide overall direction and objectives.
2. Clearly draw the line between 'acceptable' uses of space to support national security and 'unacceptable' uses that would cut across India's wider security objectives and policies or jeopardise the peaceful and civilian uses of space on which our quality of life and security now rely.
3. Clarify the nexus between the national defence and security policy which may be oriented towards military as well as civilian purposes and the 'peaceful purposes' mandate for India's space activities.
4. To avoid confusion and duplication, India's competence in security and defence should be openly addressed, clarified and managed, taking into account the dual use character of much of the technology and capabilities.
5. Classification of India's space assets.
6. Proactively protect Indian access to, and assets in, space through both technological and political initiatives, including space situation awareness.
7. Coordinate policies and strategies to enable India to play a more significant and effective role in strengthening the international legal regime and developing rules of the road for space activities and uses.
8. Formulate a policy and strategy to prevent the weaponisation of space.

CONCLUSION

It is clear that national security is symbiotically linked to the rapid changes taking place in the global space industry, bringing new challenges every day. Finally, the development of space security doctrines, embedded in national

security goals, of new space weapons systems; threat of weaponisation of outer space; new arms race; the obscuring boundary between airspace and outer space; incalculable commercial gains from space related activities; shrinking natural resources in outer space; and non-state and hostile entities with resources at their command all demand that the moment is not too early to rework India's national security policy to empower it with an appropriate space policy, together with attendant procedures and legislation within its fold.



PAKISTAN'S NUCLEAR POSTURE: IMPLICATIONS OF INDO-US COOPERATION

PETER R. LAVOY

This paper examines Pakistan's strategy for ensuring the security and survivability of its nuclear deterrent during periods of peace, crisis, and war. Toward this end, five main features of Pakistan's strategic deterrence policy are described in some detail. With an understanding of how Pakistani military planners perceive the basic requirements of their strategic deterrent, the ways in which the rapidly evolving United States-India strategic partnership threatens Pakistan's core defence precepts become apparent. A set of new long-term Pakistani strategic concerns stimulated by the expanding US-India partnership is identified and analysed. The basic point is that projected developments in India's nuclear and conventional military capabilities eventually could threaten the survivability of Pakistan's strategic deterrent, which has always been a major concern for the country's defence planners. The concluding section of the paper examines how the Pakistan government officials might view three emerging strategic threats posed by India and its expanding international partnerships.

FIVE DIMENSIONS OF PAKISTAN'S NUCLEAR DETERRENCE POLICY

Pakistan has relied on nuclear weapons to deter Indian aggression for over two decades, but a thoroughly considered and planned nuclear deterrence strategy took shape only after the country conducted its first nuclear explosive tests in

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May 1998, a development that was prompted suddenly and unexpectedly by India's surprise nuclear test series earlier that month. Before then, nuclear weapons had not been integrated into Pakistani military plans; the armed forces had no nuclear employment doctrine to speak of, and command and control over the nuclear arsenal and delivery systems was only vaguely defined and loosely organised.¹ Even after the 1998 nuclear tests, Pakistani defence planners gradually recognised that premising national security on nuclear weapons required a multitude of new undertakings related to doctrine, command and control, force structure, delivery systems, and the vetting and training of specialised personnel assigned to various strategic force responsibilities.

Pakistan's efforts to establish an effective nuclear force posture, strategic organisation, use doctrine, deterrence strategy, and command and control system were severely complicated, but also ultimately facilitated, by three serious crises that occurred in the past five years: (1) the forced reorientation of Pakistan's foreign and defence policies after the September 11, 2001 terrorist attacks against the United States and the subsequent US-led war on terrorism; (2) the 2001-02 military standoff that nearly produced a major war with India; and (3) the revelations in early 2003 of the A. Q. Khan network's illicit transfers of nuclear weapons technology and materials to Iran, Libya, and North Korea. Because of the sweeping changes Pakistan has made in its nuclear programmes, strategic organisations, and force posture in the wake of these traumatic events, Pakistani security planners now have a much more effective – and “normal” – nuclear deterrence posture. However, the emergence of new political and military challenges arising from the US-India strategic partnership – particularly the US-India initiative for civilian nuclear cooperation and possible defence technology and military equipment transfers – will further test the ability of Pakistan's military leadership to maintain a robust, credible, and secure nuclear deterrent.

Today, Pakistan's strategic deterrence strategy consists of five major elements: (1) an effective conventional fighting force and the demonstrated

1. Zafar Iqbal Cheema, “Pakistan's Nuclear Use Doctrine and Command and Control,” in *Planning the Unthinkable: How New Powers Will Use Nuclear, Biological, and Chemical Weapons* (Ithaca: Cornell University Press, 2000), p.159.

resolve to employ it against a wide range of conventional and sub-conventional threats; (2) a minimum nuclear deterrence doctrine and force posture; (3) an adequate stockpile of nuclear weapons and delivery systems to provide for an assured second strike; (4) a survivable strategic force capable of withstanding sabotage, conventional military attacks, and at least one enemy nuclear strike; and (5) a robust strategic command and control apparatus designed to ensure tight negative use control during peace time and prompt operational readiness (positive control) at times of crisis and war. Each of these features is described below.

Conventional-Military Components of Deterrence

Pakistan's nuclear weapons are considered to be absolutely essential to deter India from undertaking a wide range of coercive political-military behaviour that could undermine Pakistan's territorial integrity and political sovereignty. However, it is important to recognise that Pakistani defence planners still consider their conventional armed forces to be the first line of defence against an Indian conventional military attack and the backbone of the country's overall deterrence posture. It could be said that 95 per cent of Pakistan's strategic deterrent relies on a robust conventional military capability and deliberate and repeated demonstrations of the Pakistan leadership's readiness to employ it decisively if attacked, or even seriously threatened with a military attack.

Pakistan's military conduct during the 2001-02 crisis with India revealed this orientation. When India mobilised its armed forces for attack shortly after the December 13, 2001 terrorist strike against the Indian Parliament, Pakistan responded by immediately putting its own armed forces on a war-footing. Pakistani military

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leaders were very satisfied that their ground forces were able to reach their designated strike positions more quickly than their opposite numbers, thus, eliminating the element of surprise and nullifying any advantage that India might have by striking across the border first. It is widely speculated that Indian Prime Minister Atal Bihari Vajpayee decided against a military attack when his troops had moved into their strike positions by the middle of January because Pakistani troop deployments indicated that Islamabad was well prepared to counter-strike at locations of its choosing, thus, eliminating any advantage India would have gained by attacking first. As President Pervez Musharraf wrote in his memoir, "We went through a period of extreme tension throughout 2002, when Indian troops amassed on our borders during a hair-trigger, eyeball-to-eyeball confrontation. We responded by moving all our forces forward. The standoff lasted ten months. Then the Indians blinked and quite ignominiously agreed to a mutual withdrawal of forces."²

A similar experience in coercive diplomacy occurred a few months later, when Indian and Pakistani troops were still fully deployed along the international border and the Kashmir Line of Control. When the Pakistani leadership received tactical intelligence that India once again was preparing to attack in early June 2002, the

By demonstrating its readiness to use conventional military force in response to any Indian provocation, Pakistan hoped then, and still hopes today, to compensate for its disadvantage relative to India.

Pakistani military command's response was to instruct its soldiers to counter-attack immediately after the first Indian violation of the international border. Not only that, but following the traditional approach of Pakistani deterrence strategy, orders were given for at least one additional counter-attack to take place in reaction to the Indian strike.³ By demonstrating its readiness to use conventional military force in response to any Indian provocation, Pakistan hoped then, and still hopes today, to compensate for its disadvantage

2. Pervez Musharraf, *In the Line of Fire* (New York: Free Press, 2006), p. 301.

3. Personal conversations with senior Pakistani military officers.

relative to India in conventional troop numbers and equipment quality with greater resolve and the willingness to run greater military risks.⁴

If an Indo-Pakistani military crisis were to deepen, the weight of deterrence would shift more to nuclear weapons. Pakistan's nuclear posture, which during peace-time is recessed and structured mainly for secrecy and safety, would reflect a much greater emphasis on usability and operational readiness. Of course, this is what senior Pakistani defence planners have referred to when they express concern

about the degradation of Pakistan's conventional military capability lowering the threshold for nuclear weapons use: the shorter the period of time that Pakistan's conventional military (notably the Pakistan Army and Air Force) could hold out in a war, the quicker the National Command Authority (NCA) would be to order the deployment – and possibly the employment – of nuclear weapons.

A key point that emerges from this understanding of the close connection of conventional military force and nuclear force in Pakistan's deterrence strategy is the realisation that escalation dominance at all rungs of the military ladder – from low-intensity conflict to conventional war and all the way to nuclear war – is deemed absolutely essential for the weaker power to survive. Pakistani defence planners firmly believe that if they allow India to seize the advantage at any level of violence – from sub-conventional through conventional to nuclear warfare – then India is sure to exploit it, and all will be lost.

Minimum Nuclear Deterrence Doctrine

Pakistan has not formally declared a nuclear employment doctrine. But this does not mean there is no doctrine. On the contrary, Pakistan has operational plans and requirements for nuclear use integrated within its military war-fighting plans. In

4. This is an intuitive element of Pakistan's strategic culture, but it conforms to the findings of much theoretical research by Thomas Schelling and other scholars on the nature of strategic interaction between nuclear-armed powers during military crises.

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Pakistani officials plan to be the first to use nuclear weapons as a last resort to prevent the loss of Pakistan's territory, or the military defeat of the Pakistani armed forces.

contrast to India, which has stated the basic parameters of its nuclear use doctrine but remains quiet about its strategic command and control structure, Pakistan has disclosed the basic features of its nuclear command and control organisation,⁵ but no official has discussed how the government plans to employ its nuclear weapons. In fact, Lt. Gen. Khalid Kidwai, director of Pakistan's Strategic Plans Division (SPD) – the military organisation

created in 1999 to oversee the development, custody, and employment of nuclear weapons – affirmed to a pair of Italian physicists in 2002 that Pakistan would not make its nuclear doctrine public, as India did in August 1999.⁶

The primary purpose of Pakistan's nuclear arsenal, which Pakistani officials have openly stated, is to deter an Indian conventional military attack. As noted above, Pakistan prioritises conventional military readiness for deterrence and war-fighting. If this fails, Pakistani officials plan to be the first to use nuclear weapons as a last resort to prevent the loss of Pakistan's territory, or the military defeat of the Pakistani armed forces. In the most authoritative statement on the subject, Pakistani Foreign Minister Abdul Sattar indicated in June 2001 that the government had adopted "minimum credible deterrence as the guide to [its] nuclear programme."⁷

Planning for how and under what circumstances Pakistan's nuclear weapons would be employed has been only broadly outlined over the years. As early as December 1974, Prime Minister Zulfikar Ali Bhutto declared for the first time the basic principle of Pakistan's nuclear weapons use policy. He stated: "Ultimately,

5. See "National Command Authority Established," Associated Press of Pakistan, February 3, 2000, available at <http://www.fas.org/news/pakistan/2000/000203-pak-app1.htm>.

6. See Paolo Cotta-Ramusino and Maurizio Martellini, "Nuclear Safety, Nuclear Stability and Nuclear Strategy in Pakistan," *Concise Report of a Visit by Landau Network - Centro Volta*, January 21, 2002, <http://lxmi.mi.infn.it/~landnet>. Kidwai reiterated this point in a October 27, 2007 address to the Centre for Contemporary Conflict at the Naval Postgraduate School in Monterey, California. For a summary of the talk, see <http://www.ccc.nps.navy.mil/news/kidwaiNov06.asp>.

7. Pakistani Foreign Minister Abdul Sattar, keynote address at Carnegie International Non-proliferation Conference, June 18, 2001, <http://www.ceip.org/files/projects/npp/resources/Conference%202001/sattar.htm>.

if our backs are to the wall and we have absolutely no option, in that event, this decision about going nuclear will have to be taken.”⁸

Three decades later, at the peak of the 2002 crisis, when Indian and Pakistani forces were deployed against each other in a military standoff unprecedented in duration and intensity, President Pervez Musharraf repeated Bhutto’s policy formulation. Musharraf stated in an interview published in April 2002 in the German magazine, *Der Spiegel*: “Nuclear weapons are the last resort. I am optimistic and confident that we can defend ourselves with conventional means, even though the Indians are buying up the most modern weapons in a megalomaniac frenzy.” Nuclear weapons could be used, Musharraf said. “If Pakistan is threatened with extinction, then the pressure of our countrymen would be so big that this option, too, would have to be considered.” In a crisis, he said, nuclear weapons also have to be part of the calculation.⁹

In a rare departure from established procedure, Lt. Gen. Khalid Kidwai selectively removed some of the traditional ambiguity over the circumstances in which Pakistani defence planners have thought about the employment of nuclear weapons. As the military crisis deepened with India in January 2002, Kidwai told a pair of Italian physicists that Pakistani nuclear weapons would be used only “if the very existence of Pakistan as a state is at stake.” Kidwai elaborated: “Nuclear weapons are aimed solely at India. In case that deterrence fails, they will be used if: “(a) India attacks Pakistan and conquers a large part of its territory (space threshold); “(b) India destroys a large part either of its land or air forces (military threshold); “(c) India proceeds to the economic strangling of Pakistan (economic strangling); “(d) India pushes Pakistan into political destabilisation or creates large-scale internal subversion in Pakistan (domestic destabilisation).”¹⁰

8. Reported in *The Pakistan Times*, December 27, 1974.

9. Roger Boyes, “Musharraf Warns India He May Use Nuclear Weapons,” *Times Online*, April 8, 2002, available at <http://www.nci.org/02/04f/08-06.htm>.

10. Pakistani military officials subsequently informed the authors of the Landau report that Gen. Kidwai’s remarks on what would trigger a Pakistani nuclear reaction were “purely academic.” The officials stated: “These are matters which as elsewhere, are primarily the responsibility of the political leadership of the day. . . . The elaborate command and control mechanisms introduced with the establishment of the National Command Authority which is chaired by the Head of State and assisted by political and civilian leaders . . . ensure the highest level of responsibility and due deliberation on all matters of strategic importance.” See Cotta-Ramusino and Martellini, n.6.

The last two elements of the four nuclear use triggers are fuzzy and should not be considered in isolation. They are offshoots or preludes to a conventional war that India might undertake. In this respect, “economic strangulation” chiefly implies an Indian naval blockade or possibly also the placement of Indian dams on rivers flowing from Kashmir that could be used either to dry up or flood Pakistan’s Punjab plains, depending on how India’s military operations were to unfold. Similarly, “ethnic conflict” is a red line peculiar to South Asia. In Pakistan, this is seen as a threat to national survival, reminiscent of India’s assistance to the Mukti Bahini guerrillas that led to the breakdown of Pakistan’s control over East Pakistan in 1971 and subsequently resulted in the creation of Bangladesh. Pakistani apprehension over Indian-abetted ethnic conflict also derives from memories of Indian machinations in Pakistan’s Sindh province in the 1980s, which were believed to have been conducted as a *quid pro quo* for Pakistan’s alleged support to the Sikh insurgency in Indian Punjab. This concern is exacerbated today by Pakistani allegations of Indian complicity (via Afghanistan) in the ongoing ethnic crises in the two states of Pakistan that border Afghanistan: Baluchistan and the Northwest Frontier Province. Pakistan is unlikely to bring nuclear weapons directly into play in such a scenario (though a naval blockade is an act of war), as they could not play any credible role in resolving the crisis. But any conventional force posturing in conjunction with this will certainly up the ante.

Pakistan's official position is that the main function of its nuclear arsenal is to prevent India from destroying or otherwise overwhelming the country. However, **By not specifying the precise Indian actions that would trigger Pakistan’s use of nuclear weapons, Pakistani defence planners hope to create uncertainty in the minds of Indian policy-makers.** the precise Indian actions that are interpreted as posing an existential threat have not been articulated. Kidwai’s four existential threats for possible use are credible, but also vague. The statement was almost certainly intended to be imprecise so as to enhance Pakistani deterrence. If Pakistan were more explicit about nuclear red lines, this might enable India to adjust the scope of its strategic plans and military operations accordingly. By not specifying the precise Indian

actions that would trigger Pakistan's use of nuclear weapons, Pakistani defence planners hope to create uncertainty in the minds of Indian policy-makers as to how far they can press Pakistan on the battlefield

The second objective of Pakistan's nuclear weapons policy is to deter an overwhelming Indian conventional military attack against Pakistan's armed forces. Islamabad considers that India's advantages in geography and nearly all categories of conventional military capability make nuclear force indispensable for Pakistan's defence. Pakistani military officials believe that clearly communicated resolve to use nuclear weapons and a robust conventional military posture are the key requirements for effective deterrence. In their view, one would not work without the other. According to this logic, if India attacks, Pakistan would counter-attack with conventional forces; each side would inflict significant damage on the other; and India would be forced to refrain from escalating the conflict out of a fear of Pakistan's nuclear response.

The conviction that nuclear force is required to augment Pakistan's conventional military deterrence of a possible Indian conventional attack is reinforced by the common perception among Pakistani elites that Pakistan successfully deterred attacks by India on at least six occasions – during the military crises of 1984-85, 1986-87, 1990, 1998, 1999, and 2001-02.¹¹ This interpretation gained even more credibility in light of President Musharraf's December 2002 statement that war with India was averted because of his repeated warnings that if Indian forces crossed the border, Pakistan would not restrict its response to conventional warfare.¹² Despite the fact that war was only narrowly averted in 2002, Pakistani military planners now appear to have even greater confidence in their ability to manage the risks of strategic deterrence.

The Pakistan government's approach to employing nuclear weapons, thus,

11. Agha Shahi, Zulfiqar Ali Khan and Abdul Sattar, "Securing Nuclear Peace," *The News International*, October 5, 1999; "Are Pakistani Nukes More Effective Than Indian?" *Daily Times* (Lahore), http://www.dailytimes.com.pk/default.asp?page=story_13-12-2002_pg1_11.

12. Musharraf did not specify the nuclear threat in his speech to an army corps reunion in Karachi, but he did state that he was prepared to act decisively at the height of 2002 crisis: "In my meetings with various world leaders, I conveyed my personal message to Indian Prime Minister Vajpayee that the moment Indian forces cross the Line of Control and the international border, then they should not expect a conventional war from Pakistan. I believe my message was effectively conveyed to Mr. Vajpayee." "India Was Warned of Unconventional War," *The News International*, December 31, 2002, available at http://www.nti.org/d_newswire/issues/2002/12/30/5s.html.

Pakistani civilian and military policy-makers recognise that their government and perhaps even their country is not likely to survive a nuclear exchange with India.

rests on a calculation of its vulnerability to India's conventional and nuclear forces, and even to India's possible use of non-military instruments to threaten Pakistan's territorial integrity, political stability, and economic viability (as per Kidwai's reference to economic strangling and domestic destabilisation). Armed with few viable defence options apart from its expanding nuclear arsenal, and ever concerned about

such wide-ranging threats, Pakistan is likely to continue to embrace a flexible and non-specified doctrine for using nuclear weapons.

If at all possible, Pakistan does not intend to fight India with nuclear weapons. Pakistani civilian and military policy-makers recognise that their government and perhaps even their country is not likely to survive a nuclear exchange with India. But operational military plans must include all contingencies. Pakistan's targeting policy probably includes a mix of counter-value and counter-force targets. At present, Pakistan has nuclear-capable F-16 and Mirage 5 aircraft, which have limited range and penetration capability. Pakistani ballistic missiles, both liquid and solid fuel, can reach key strategic points in India. Cruise missiles also have been tested and gradually will be integrated into operational plans. Pakistan's strategic development strategy includes continuous research experiments and flight-tests to improve the accuracy and penetrability of existing nuclear delivery systems. Pakistan's nuclear use doctrine probably calls for holding multiple Indian industrial centres, military-industrial complexes, defence facilities, and military bases and formations at risk. Should India push Pakistan to the brink – whether by attacking, occupying, destroying, or strangling – Pakistan's National Command Authority could very well decide to use nuclear weapons.

Nuclear Weapons Stockpile and Delivery Systems

Pakistan's nuclear force requirement is a tightly held national secret. Islamabad's stated goal is to maintain a credible minimum deterrent, defined primarily around

Pakistan’s assessment of India’s nuclear force’s inventory, penetrability and targeting requirements, and unspecified future adversaries and contingencies. In addition, Pakistani decision-making for its strategic force structure is based on the requirements of survivability, which include a sufficiently large weapons stockpile to ensure dispersal to multiple launch sites and a second-strike capability. A key strategic consideration, thus, is the maintenance of “sufficient” fissile stock material as well as the creation and operation of fissile material production facilities with adequate capacity to meet both short-term and long-term requirements.

According to public estimates of Pakistan’s fissile material stockpile at the end of 2006, Islamabad had probably amassed between 30 and 85 kg of weapon-grade plutonium from its Khushab research reactor and between 1,300 and 1,700 kg of weapon-grade highly enriched uranium (HEU) from the Kahuta gas centrifuge facility. The Khushab reactor probably can produce between 10 and 15 kg of plutonium per year. Kahuta may be able to produce 100 kg of HEU each year. Assuming that Pakistani scientists require 5 to 7 kg of plutonium to make one warhead, and 20 to 25 kg of HEU to produce a bomb, then Pakistan would have accumulated enough fissile material to be able to manufacture between 70 and 115 nuclear weapons by the end of 2006.¹³ A medium estimate based on these figures would mean that Pakistan could have an arsenal of about 90 weapons, as indicated in Table 1.

Table 1: Pakistani Fissile Material and Nuclear Weapons			
Pakistani Fissile Material & Nuclear Weapons (end of 2006)			
	Low	Medium	High
Weapon-Grade Plutonium (kg)	30	55	85
Weapon-Grade Uranium (kg)	1,300	1,500	1,700
Weapon Capability	70	90	115

13. Institute for Science and International Security, “Global Stocks of Nuclear Explosive Materials,” July 12, 2005, revised September 7, 2005, http://www.isis-online.org/global_stocks/end2003/tableofcontents.html. A separate study by a team of Indian and Pakistani analysts puts Pakistan’s plutonium inventory slightly higher (90 kg) and its HEU holding slightly lower (1,300 kg). Zia Mian, A. H. Nayyar, R. Rajaraman, and M. V. Ramana, “Fissile Materials in South Asia: The Implications of the US-India Nuclear Deal,” International Panel on Fissile Materials Research Report No. 1 (September 2006), p. 3, http://www.fissilematerials.org/ipfm/site_down/ipfmresearchreport01.pdf.

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In Pakistan's normal peace-time force posture, nuclear weapons are believed not to be deployed. That is, they are not mated with their delivery systems. Nuclear warheads and missile delivery systems probably are stored in secure locations that are separate from one another – but not too far apart. Delivery aircraft, of course, are located at one or more of the country's ten major air bases or ten forward operating air bases. In the past five years, Pakistan has started to set up strategic forces in all three Services, two of which (land and air), are presently functional.

Pakistan relies on a combination of aircraft and ballistic missiles for nuclear delivery missions. Two aircraft in its inventory, the US-supplied F-16 Fighting Falcon multi-role fighter and the French Mirage 5PA are particularly well suited to this role. At present, Pakistan has about 50 Mirage 5s and 35 1980s-vintage F-16s, although at the end of 2006, the United States agreed to provide mid-life upgrades for Pakistan's existing F-16s and to transfer another 18 models to the Pakistan Air Force.¹⁴

With non-proliferation sanctions severely curtailing Pakistan's ability to modernise its air force during the 1990s, Islamabad went on a major campaign to procure technology and parts for a variety of ballistic missiles for nuclear delivery roles. Today, Pakistan possesses a missile force comprising road and rail mobile solid-fuel missiles (Abdali, Ghaznavi, Shaheen 1 and 2), as its mainstay, and the less accurate liquid-fuel missiles (Ghauri 1 and 2) for long-range strikes against deep population centres in India. Pakistan is also working on a ground-launched cruise missile (GLCM), called the Babur, which was tested first in August 2005 and again in March 2006. Table 2 lists the main air and missile delivery systems in Pakistan's inventory.

Survivable Strategic Force

Since the advent of Pakistan's nuclear programme, Pakistani officials have

14. John Grevatt, "USAF Awards Lockheed Martin Pakistan's F-16 Upgrade," *Jane's Defence Industry*, January 1, 2007.

Table 2: Pakistani Nuclear Delivery Systems¹⁵

Aircraft / Missile	Range	Source	Status
F-16 A/B	925 km	United States	35 planes in inventory
Mirage 5 PA	1,300 km	France	50 planes in inventory
Hatf 1	80-100 km	Indigenous	In service since mid-1990s
Hatf 2 (Abdali)	180 km	Indigenous/ China	Tested in May 2002, in service
Hatf 3 (Ghaznavi)	300 km	Indigenous/ China	M-11, tested May 2002, in service
Hatf 4 (Shaheen 1)	600-800 km	Indigenous / China	First tested October 2002, in service
Hatf 5 (Ghauri 1)	1,300-1,500 km	Indigenous/ DPRK	No Dong, tested May 2002, in service
Hatf 5 (Ghauri 2)	2,000 km	Indigenous/ DPRK	No Dong, tested April 2002, in development
Hatf 6 (Shaheen 2)	2,000-2,500 km	Indigenous/ China	First tested March 2004, in development
Hatf 7 (Babur)	500 km GLCM	Indigenous/ China?	First tested August 2005, in development

worried about preventive strikes against their nuclear production facilities and later against their concealed weapons arsenal. Concerns about the survivability of the nuclear programme arose in the mid and late 1970s, when (following India's first nuclear explosive test in May 1974) the US government aggressively blocked Pakistan's attempt to acquire nuclear technology from Europe. Pakistanis believed that Washington established the Nuclear Suppliers Group

15. Information contained in the table is from various sources, including "Pakistan: Air Force," *Jane's World Air Forces*, November 28, 2006, and "Pakistan: Armed Forces," *Jane's Sentinel Security Assessment: South Asia*, November 22, 2006, both subscription websites.

(NSG) primarily to prevent them from going nuclear; meanwhile, India's nuclear status was accepted after the minor opprobrium it received following its surprise nuclear detonation. Even today, Pakistanis cite as evidence of international discrimination against their nuclear effort the visit to Islamabad by US Secretary of State Henry Kissinger in August 1976 to pressure President Zulfikar Ali Bhutto to abandon the nuclear bomb development programme, which was then at a very early stage. Kissinger offered 110 A-7 attack aircraft as compensation to reverse Pakistan's nuclear ambitions. Although Kissinger evidently did not issue a direct threat, to this date, the Pakistani narrative consistently has maintained that Bhutto was threatened with severe consequences if he did not change the country's nuclear policy.¹⁶

Three years later, after US President Jimmy Carter levied nuclear non-proliferation sanctions against Islamabad, Pakistani officials feared that the United States might conduct sabotage or air strikes against Pakistan's uranium enrichment plant at Kahuta. In response, Pakistan tightened perimeter security and air defences around the sensitive fissile material production facility. These fears were rekindled after Israel's successful attacks on Iraq's Osirak nuclear reactor in June 1981. Reportedly, in the same month, the Indian Air Force established contingency plans for attacking Kahuta, which the Indian government consistently has denied.¹⁷

Alarm bells sounded once again in the mid-1980s over the prospect of Indian air attacks against Kahuta. Islamabad's threat perceptions escalated in the summer of 1984 when the Indian Army mounted military operations inside the sacred Golden Temple in Amritsar to suppress the Sikh crisis in Indian Punjab and also occupied the contested Siachen Glacier in the same month. A few years later, during the 1986-87 Brasstacks military crisis, Pakistani fears of a preventive strike against Kahuta triggered even more serious concerns. By then, sufficient evidence had convinced the Pakistan leadership that Indian Army Chief Gen. Sundarji was planning a preventive war against Pakistan in the shadow of military exercises along the border with the ultimate objectives of neutralising

16. Dennis Kux, *United States and Pakistan, 1947-2000: Disenchanted Allies* (Washington, D.C.: Woodrow Wilson Center, 2001), p.222.

17. Milton R. Benjamin, "India Said to Eye Raid on Pakistan's A-Plants," *The Washington Post*, December 20, 1982.

Pakistan's alleged support for the Sikh separatist movement and dismantling Pakistan's nuclear weapons programme.¹⁸ This crisis, which led to the partial mobilisation of troops on both sides of the border, finally subsided after President Zia ul-Haq met with Prime Minister Rajiv Gandhi at a cricket match in Jaipur, India.

During the Kashmir uprising in the early 1990s, Pakistani policy-makers once again became concerned about the security of their nuclear facilities, this time suspecting a joint Israeli-Indian preventive military attack. On this occasion, the Pakistani leadership of President Ghulam Ishaq Khan, Prime Minister Benazir Bhutto, and Army Chief Gen. Aslam Beg decided to convey a clear threat to India that Pakistan would attack India's key nuclear facilities outside of Bombay (the Bhabha Atomic Research Centre and the Tarapur power reactors) if Kahuta were struck. Soon thereafter, the military crisis ended, although the violence in Kashmir persisted for well over a decade. Partly as a consequence of Pakistan's nuclear policy reorientation during the 1990 crisis, the US government invoked non-proliferation sanctions under the Pressler Amendment, which terminated all arms transfers and nearly all economic assistance to Pakistan throughout the decade of the 1990s.

Immediately after India conducted its surprise nuclear tests on May 11 and 13, 1998, Pakistani policy-makers became concerned about the possibility of an Indian or joint Indian-Israeli attack on Pakistan's nuclear production and storage facilities and its test site in Baluchistan. This threat perception was stimulated on a general level by the aggressive rhetoric of the new ruling party in India, the Bharatiya Janata Party (BJP), and more specifically by

18. Proliferation analyst George Perkovich has written that consideration of an attack on Pakistani nuclear facilities went all the way up to the most senior Indian policy-makers in January 1987: "[Prime Minister] Rajiv [Gandhi] now considered the possibility that Pakistan might initiate war with India. In a meeting with a handful of senior bureaucrats and General Sundarji, he contemplated beating Pakistan to the draw by launching a preemptive attack on the Army Reserve South. This also would have included automatically an attack on Pakistan's nuclear facilities to remove the potential for a Pakistani nuclear riposte to India's attack. Relevant government agencies were not asked to contribute analysis or views to the discussion. Sundarji argued that India's cities could be protected from a Pakistani counterattack (perhaps a nuclear one), but, upon being probed, could not say how. One important advisor from the Ministry of Defense argued eloquently that 'India and Pakistan have already fought their last war, and there is too much to lose in contemplating another one.' This view ultimately prevailed." George Perkovich, *India's Nuclear Bomb: The Impact on Global Proliferation* (Berkeley: University of California Press, 1999), p.280. See also Scott D. Sagan and Kenneth N. Waltz, *The Spread of Nuclear Weapons: A Debate Renewed* (New York: W.W. Norton, 2003), pp.92-95.

Pakistani intelligence reports of at least one Israeli aircraft that was observed operating on Indian territory during the period when Pakistan was preparing for its own nuclear test series.

According to Pakistani defence analyst, Hasan-Askari Rizvi, "Two intelligence reports appeared that caused much panic among Pakistan's policy-makers. First, intelligence service and army authorities reported the sighting of an unidentified F-16 aircraft in Pakistan's airspace on May 27 (it should be noted here that India does not have F-16 aircraft; Pakistani military authorities were suggesting the presence of an Israeli aircraft in the area). The country's Ghauri missiles were deployed that same day. The second report came shortly after midnight of May 27-28. The Pakistani military was put on maximum alert when the country's intelligence agencies reported unusual movement of aircraft in India just across the border, hinting at a possible preventive air strike against nuclear installations. The Pakistani Press began to talk about the possibility of an Indian air strike on Pakistan's nuclear installations a couple of days before the security alert."¹⁹ Ultimately, nothing came of these reports – except for the Pakistan government's rush to demonstrate its nuclear weapons capability before something came up to prevent it from doing so.

A few years later, in the immediate aftermath of the September 11, 2001, terrorist attacks against the United States, Washington's urgent response to take down Al Qaeda and the Taliban regime in Afghanistan created new worries in Islamabad about preventive strikes against Pakistan's nuclear arsenal. In a statement to the nation announcing Pakistan's full cooperation with the US war on terrorism and its sudden withdrawal of support for the Taliban, President Musharraf cited the protection of the country's strategic assets as one of the main reasons for this policy reversal. As Musharraf has written in his memoir, "The security of our strategic assets would be jeopardised. We did not want to lose or damage the military parity that we had achieved with India by becoming a nuclear weapons state. It is no secret that the United States has never been comfortable with a Muslim country acquiring nuclear weapons, and the Americans undoubtedly would have taken the opportunity of an invasion to destroy such weapons. And

19. Hasan-Askari Rizvi, "Pakistan's Nuclear Testing," *Asian Survey*, 41, no. 6, November-December pp. 2001, 943-955.

India, needless to say, would have loved to assist the United States to the hilt."²⁰ US and Indian reactions to the events of 9/11 put Pakistan in a very precarious position in which its strategic assets and undoubtedly its overall sovereign integrity would have been threatened if it did not immediately and completely reverse its position toward the Taliban – even though sacrificing the Taliban out of geo-political exigencies created enormous domestic problems for the Musharraf government, and still complicates its ability to rule in the northwestern part of the country.²¹

Fears of an Indian attack against Pakistan's nuclear assets resurfaced once again during the military standoff with India following the December 13, 2001, terrorist attack against the Indian Parliament building. This time, however, Pakistan mobilised its conventional forces and went into full operational alert. Nuclear weapons reportedly already had been dispersed after the post-September 11 crisis; but although the entire national security apparatus was placed on high alert, there were no reports of Pakistan mating nuclear weapons to delivery systems during this 2001-02 military standoff.

Since the 1998 tests, various pronouncements, publications in the Western Press, and events in the region have eroded the credibility of Pakistan's nuclear command and control, overshadowing the efforts that have been made since 1999 to harness a coherent command system to ensure management of its nuclear capabilities. The revelation of A. Q. Khan's reckless secondary proliferation activities and information that two Pakistani atomic scientists met members of Al Qaeda in Afghanistan created further concerns over Pakistan's nuclear security. Also, US intelligence reportedly believed that Pakistan had readied its nuclear arsenal, to threaten India during the Kargil conflict, creating an overall impression of an irresponsible nuclear power.²²

Pakistani officials admit that many mistakes had been made, which allowed the A. Q. Khan saga to take place. But continuing criticism of its nuclear

20. Musharraf, n2.

21. For background, see Khawar Hussain, *Pakistan's Afghanistan Policy*, Master's thesis, Naval Postgraduate School, June 2005, <http://www.ccc.nps.navy.mil/research/theses/Hussain05.pdf>.

22. See Scott D. Sagan, "Keeping the Bomb Away from Tehran," *Foreign Affairs* 85, no 5, September-October 2006, pp. 51-54; Strobe Talbott, *Engaging India: Diplomacy Democracy and the Bomb* (Washington D.C.: The Brookings Institution Press, 2004), pp. 166-167; and Bruce Riedel, "American Diplomacy and the 1999 Kargil Summit at Blair House," Centre for the Advanced Study of India, University of Pennsylvania, *Policy Paper Series*, 2002.

One effect of Pakistan's decades-old fears of preventive strikes against its nuclear complex has been a very high priority placed on the survivability of all nuclear production facilities, weapons and missile storage complexes, and potential launch facilities.

custodianship within Western government and think-tank circles feeds Pakistani fears of being targeted and labelled as an irresponsible state, not primarily due to its nuclear policy and custody shortcomings, which it believes it has corrected, but more as a conspiracy to keep the Pakistani nuclear programme on the defensive. This "conspiracy" is viewed in Islamabad as an attempt to establish the grounds for rollback of its nuclear weapons programme, harkening back to the US position from the 1970s through the mid-1990s. These fears are further reinforced with Washington's renewed global partnership with India, making Pakistan's nuclear weapons arsenal an exceptionally – perhaps even uniquely- "illegitimate" capability.

Today, the expanding US-India strategic partnership, which goes well beyond the civilian nuclear cooperation deal, has rekindled concerns about a possible Indian preventive military attack, this time perhaps in collaboration with the United States. In response to the US-India announcement of civilian nuclear cooperation during President George Bush's visit to India in March 2006, Pakistan's National Command Authority publicly resolved that any deal that would shift the nuclear balance in South Asia would force Pakistan to reevaluate its minimum nuclear deterrence requirements. One effect of Pakistan's decades-old fears of preventive strikes against its nuclear complex has been a very high priority placed on the survivability of all nuclear production facilities, weapons and missile storage complexes, and potential launch facilities. Because of operational security concerns, no details have been revealed about the measures taken to ensure survivability, but presumably they involve an emphasis on mobile systems, camouflage, hardened and deeply buried facilities, and strict compartmentalisation of information about the plans, locations, and standard operating procedures governing the movement, deployment, and possible employment of strategic forces.

Responsive Strategic Command and Control System

President Pervez Musharraf announced the formal creation of Pakistan's National Command Authority on February 2, 2000. Prior to this announcement, a *de facto* nuclear command and control arrangement existed as part of the national military command structure, which had provided – and continues to provide – guidance over conventional military operations. The new NCA operates much like the structure that preceded it, although its membership is more formally (and publicly) articulated, and at least one dedicated communications system reportedly has been created to enable the NCA to issue guidance to operational strategic forces during serious military crises and war.

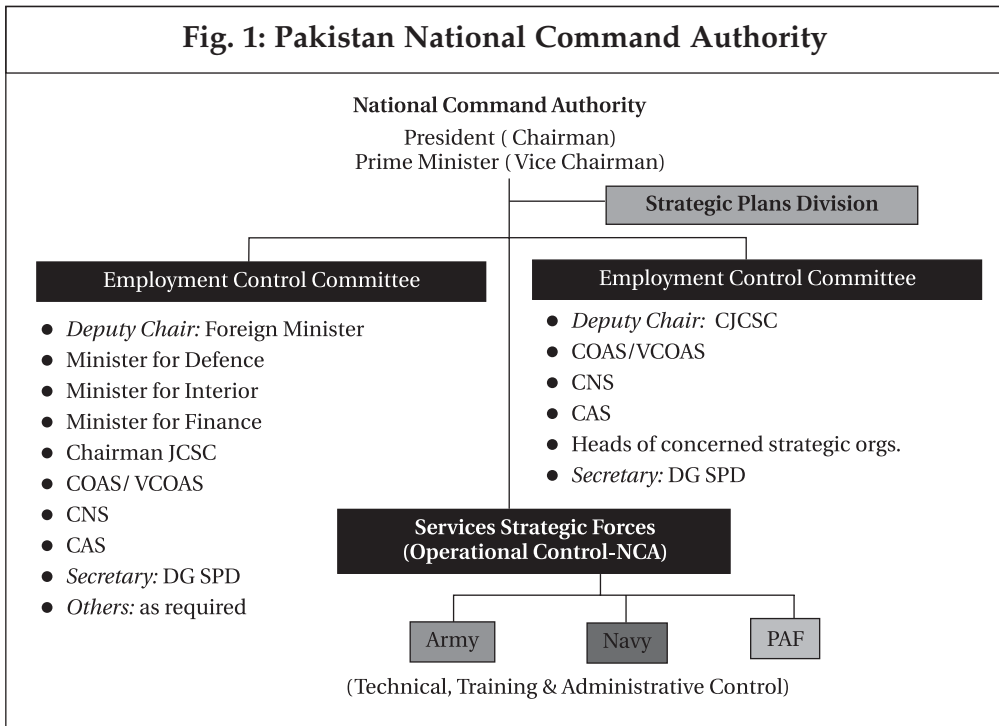
The secretariat of the NCA is the Strategic Plans Division (SPD), located at the Joint Services Headquarters. SPD supports each of the two main elements of the NCA. The apex body is the Employment Control Committee (ECC), a senior leadership group comprising both military and civilian policy-makers. This decision-making group provides policy direction and is the authority over strategic forces. This body is chaired by the president and also includes the prime minister (who is the vice chairman), foreign minister (deputy chair), ministers for defence, interior, and finance, the three Service chiefs, the chairman of the Joint Chiefs of Staff Committee (JCSC), and, of course, the director general of, SPD (who serves as the organisation's secretary). The finance minister was not on the original ECC approved by Prime Minister Nawaz Sharif. He was added shortly after Musharraf assumed control of the government in October 1999.

The membership of the ECC has undergone some change even after the Pakistan government announced it publicly in February 2000. When Musharraf first talked openly about the NCA, he was then chief executive of the country, and he indicated that the chair of the NCA would be the head of the government. Then, after the October 2002 elections, when Zafarullah Khan Jamali became prime minister, Musharraf announced that the chair of the NCA would become the president, a post he then occupied, and that the vice-chair would be the prime minister.

The subordinate body of the NCA is the Developmental Control Committee (DCC), which comprises military and scientific elements and is tasked to optimise the technical and financial efficiency of the entire programme to

implement the strategic force goals set by the Employment Control Committee. This group is also chaired by the president and includes the prime minister (vice chairman), the chairman of the Joint Chiefs of Staff Committee (deputy chair), the three Service chiefs, the heads of the concerned strategic-scientific organisations, and the director general of SPD (secretary). In practice, the DCC is chaired by the DG-SPD, and the operational directors of each of the military services attend in place of the Service chiefs.

The organisational diagram of the NCA is shown in Fig.1.



The A.Q. Khan crisis has galvanised the Pakistani command and control system in ways Pakistani policy-makers could not have predicted. In this instance, it was indeed true that the crisis contained both grave danger and tremendous opportunity. Out of a strange combination of necessity and desire, the military moved very quickly to tighten its grip on all of the

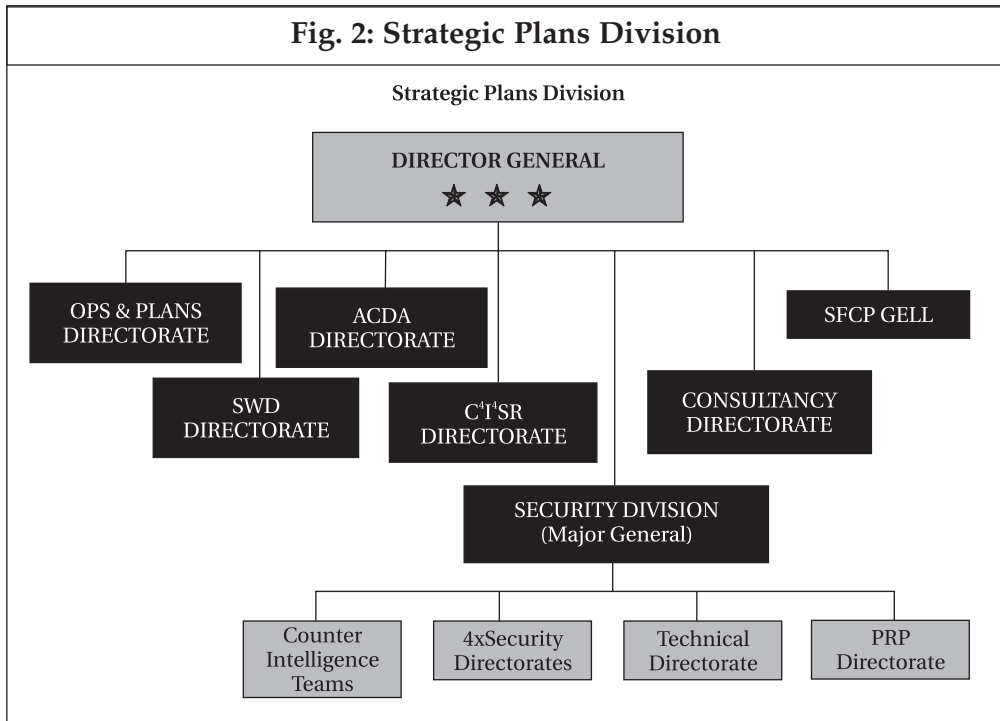
country's strategic and scientific organisations in a professional manner—bringing about more coherence among the military planners, operators, and scientific bodies. Meanwhile, the three armed Services continue to build and train strategic forces with a great deal of secrecy and compartmentalisation. However, Pakistan has continued with the same personnel under the leadership of SPD Director General Lt. Gen. Khalid Kidwai, who remains the focal point of all nuclear matters in Pakistan.

Since the A.Q. Khan affair, the Strategic Plans Division has gone to great lengths to improve the country's command and control infrastructure. One of the greatest flaws in the system was the lack of formal oversight over the strategic scientific organisations. The security set-up arranged since the beginning of the programme was designed to protect it from outside interference, spying, and physical threats (including sabotage). There was no formal reporting channel of the security apparatus that could have the ability to account for shipments (in and out), personal travels, etc. Also, there was no formalised procedure of nuclear material protection, control, and accounting (MPC&A).²³ The nuclear security and safety aspect was always believed to be a highly classified national secret because it revealed the capacity and capability of the country. This was a fatal flaw in the system, which the SPD had grappled with since its formation.²⁴

The SPD placed particular emphasis on enhancement of its security division. Lt. Gen. Kidwai appointed a dedicated two-star general to head this vital part of the organisation and expanded it to include approximately 8,000 military personnel. A separate security directorate for counter-intelligence was formulated, headed by a one-star brigadier general. This organisation essentially coordinates with all intelligence agencies about any external threats. The Inter-Services Intelligence Directorate (ISID) forms the outermost ring of security and works closely with the security division. Prior to this, there was no formal role for the ISID in nuclear matters. Even now, the ISID director general is not a formal member of the National

23. For background, see Nathan E. Busch, *No End in Sight: The Continuing Menace of Nuclear Proliferation* (Lexington: University of Kentucky Press, 2004).

24. For background, see Peter R. Lavoy and Feroz Hassan Khan, "Rogue or Responsible Nuclear Power? Making Sense of Pakistan's Nuclear Practices," *Strategic Insights*, vol. 3, no. 2 February 2004, <http://www.ccc.nps.navy.mil/si/2004/feb/lavoyFeb04.asp>.



Command Authority. (Reportedly, he is a regularly invited member.) Since the whole SPD organisation falls under the Joint Services Headquarters, the overall responsibility of nuclear safety and security rests with the chairman of the Joint Chief of Staff Committee. The chairman represents the highest level of joint military integration for national security intelligence and articulation of the nuclear command authority. See Fig. 2 for an organisational diagram of SPD.

IMPACT OF US-INDIA STRATEGIC COOPERATION ON PAKISTAN

The growing strategic cooperation between the United States and India has caused some consternation in Islamabad, even though Pakistani policy-makers have not made a public hue and cry over the issue. Three potential implications of expanded nuclear and defence cooperation between Washington and New Delhi are particularly troubling – not as immediate concerns, but more as long-term threats that need to be monitored and countered.

1. *India may be able to out-race Pakistan by rapidly expanding its production of fissile material.*

The most widely discussed implication for Pakistani security of the US-India civil nuclear cooperation accord is the potential it provides for India to divert more of its indigenously produced nuclear fuel to the weapons programme because of the likely boost in international supplies of fuel for India's civil nuclear power programme. Both the Indian government and the Bush Administration deny that this will be the case. For example, US Under Secretary of State Nicholas Burns told reporters on March 2, 2006, that the agreement would not have an impact on India's strategic programme.²⁵ However, Pakistanis may believe that unless India stops production of fissile material for weapons purposes – which it shows no interest in doing – nuclear safeguards will do little to ensure that outside assistance is not diverted.

The problem, as viewed in Islamabad, is exacerbated by the tendency of Pakistan's military and political leaders to view everything related to India in zero-sum terms – a particularly dangerous state of affairs considering India's growing economic and military might and its significantly enhanced political capital in the United States, Europe, China, and elsewhere. Pakistani defence planners have shown little willingness to accommodate India's growing regional preeminence. They say that what is required are firm assurances that India will respect Pakistan's independence and territorial integrity – or, to put it more colourfully, prevent the transformation of Pakistan into a weak, subservient “West Bangladesh.” However, the main “dilemma” of Pakistan's security predicament is that no Pakistani leader has ever been able to articulate what kind of assurances are required of India to reassure Pakistan that India accepts its existence as a permanent nation-state.

The problem as viewed in Islamabad is exacerbated by the tendency of Pakistan's military and political leaders to view everything related to India in zero-sum terms.

25. White House, Office of the Press Secretary, “Press Briefing by Under Secretary of State for Political Affairs Nick Burns,” Maurya Sheraton Hotel and Towers, New Delhi, March 2, 2006.

Although Indian government officials deny that they have any interest in significantly expanding their fissile material production capabilities, because of Pakistan's intense insecurity complex, there is a tendency in Islamabad to listen to, and accept as true, the aggressive and sometimes hegemonic claims of India's defence hawks such as Brahma Chellaney and Bharat Karnad – the latter of whom has been a particularly vocal critic of India's minimum deterrent posture, arguing for a force of at least four SSBNs armed with 48 SLBMs, 25 nuclear-armed ICBMs, 40 nuclear IRBMs, and 70 manned nuclear-delivery aircraft, all to be complemented by another 70 nuclear-equipped air-to-surface missiles and 25 demolition munitions.²⁶ While all objective evidence would suggest that the Indian government does not pay very close attention to Chellaney, Karnad, and other hawks, at least on the issue of nuclear force levels, inside the Pakistani strategic community these views are taken as a rough blueprint for India's force development. In the absence of reliable intelligence on many crucial strategic matters, worst-case analysis usually guides policy-making.

Compounding the problem is another tendency of Pakistani military officials to also pay close attention to the debate in the United States over strategic matters in South Asia. The incredible publicity over the US-India initiative for civilian nuclear cooperation has provided an abundance of grist for the worst-case analysis mill in Islamabad and Rawalpindi. In 2006, for example, Robert Einhorn has stated, "The deal appears to give India complete freedom not just to continue but to expand its production of fissile material for nuclear weapons." Joe Cirincione has been even more blunt: "President Bush has now given away the store. He did everything but actually sell nuclear weapons to India." Cirincione added: "If the deal stands, India will use foreign fuel for its power reactors, freeing up Indian uranium for its military reactors. India will be able to double or triple the number of weapons it can make annually. They could go from the 6-10 they could currently produce to 30 a year."²⁷

Regardless if this prediction is merited or not, Pakistani strategic planners almost certainly put a great deal of stock in this calculation when they reviewed

26. Bharat Karnad, "A Thermonuclear Deterrent," in Amitabh Matoo, ed., *India's Nuclear Deterrent* (New Delhi: Har-Anand Publications, 1999).

27. Joseph Cirincione, "Oh Canada!" *The Globe and Mail*, March 11, 2006, available at <http://www.carnegeendowment.org/npp/publications/index.cfm?fa=view&id=18116>.

the implications of the US-India nuclear deal for their own strategic requirements in a combined National Command Authority meeting on April 12, 2006. During this meeting, Pakistan's strategic leadership probably concluded that Pakistan's own fissile material production plan required some adjustment—possibly to include the acquisition of an additional fissile material production facility to compensate for India's presumed expansion of fissile material production. Recent public reports about the expansion of Pakistan's plutonium production and reprocessing capabilities, if true, would seem to be further evidence of this development.²⁸

2. *India may be able to identify and target Pakistan's strategic assets with its enhanced intelligence, surveillance, and reconnaissance (ISR) capabilities and it may be able to reach and destroy Pakistani strategic assets using its improved precision-strike aircraft and missile capabilities.*

As discussed above, Pakistani defence planners have long been concerned about the survivability of their nuclear weapons production facilities and weapons arsenal. Although there were many scares about possible Indian preventive strikes – either alone or in combination with some outside power – Pakistani officials probably recognised that India's ability to locate key strategic targets and then mount precision attacks against them was relatively limited. India simply did not possess either the intelligence, surveillance, and reconnaissance systems or precision strike capabilities to perform this kind of mission with a high confidence of success. However, because of India's expanding international defence relationships, especially with the United States, this situation is changing.

India is placing a real priority on developing and acquiring foreign weapons systems to deter aggressive actions from both China and Pakistan. To improve its ISR capabilities, India has purchased, or is in negotiation for, the Phalcon airborne warning and control system (AWACS), surveillance radars, weapon locating radars, maritime surveillance aircraft, unmanned aerial vehicles

28. For example, see David Albright and Paul Brannan, "Chashma Nuclear Site in Pakistan with Possible Reprocessing Plant," Institute for Science and International Security report, January 18, 2007, <http://www.isis-online.org/publications/southasia/chashma.pdf>.

(UAVs), and satellites. In the area of precision strike, India's priorities have been on acquiring the new models of the Su-30MKI and Mirage 2000-5 aircraft, upgrading the Jaguar and the MiG-27 jets, acquiring and developing anti-tank guided-weapon systems, guided artillery weapons, multi-purpose guided weapons, and the Rafael listening targeting pod.²⁹

The ISR and precision strike systems mentioned above are expected to provide India with the ability to dissuade and deter its potential attackers by helping achieve a military edge over Pakistan and by helping bridge a quality gap between the Chinese military and the Indian military. The modern technology is expected to improve the ability of the Indian armed forces to survey potential threats to Indian security and to respond to them in a timely and effective manner. The ISR systems will provide an improved capability to detect and track enemy infiltration, and will also provide improved queuing for patrolling assets to engage the enemy. Having precision strike capability will then allow Indian forces to effectively engage and neutralise the enemy with a high degree of success. Having an improved ISR, precision strike, and missile defence capability is expected to dissuade and deter a potential enemy by ensuring its detection and punishment, and a successful defence against a missile attack is expected to deter the enemy from launching an attack in the first place.

This pattern of arms acquisition by India has been a serious concern for Pakistan. Predictably, Islamabad is likely to view India's recent modernisation efforts as a significant threat to its security. India's military modernisation programme has led to a growing disparity between the Indian and Pakistani conventional military capabilities. A particularly grave concern is that if India pursues its policy to achieve technical superiority in ISR and precision targeting, this will provide India the capability to effectively locate and efficiently destroy strategically important targets in Pakistan. India's new-found ISR capability, through its acquisition of the Phalcon AWACS, will provide India with the ability to locate targets deep inside Pakistan's territory, and direct India's superior aircraft, such as the Su-30 and the Mirage 2000-5, with their air-to-air

29. Lt. Gen. R.K. Jasbir Singh, PVSM, ed., *Indian Defence Yearbook 2004* (Dehra Dun, India: Natraj Publishers, 2004).

and precision strike capabilities, onto those targets. Possessing advanced precision strike capability will ensure high probability of kill, and put Pakistan at a significant disadvantage. The result of this growing divergence in the two states' conventional capabilities will be either a regional arms race – as Pakistan desperately attempts to keep pace with India in order to deter a preventive strike from India – and/or a lowering of the nuclear threshold for Pakistan, if it fails to keep up in the conventional arms race with an economically powerful India and, therefore needs to rely on its nuclear arsenal for a deterrent.

How this issue will play out in the coming years remains to be seen, but suffice it to say that Pakistani defence planners have considerable cause for concern as they project the evolving security environment over the next one-to-two decades. This concern is not particularly evident from the rhetoric of the government. For example, President Musharraf remarked in December 2006: "If we look at the unconventional mode then, Pakistan is a nuclear power. We have tested our whole missile power and the security and safety of our missile system is that much strong that if any nuclear attack is done on Pakistan, it will not be affected. So I am sure that there is no threat against Pakistan and Pakistani nation is fully prepared to face any threat."³⁰ Despite the positive spin, it seems likely that Pakistani officials are growing increasingly concerned about the long-term survivability of their strategic deterrent owing to India's improving ISR and precision-strike capabilities.

3. *The US government, which seemingly places more value on its strategic, economic, and political relations with India, may be more inclined to side with India in future regional disputes, continuing a trend that began with the Kargil conflict in the summer of 1999.*

The final implication considered here of the expanding US strategic relationship with India for Pakistan's security is the most difficult to define with any precision. It is a more general apprehension held by many Pakistani defence decision-makers that Washington's views on South Asian affairs will

30. President Pervez Musharraf, "Address on Birth Anniversary of Quaid-e-Azam at Mazari-Quaid," December 25, 2006, [http://www.presidentofpakistan.gov.pk/FilesSpeeches/SpecialDays/117200733854AM Presidents % 20Speech%20on%20Dec%2025.pdf](http://www.presidentofpakistan.gov.pk/FilesSpeeches/SpecialDays/117200733854AM%20Speech%20on%20Dec%2025.pdf).

Apprehensions are held by many Pakistani defence decision-makers that Washington's views on South Asian affairs will increasingly be shaped by India's perceptions and arguments.

increasingly be shaped by India's perceptions and arguments, rather than by a cool, objective determination by US policy-makers.

The Pakistani commentators who have expressed this concern have pointed to different causal dynamics. These range from the benign – a shift in US perceptions that could result from the greater degree of Indian inputs coming into the US system due to the heightened strategic interaction between US and Indian policy-makers and military officers – to the sinister – the possible tendency of US

officials to take a pro-Indian line because of the growing economic interaction between the two countries and the much higher money and rewards at stake than ever was the case in South Asia.

No matter what the driving force is – or is thought to be – and notwithstanding Washington's repeated reminders that the US strategic relationship with Pakistan continues to be of vital importance to US security interests, Pakistan's concern of becoming strategically isolated – as it was in the late 1970s and throughout the 1990s – is likely to intensify as the US-India strategic relationship continues to grow. How this plays out in Islamabad's general foreign policy orientation and in its strategic policies remains to be seen.



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a) References to books should give author's name: title of the book (italics); and the place, publisher and date of publication in brackets.

e.g. 1. Samuel P. Huntington, *The Common Defense* (NY: Columbia UP, 1961), Ch. 2, pp. 14-18.

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e.g., Douglas M. Fox, "Congress and the US Military Service Budgets in the Post War Period," *Midwest Journal of Political Science*, vol. 16, no. 2, May 1971, pp. 382-393.





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